Finnish Centre for Pensions,
Reports

03
2023

Statutory pensions in Finland – Long-term Projections 2022

Heikki Tikanmäki
Kaarlo Reipas
Sampo Lappo
Ville Merilä
Tuija Nopola
Mikko Sankala

Finnish Centre for Pensions, Reports 03/2023

Statutory pensions in Finland – Long-term Projections 2022

Heikki Tikanmäki
Kaarlo Reipas
Sampo Lappo
Ville Merilä
Tuija Nopola
Mikko Sankala

Eläketurvakeskus
00065 ELÄKETURVAKESKUS
Puhelin: 029 411 20
Sähköposti: etunimi.sukunimi@etk.fi

Pensionsskyddscentralen
00065 PENSIONSSKYDDSCENTRALEN
Telefon: 029 411 20
E-post: förnamn.efternamn@etk.fi

Finnish Centre for Pensions
FI-00065 ELÄKETURVAKESKUS, FINLAND
Phone: +358 29 411 20
E-mail: firstname.surname@etk.fi

Helsinki 2023

ISBN 978-951-691-361-5 (online)
ISSN 1798-7490 (online)

To the reader

One of the statutory tasks of the Finnish Centre for Pensions is to project the development of pensions and their financing. Finnish statutory pensions include earnings-related pensions, national pensions, the guarantee pension, as well as special pensions (incl. benefits paid under motor liability insurance, workers compensation insurance and compensation for military accidents). This report presents the Finnish Centre for Pensions' long-term projections of statutory pensions for the period 2022–2090.

The previous report was published in 2019. Since then, the world was hit by the corona pandemic and Russia invaded Ukraine on multiple fronts. Western countries have reacted to the attack by imposing significant economic sanctions against Russia. Global turmoil inevitably also affects the operational environment of the Finnish pension scheme. Investments have yielded favourable returns, mortality rates have been high and inflation has increased. Central banks have reacted by raising interest rates.

Pension legislation has also changed somewhat over these few years. The most significant changes in benefits include the reform of survivors' pensions that came into force at the beginning of 2022 and the increases to pensions paid by Kela made at the beginning of 2020. Abolishing the additional days of the earnings-related unemployment allowance also affects pensions. At the beginning of the corona pandemic, the employer's share of the contribution under the Employees Pensions Act was reduced for part of 2020, but the reduced part will be reclaimed over the next few years via higher employer contributions. The way the investment return requirement within the earnings-related pension scheme is determined has been made more flexible to strengthen pension providers' ability to weather low investment returns.

The assumptions used in the projections are selected using the best available data. The most considerable changes in the assumptions compared to the previous report are the new population projection and new assumptions concerning the growth in earnings and retirement rates. The pension assets for 2021 are considerably larger than in previous projections.

The projections presented in this report have been calculated using the long-term projection (LTP) model and the ELSI microsimulation model of the Finnish Centre for Pensions. Kaarlo Reipas, Mikko Sankala and Tuija Nopola prepared the projections using the LTP model. Sampo Lappo and Heikki Tikanmäki prepared the projections using the ELSI microsimulation model. Sampo Lappo has compiled and revised the register data used in the projections. Ville Merilä prepared the short-term economic forecasts. Tuija Nopola prepared the population forecast that underlies the projections. Heikki Tikanmäki coordinated the writing of the report, which was translated into English by Lena Koski. Minna Kurttila and Marianne Laune prepared the report for publication.

The report has been improved based on feedback we have received. We have clarified the presentation and have moved calculations on pension financing that were previously in the appendices to the actual text. Paula Hämäläinen assisted us in this work. We have also paid increasing attention to the comparability of different sensitivity analyses.

The data of the graphs and tables included in the report are available on the report's website.[1] In addition, it is possible to examine combinations of sensitivity analyses and supplementing sensitivity analyses using the Skeneraattori application (in Finnish).[2]

The authors of the report thank Allan Paldanius and Ismo Risku from the Finnish Centre for Pensions for their valuable advice and comments at different stages of the work. Many of our other colleagues at the Finnish Centre for Pensions have also contributed in different ways in the preparatory work – a warm thank you to all of them. The report makes use of information and estimates provided by many experts outside the Finnish Centre for Pensions. We would like to thank Petteri Arinen (Hanken School of Economics), Roman Goebel (Keva), Julia Hellstrand (University of Helsinki), Kimmo Karppinen (Seafarers' Pension Fund), Jorma Kinnunen (The Farmers' Social Insurance Institution Mela), Kimmo Koivurinne (The Finnish Pension Alliance TELA), Risto Louhi (Keva), Meri Obstbaum (Bank of Finland), Pertti Pykälä (Kela), Markus Rapo (Statistics Finland), Marina Sirviö (Kela), Markku Stenborg (Ministy of Finance), Antti Suhonen (Aalto University) and Kari Vatanen (Veritas Pension Insurance Company Ltd.), as well as the Actuarial Society of Finland. The responsibility for the contents of the report remains with the authors.

Helsinki, February 2023

Heikki Tikanmäki, Kaarlo Reipas, Sampo Lappo,
Ville Merilä, Tuija Nopola and Mikko Sankala

1 https://urn.fi/URN:ISBN:978-951-691-361-5

2 https://tilastot.etk.fi/chart/Skeneraattori/skeneraattori.html

Summary

In this report, we present the Finnish Centre for Pensions' 2022 long-term projections of the development of statutory pension expenditure and the level of pension benefits. Our report also includes financing projections for the earnings-related pension schemes. The main result from the financing projections is the development of contributions and assets under the Employees Pensions Act (TyEL) for the years 2022–2090.

The future development of mortality is based on Statistics Finland's population forecast from 2021. However, we have modified the forecast to take into account the unusually high mortality rate in 2021 and early 2022. We have also extended the population forecast to cover the years 2071–2090. According to the forecast, the population in Finland will continue to grow until the mid-2030s, after which it will start to shrink. At year-end 2021, the population numbered 5.55 million. It is projected to shrink to 5.1 million by 2090. Despite the shrinking population, the number of people aged 65 and over will grow until 2080. The number of working-age people and children, on the other hand, will decrease very sharply over the projection period.

By the end of the projection period, the old-age dependency ratio (the ratio of persons aged 65 and over to 15–64-year-olds) will be around 65 per cent. In 2021, the dependency ratio was 37.4 per cent. The share of persons who have reached their retirement age grows at a slower pace than the old-age dependency ratio since the retirement age rises. The weakening of the old-age dependency ratio in the near future is a consequence of the current age structure in Finland. Long-term, the weakening of the old-age dependency ratio is caused by a steadily rising life expectancy combined with a low birth rate. In 2021, life expectancy at birth was 81.8 years. It is projected to rise to nearly 91 years by 2090.

The employment rate in 2021 was 71.5 per cent. According to the employment projection, the employment rate is expected to rise at the beginning of the projection period and then stabilize at 73–74 per cent. After that, the employment rate will vary slightly based on the age-structure of the working-age population. The standard employment rate is calculated for 15–64-year-olds. Long term, this measure will not give a complete picture of employment as the retirement age will exceed 65 years in the early 2030s, and the number of workers aged 65 or over will grow.

The expected effective retirement age will continue to rise throughout the projection period. In 2021, it was 62.4 years. It is projected to rise to 63.3 years in 2030 and to over 66 years by the end of the projection period.

Old-age pensions are adjusted to changes in life expectancy with the life expectancy coefficient. The value of the life expectancy coefficient is determined separately for each birth cohort. In 2022, the life expectancy coefficient for 62-year-olds is 0.94659. Due to the unusually high mortality rates during the corona pandemic, the life expectancy coefficient may grow in the near future. In the long-term, however, the life

expectancy coefficient will decrease if mortality follows its historical trend. In 2030, the life expectancy coefficient will be 0.93, and in 2090, it will be 0.86.

The retirement age will also be linked to the development of the life expectancy as of those born in 1965. The retirement age for those born in 1980 is around 67 years. It will rise to around 69 years for those born in 2005.

In 2021, the total statutory pension expenditure was 13.2 per cent of GDP. The ratio will remain more-or-less unchanged up to 2035. At its smallest, the ratio will be slightly less than 13 per cent in the 2040s, after which it will start to grow again. At its highest, the pension expenditure will be over 14 per cent of GDP in the 2080s.

In 2021, the earnings-related pension expenditure was 31.5 per cent relative to the sum of earned income. The expenditure ratio will grow until 2032, at which time it will be slightly above 33 per cent. After that, the ratio will decrease, standing at approximately 31 per cent of the sum of earned income in 2045. From then on, the expenditure ratio relative to the sum of earned income will grow to 37 per cent by the 2080s. The increase in the expenditure ratio is caused, in particular, by a shrinking working-age population. At the very end of the projection period, the expenditure ratio will break into a slight downturn.

In 2021, the average monthly pension was 1,784 euros. The purchasing power of the average pension is projected to grow continuously after 2023, reaching nearly 3,300 euros in 2090 (at 2021 prices). In the very near-term, average pensions will improve more rapidly than average earnings since pensions in payment are indexed mainly based on changes in prices, and prices will rise more than earnings. However, the ratio of the average pension to the average wage will decrease from the mid-2020s onwards. The main reason for the decrease is the life expectancy coefficient, which adjusts the benefit level to correspond to changes in life expectancy. Other previously made changes to how pension benefits are determined will also affect the trend.

The discretionary increases made to the pensions paid by the Social Insurance Institution of Finland (Kela) will have a crucial impact on the level of these pensions. According to the assumptions of this long-term projection, the increases to the pensions paid by Kela will exceed inflation by half of the real growth of earnings.

Pension distributions for both men and women will widen slightly during the projection period. This is partly because, in the future, a greater share of retirees will be immigrants whose average pensions will be small. However, the gender gap in pensions will decrease. A person’s educational level will continue to be a good predictor for the size of their pension, but the gap in pensions between the group with an upper-secondary education and that with a higher education will decrease slightly. The pensions of the group with only a basic-level education will improve at a clearly slower rate than the pensions of other groups. In the future, the group with only a basic-level education will include relatively more people with a shorter-than-average working life, as well as immigrants, who have spent only part of their working life in Finland.

The average contribution rate under the Employees Pensions Act (TyEL contribution) was around 24.4 per cent of wages in 2021. Due to the repayment of the reduced contribution during the corona pandemic, the TyEL contribution in the projection is 24.85 per cent during the period 2022–2025. After that, the contribution will be 24.4 per cent until 2040, when it will begin to rise again. In the early 2050s, the TyEL contribution rate will reach 25 per cent, and at the end of the 2060s, it will rise to 26 per cent. This will be a sustainable contribution level also after the 2060s. The assets under the Employees Pensions Act (TyEL assets) relative to the wage sum will grow as of the 2030s. TyEL assets relative to pension expenditure will also grow from their current level but stabilize as of mid-century. Thanks to increasing TyEL assets, there is no pressure to raise the contribution rate after the end of the projection period.

A constant TyEL contribution rate of 25.3 per cent (up by around one percentage point from the actual contribution in 2021) would be sufficient to finance expenditures long term. This sufficient constant TyEL contribution rate takes into account both the short- and long-term financing needs. Correspondingly, a sufficient constant contribution rate for public sector municipal pensions (JuEL municipal pensions) would be 26.2 per cent. In 2021, the comparable JuEL municipal contribution rate was 28.2 per cent relative to the wage sum. The contribution level sufficient to finance the total pension expenditure under all earnings-related pension acts would be 27.8 per cent. The comparable contribution income (incl. the State's shares) was 29.2 per cent of the economy's sum of earned income in 2021. These constant contribution rates depend on the assumptions used in the projections, particularly those of the return on pension assets.

We have tested our results for sensitivity to changes in the main assumptions in our report. The sensitivity of results to changes in population assumptions is checked using different mortality and birth rates. Alternative economic assumptions are made by varying earnings growth, the employment rate and return on pension assets. We have aimed to select sensitivity scenarios that have comparable ranges of variation. Return on pension assets is by far the most important single factor when it comes to pension financing. Its significance has been further emphasised in recent years as pension assets have grown due to exceptionally good returns.

Changes in *mortality* affect the development of retirement ages but also the benefit levels due to the life expectancy coefficient. However, these adaptation mechanisms do not remove all the effects of the rising life expectancy on expenditure. First of all, they do not affect the pension levels or retirement ages of those who have already retired. Second, the life expectancy coefficient does not apply to pensions paid by Kela. Third, the rise in the retirement age is not fully reflected in the effective retirement age. This phenomenon would be accentuated if the retirement age were to rise quickly because of a rapid increase in life expectancy.

The *birth rate* affects the number of the working-age population and hence also the financing of the pension scheme with a delay of about 20 years. In the low birth rate projection, the contribution rates would be higher than in the baseline projection in the latter half of the century. A birth rate exceeding the baseline projection by 10 per cent would allow the TyEL contribution to be kept at its current level.

The *growth in earnings* affects different pension schemes in different ways. Earnings-related benefits are partly linked to the development of the earnings level. In a pay-as-you-go scheme, a quick growth in earnings also means a growth in the financing base. In a funded system, on the other hand, only pension expenditure increases. In the partially funded TyEL scheme, the impact of the growth in earnings on the contribution rate is, all-in-all, minor. In the total earnings-related pension scheme, faster growth in earnings would reduce the sufficient constant contribution rate. Faster earnings growth would lead to pensions being higher in euros but smaller when compared to the earnings level.

The *employment rate* affects the pension expenditure relative to the sum of earned income in the short and the medium run. If the employment rate falls short of that in the baseline projection, the accrued earnings-related pension rights would also be lower than those in the baseline projection. In the long run, a constant deviation from the baseline projection would not show in the pension expenditure relative to the wage sum or the TyEL pension contribution rate.

The *return on pension assets* affects the contribution rate and the amount of pension assets. Higher investment returns would initially increase the amount of pension assets and, in the long run, lead to a lower TyEL contribution rate. Higher investment returns would reduce the necessary contribution level more than poorer investment returns would increase the necessary contribution level. Initially, the impact would be moderate but, in the long term, it would accumulate to a significant effect. In our sensitivity scenarios we assume investment returns that are 1.2 percentage points higher or lower than in the baseline projection. This would lead to a TyEL contribution rate that deviates from the baseline in both alternatives by around half a percentage point in 2030. Towards the end of the projection period, the alternative with low returns would lead to a TyEL contribution rate that is six percentage points higher than in the baseline projection. Correspondingly, in the alternative with high returns, the TyEL contribution rate would be 10 percentage points lower than in the baseline projection.

Optimistic and Pessimistic economic scenarios have been formed by combining the scenarios of high or low earnings growth, employment and pension asset returns. In the long run, the effects of the combined scenarios for pension financing are mainly due to the return on pension assets. However, during the latter half of the projection period, the TyEL contribution in the optimistic economic scenario would be higher than that of the high return scenario. This is because of the combined effect of strong earnings growth and high asset returns. In the short run, employment also affects pension financing.

Abbreviations and key terms

The major pension acts

JuEL Public Sector Pensions Act
KEL National Pensions Act
MEL Seafarer's Pensions Act
MYEL Farmers' Pensions Act
TyEL Employees Pensions Act
VEKL Act on Compensation for Pension Accrual from State Funds for Periods of Childcare and Periods of Study
YEL Self-employed Persons' Pensions Act

Former pension acts

KiEL Evangelical-Lutheran Church Pensions Act (merged into JuEL in 2017)
KuEL Local Government Pensions Act (merged into JuEL in 2017)
LEL Temporary Employees' Pensions Act (merged into TyEL in 2007)
TaEL Pensions Act for Performing Artists and Certain Groups of Employees (merged into TyEL in 2007)
TEL Employees Pensions Act (merged into TyEL in 2007)
TEL-L Act on supplementary pension provision under the Employees Pensions Act
VaEL State Employees' Pensions Act (merged into JuEL in 2017)

Key terms

disability (pension) incidence rate
Number of new disability pension retirees during a calendar year divided by the number of insured.

earnings / earned income
Includes wages and salaries, as well as the insured income of the self-employed.

expected effective retirement age
The expected age of retirement. The expectation is calculated analogously to life expectancy.

(pension) expenditure ratio
Pension expenditure divided by insured earnings or by GDP.

(pension) contribution rate

Pension contribution paid by employers and employees divided by insured earnings.

Kela

The Social Insurance Institution of Finland that pays national and guarantee pensions.

retirement rate

Number of new retirees during a calendar year divided by the number of insured.

sum of earned income

Same as wage sum, but also includes the insured income of the self-employed.

wage sum

The sum of wages and salaries, including employee's pension contributions.

Contents

LIST OF FIGURES

LIST OF TABLES

1 Introduction

This report presents the Finnish Centre for Pensions' long-term projection of the development of statutory pensions for the period 2022–2090. For a long time now, the Finnish Centre for Pensions has published reports on the long-term development of statutory pensions. The results of previous reports have been compared to realisations (Kesälä 2017). The previous report on long-term projections was published in 2019 (Tikanmäki et. al. 2019). The next report on long-term projections is planned to be published in 2025.

Statutory pensions under review are earnings-related pensions and pensions paid by Kela (national and guarantee pensions), as well as statutory special pensions paid under the Military Injuries Act, the Motor Liability Insurance Act and the Workers' Compensation Insurance Act. Earnings-related pension insurance covers almost all earnings by both wage and salary earners and the self-employed. Earnings-related pensions serve to ensure that the insured and their family get a reasonable income (in relation to income earned while working) in the event of old age, incapacity for work or death. The national pension and the guarantee pension provide all residents of Finland with a minimum income in old age or in the event of incapacity for work. Special pensions provide benefits in certain special cases. In 2021, the statutory pension expenditure was 33 billion euros, of which 91 per cent were earnings-related pensions, seven per cent Kela pensions and one per cent special provision pensions.

These projections describe the development of statutory pensions in accordance with current legislation. Changes to legislation that were known already when making the projections have been taken into account. The focus of the report is on projections for earnings-related pensions. Key results include developments in pension expenditure and benefits as well as pension financing.

The most significant changes in benefits include the reform of survivors' pensions that came into force at the beginning of 2022 and increases to pensions paid by Kela made at the beginning of 2020. Additional days of the unemployment allowance are abolished as of the age group born in 1965. Minor changes have also been made to pension that accrues from benefits under the sickness allowance act. In addition, the concepts of insured income have been specified in different ways.

One of the measures to combat the economic effects of the corona pandemic was a reduction of employer's TyEL contributions for part of the year 2020. The reduced part will be reclaimed in 2022–2025.

In 2022, an amendment to the law came into force, which allows the formula for the supplementary coefficient governing the TyEL funding supplements to be changed. The objective is that pension providers' technical provisions should be more flexible than before in exceptionally adverse investment market conditions. The amendment improves pension providers' average solvency ratio. If necessary, the supplementary coefficient can also be adjusted more often than before. In connection with these

changes, the administrative expenses that are part of the TyEL contribution was made pension-provider-specific.

The State Pension Fund reached its target level[3] and the future use of the fund was regulated by amending the Act on the State Pension Fund. In the future, a larger share of the state pension expenditure is financed with funded assets. The determination of contributions in the municipal sector will also change as of the beginning of 2023 when the new wellbeing services counties begin their work. The key amendment is that the contribution component based on pension expenditure is abolished. These changes do not affect the projections presented in this report since detailed projections of public sector pension financing are not included.

We have had to decide which legislative changes to take into account in this report. At the time of writing, the Finnish Parliament is processing a reform that defines more closely how the confirmed income under YEL is to be determined. Based on historical data, the confirmed income under YEL relative to the general earnings level has decreased steeply in recent years. In our projections, it is assumed that the confirmed income under YEL will stop decreasing regardless of whether the YEL reform is approved. This is because the Financial Supervisory Authority, in its thematic review, has concerned itself with how pension providers act in connection with determining the confirmed income. Pension providers have already taken actions which seem to have resulted in higher confirmed incomes under YEL.

Assumptions play a great role in projections that extend far into the future. To help selecting the assumptions, the Finnish Centre for Pensions arranged a seminar on 8 April 2022 in which the future development of productivity growth and investment returns were assessed. The speakers and participants represented pension providers, economic research institutions, universities and ministries. However, the decisions on which assumptions to use were made at the Finnish Centre for Pensions.

A key economic assumption that has changed is the assumption of the real growth in earnings that is lower than before. The assumption has also been parameterised in a different way than before. Previously we assumed that the long-term real growth in earnings is 1.5 per cent per year. In this report, we have assumed that real labour costs grow 1.2 per cent per year. As pension contribution levels rise, the long-term real growth in earnings is just under 1.2 per cent.

The assumption of long-term inflation has been raised from 1.7 to 2.0 per cent to correspond to the changed inflation target of the European Central Bank. The effects of this change on the results of our projections are marginal. The assumed short-term inflation is in line with our short-term economic forecast.

In the 2019 report, the expected real return on investments was 2.5 per cent for the first ten years. After that, the expected real return went up to 3.5 per cent. A corresponding assumption is used also in this report, but the lower real return assumption at the beginning of the projection period applies to different calendar years. The assumptions used in this report have been selected so that they make sense individually and form a consistent whole.

3 Funding ratio 25%

The starting point of the projections and the probabilities that guide model dynamics (e.g., retirement rates and probabilities related to labour market transitions) are based on register data available to the Finnish Centre for Pensions. This data is reliable and comprehensive. From the point of view of the projections, the deficiencies in the data are minor.

As retirement ages rise, pension benefits can be received at different ages than in realised register data. To account for this the trends observed in the register data on, for example, the transitions to disability and old-age pensions have been extended into the new age range.

As a rule, the starting point of the projections is the realised situation at year-end 2021. However, investment returns and inflation have been taken into account up to 31 July 2022 and other economic development up to 19 May 2022. The realised development in mortality has been considered up to 31 May 2022.

The TyEL financing projections adhere to current funding regulations. The Ministry of Social Affairs and Health confirms the contribution rates under the Employees Pensions Act each year. A central limitation as regards the TyEL contribution is that the provision for pooled claims intended for jointly financed pensions must always exceed a set minimum limit. In our projections, changes are made to the TyEL calculation criteria during the projection period regarding the allocation of the funding supplements and the mortality assumption. The funding regulations give the maker of the financing projections some leeway to decide how the TyEL contribution will develop in the future. The goal in our projections is that the pension contribution develops smoothly, follows changes in pension expenditure and is at a sustainable level at the end of the projection period. We have taken into account the known agreements on the TyEL contribution made by labour market organisations.

Chapter 2 describes the main features of the currently valid pension laws. The assumptions of the baseline projection are presented in Chapter 3. The results concerning pension expenditure and pension benefits are presented in Chapter 4, while the results relating to financing are presented in Chapter 5. The sensitivity of the results with respect to various assumptions is examined in Chapter 6. Chapter 7 includes a comparison with the previous report.

The appendices include supplementary projections and offer more details on the assumptions and modelling frameworks used.

This report has been compiled in applicable parts according to the *International Standard of Actuarial Practice 2: Financial Analysis of Social Security Programs* (hereinafter ISAP2) confirmed by the International Actuarial Association in 2013.

At year-end 2021, the Finnish Centre for Pensions requested the Actuarial Society of Finland to select a person to review this report. Professor Niku Määttänen (University of Helsinki) was appointed for the task. His evaluation was published in Finnish in February 2023 at the website www.etk.fi. Corresponding reviews were made and published also of the previous two reports.

2 Statutory pension benefits and pension financing

The earnings-related pension scheme consists of several pension schemes. Together, they cover the different sectors of the economy. In the private sector, each pension scheme has its own pension act, but in the public sector, the benefits and the financing have been separated into their own acts. Their definitions do not directly correspond to each other. In this report, the division between pension schemes is primarily based on how they are funded.

All work carried out by wage and salary earners between the ages of 17 and 67 and nearly all work carried out by the self-employed between the ages of 18 and 67 is insured in one of the pension schemes. Small-scale or temporary self-employment and self-employment while drawing an old-age pension fall outside the obligation to insure. The sector of the employer or the type of entrepreneurial activity determine which pension scheme applies. The age at which the insurance obligation ends will rise gradually by two years from the present 68 to 70 years. Those born in 1962 are the first age cohort whose insurance obligation ends at age 70.

For the most part, the rules for determining pension benefits are uniform in all pension schemes. Historically, there have been significant differences in these rules. At present, there are substantial differences between the pension schemes regarding the financing of pension expenditures.

This chapter contains a list of pension acts included in the projections, a description of the rules for determining pension benefits and, finally, a review of the pension financing rules.

For more information on the determination of earnings-related pensions, see the website of the Finnish Centre for Pensions[4]. The financing technique of private sector earnings-related pensions is described on the website of the Finnish Centre for Pensions[5] and in a handbook (Mäkinen 2018).

2.1 Pension acts included in the report

The following private sector pension acts are included in the projections of this report:

- Employees Pensions Act (TyEL),
- Seafarer's Pensions Act (MEL),
- Self-employed Persons' Pensions Act (YEL),
- Farmers' Pensions Act (MYEL)[6],
- Act on Farmers' Early Retirement Aid (LUTUL) and the Farm Closure Act (LUEL).

4 https://www.etk.fi/en/finnish-pension-system/pension-security/earnings-related-pension-benefits/

5 https://www.etk.fi/en/finnish-pension-system/financing-and-investments/financing-principles/financing-technique/

6 Scientific and artistic grant recipients are also insured under MYEL.

The projections also include the Act on supplementary pensions under the Employees Pensions Act (TEL-L).

The following public sector pension acts and regulations are included in the projections of this report:

- Public Sector Pensions Act (JuEL),
- pension regulations for the employees of the regional government of the Åland Islands,
- pension regulation in the Orthodox Church Act.

JuEL came into force at the beginning of 2017. It replaced the State Employee's Pensions Act (VaEL), the Local Government Pensions Act (KuEL), the Evangelical-Lutheran Church Pensions Act (KiEL) and the pension regulations for the staff of the Social Insurance Institution of Finland (Kela). However, the public sector pension financing regulations were kept separate. The pensions of the personnel of the Bank of Finland were incorporated into JuEL at the beginning of 2021. The financing of pensions under JuEL is regulated by the following acts:

- Act on the Financing of State Pension Cover,
- Keva Act,
- Act on the Financing of the Evangelical-Lutheran Church Pension Cover,
- Act on the Social Insurance Institution of Finland,
- Act on the Employees of the Bank of Finland.

Pension schemes refer to the above-mentioned private sector earnings-related pension acts and the different public sector regulations on the financing of pensions. They include the State pensions under JuEL (referred to as JuEL [State]), and the municipal pensions under JuEL (JuEL [municipal])[7]. The pensions of the employees of the Evangelical-Lutheran Church, Kela and the Bank of Finland are presented only as a part of the total public sector. State pensions under JuEL correspond to the former State Employees' Pensions Act (VaEL) and the municipal pensions under JuEL to the former Local Government Pensions Act (KuEL). In the future, the personnel of the wellbeing services counties will also be insured under JuEL (municipal). Certain special state groups are also insured under JuEL (State). Their pensions are regulated in a special acts, for example the act on representatives' pensions and the adjustment allowance.

The projections also include the Act on compensation for Pension Accrual from State Funds for Periods of Childcare (of child under the age of 3) and Periods of Study (VEKL). The pension expenditure under this act is not part of either the private or the public sector pension expenditure. The VEKL expenditure is included in the total earnings-related pension expenditure for the whole economy.

7 Strictly speaking, JuEL municipal pensions refer in this report to the pension scheme of Keva's member organisations. They include municipalities, joint municipal authorities, wellbeing services counties and their joint authorities, Keva itself, the Municipal Guarantee Board and the Local Government and County Employers KT. Under certain conditions, some municipal sector associations, foundations, universities of applied sciences and corporations owned by the municipalities may be member organisations of Keva.

For the most important pension acts (TyEL, YEL, MYEL, JuEL [State] and JuEL [municipal]), the expenditure projections are presented by pension scheme. The results regarding VEKL are also presented separately as it would be unnatural to combine the VEKL expenditure with the sector-specific expenditures. For the other pension schemes, the pension expenditure and the wage sums are included in both the sector-wide results and the results covering all earnings-related pensions.

The projections for the private sector pension acts TyEL, YEL and MYEL cover both pension expenditure and financing. The financing of public sector pensions is covered only in the projections of the sufficient constant contribution rates and the funding balance analysis in section 5.2.

Earnings-related pensions are defined benefits. That means that the size of the pension expenditure determines the contribution rate and the need for other financing. Consequently, this report begins with a review of pension expenditures, followed by a review of how these expenditures are financed.

Pensions paid by Kela are presented jointly. They include benefits under the following acts:

- National Pensions Act (KEL),
- Act on the Guarantee Pension, and
- Front-Veterans' Pensions Act (REL).

Special pensions (SOLITA pensions) consist of pensions or life annuities paid based on the following acts:

- Motor Liability Insurance Act (LVL),
- Workers' Compensation Act (TyTAL),
- Act on Compensation for Military Accidents and Service-Related Illnesses, and
- Act on Compensation for Accidents and Service-Related Illnesses in Crisis Management Duties.

The special pensions have been included in this projection only in general terms. The projections also include the pension expenditures of the predecessors of the aforementioned acts. The benefits have been defined in the same way as in Kela's and the Finnish Centre for Pensions' joint statistics (Kela 2021), except for pensions granted solely as special benefits, which have been included in the projections of this report. Compensation under, for example, the Patient Injuries Act or the Rail Traffic Liability Act are not included in the projections.

The report covers the Finnish statutory pension scheme quite comprehensively. However, some acts on pension benefits that apply to special groups have been excluded from our review. Such acts are, for example, the Act on Accident and Pension Provision for Athletes and the Act on additional sports pensions. These acts are also not included in the joint statistics of Kela and the Finnish Centre for Pensions.

2.2 Benefit types and levels

2.2.1 Earnings-related pensions

In the following, we present the main points of the currently valid determination rules of earnings-related pensions. The benefits in various acts are fairly uniform. Historically, there have been significant differences in these rules in the public sector, some of which are still being transitioned out of. The most significant exceptions that are still valid include the following:

- The retirement age is lower for some public sector workers.
- In the public sector, the eligibility for disability pension is based on a definition of vocational disability.
- Soldiers and other special groups covered by state pensions have pension determination rules that deviate from the other pension laws.

Accrual rules

For wage earners, earnings-related pensions accrue based on the earned income as of age 17 until the age when their insurance obligation ends (separate for each age cohort). For the self-employed, earnings-related pensions accrue as of age 18. Persons below the age of 17 or above the age when the insurance obligation ends do not accrue pension and are not obligated to pay pension contributions. As of 2026, pension accrues at a rate of 1.5 per cent of the annual earnings for insured persons of all ages. Until then, pension will accrue at a rate of 1.7 per cent of the earnings for persons aged between 53 and 62 years.

Pension accrues also during periods of the earnings-related unemployment allowance, the parental allowance, the sickness allowance, the sickness allowance on account of an infectious disease, the adult education subsidy and the job alternation leave allowance. Earnings-related pension accrues also from a few other benefits that are less significant from the point of view of pension expenditure. Pension that accrues based on periods of benefits is referred to as pension accrued from unsalaried periods.

Regardless of age, the pension accrual rate for social benefits is 1.5 per cent per year. The earnings used in the accrual of these pensions are calculated from the earnings that the actual benefit is based on. For the parental allowance, the basis for the pension is 121 per cent of those earnings. For the sickness allowance, the percentage is 62 per cent; for earnings-related unemployment benefits, 75 per cent; for the job alternation leave allowance, 55 per cent of the earnings. For other types of daily allowance, the basis for the pension is 65 per cent of the earnings.

The earnings-related pension acts are supplemented by the Act on compensation for Pension Accrual from State Funds for Periods of Childcare and Periods of Study (VEKL). Based on this act, pension accrues from studies leading to a vocational or university-level degree, as well as from childcare at home for one's own children under the age of three. The pension accrual rate is 1.5 per cent per year. The pension accrual is calculated using an earnings base of around 786 euros per month (at 2022 prices). The amount is tied to the wage coefficient.

Benefits

Earnings-related pension benefits are the disability, old-age, partial old-age, years-of-service and survivors' pensions. Previously granted part-time pensions are paid up to 2023, but no new pensions of this type are granted.

Age limits and the life expectancy coefficient

The retirement age for the old-age pension is 63 years for persons born in 1954 or earlier. It will rise by three months per birth cohort as of those born in 1955, until it is 65 years for those born in 1962. As of those born in 1965, the retirement age will be linked to life expectancy so that the ratio between the computational working life (time from age 18 to the retirement age) and the life expectancy at the retirement age will remain stable. However, the retirement age can rise by no more than two months per age cohort.

The initial amount of the old-age pension, the partial old-age pension, the disability pension, the partial disability pension and the years-of-service pension is adjusted with a life expectancy coefficient based on changes in life expectancy. The amount of the starting pension is determined by multiplying the accrued pension by the life expectancy coefficient. In the case of a disability pension, only previously accrued pension is multiplied by the life expectancy coefficient. If the disability begins in 2027 or later, the total pension will be adjusted with the life expectancy coefficient.

The value of the life expectancy coefficient is determined so that the capital value of the old-age pension remains unchanged, even if the mortality rates of those of a pensionable age were to differ from the mortality rates observed between 2003 and 2007. The life expectancy coefficient affects the pensions of persons born in 1948 and later. The value of the coefficient is determined separately for each age cohort. As of 2027, that is, as of those born in 1965, the life expectancy coefficient will be made more lenient to make up for increases in retirement ages higher than 65 years.

Using the life expectancy coefficient, a target retirement age is determined for each age cohort.[8] By deferring retirement until the target retirement age, the pension increase for late retirement will offset the effects of the life expectancy coefficient.

The insurance obligation ends at age 68 for those born in 1957 and earlier. For those born between 1958 and 1961, it is 69 years, and for those born in 1962 and later, it is 70 years. The age at which the insurance obligation ends is not linked to life expectancy.

8 No target retirement ages are presented in this report for those age groups whose target retirement age would exceed the age at which the insurance obligation ends.

Indexing

When calculating the initial pension amount, the income from different years is adjusted using the wage coefficient. It is a weighted average in which changes in the general earnings level weigh 80 per cent and changes in consumer prices weigh 20 per cent. Pensions in payment are adjusted with the earnings-related pension index, in which changes in the general earnings level weigh 20 per cent and changes in consumer prices weigh 80 per cent. The pensions of young and middle-aged disability pensioners are raised with a one-off increase once they have received the pension for five years. The increase is 25 per cent for pensioners under the age of 32. For those over 32, the increase is lowered by one percentage point for each year of age, until it ceases altogether.

Disability pension

The disability pension can be granted either as a full or a partial pension, depending on the insured person's degree of disability. The partial disability pension amounts to half of the full disability pension.

The disability pension is the pension amount accrued up to the date on which the disability begins, plus an additional projected pension component. The purpose of the projected pension component is to make up for pension that has not accrued from work due to disability. The projected pension component is calculated for the period from the pension contingency to the person's retirement age. If the retirement age has not yet been confirmed for the person's age group, the projected pension component is calculated from the pension contingency until the latest confirmed retirement age.

The accrual rate for the projected pension component is 1.5 per cent. As a rule, the earnings that the projected pension component is based on are the average earnings that the individual received over a period of five years before the disability began. The life expectancy coefficient affects the starting amount of the disability pension as explained before in this chapter.

Old-age pension

The insured person is entitled to an old-age pension after reaching the retirement age of their age cohort. In some special cases, the retirement age may be lower. If the insured defers their pension past their retirement age, the pension will grow by 0.4 per cent for each month of deferral.

If the insured works while getting a pension, new pension will accrue at a rate of 1.5 per cent.

An old-age pension directly following a full disability pension will be of the same amount as the full disability pension. When a partial disability pension becomes an old-age pension, the amount of the pension doubles. Any pension that has accrued for work done while drawing the disability pension will be added to the old-age pension at that point. Once the person reaches the age at which the insurance obligation ends, no more pension will accrue.

Partial old-age pension

An insured person born in 1963 or earlier can retire on a partial old-age pension after turning 61. Persons born in 1964 can retire after turning 62 years, while those born in 1965 or later can draw a partial old-age pension three years before reaching their retirement age. The partial pension is either 25 or 50 per cent of the accrued old-age pension. If the pension is taken out early, the part taken will be permanently reduced by 0.4 per cent for each month that the pension is taken early. Correspondingly, if the pension is taken out late, the part taken will be permanently increased by 0.4 per cent for each month that the pension is deferred.

Years-of-service pension

The years-of-service pension can be granted to a person who has turned 63 years and who has done mental or physical work that requires great effort for at least 38 years. In addition, the insured person's ability to work must be reduced, but not by as much as for a disability pension. The years-of-service pension is the same amount as the disability pension, without the projected pension component. Those born in 1965 or later can retire on a years-of-service pension two years before reaching their retirement age.

Survivors' pension

Survivors' pensions are paid to the surviving spouse, the children and, in some cases, to a former spouse to whom the deceased was paying alimony. As of 2022, a common-law spouse may also in some cases be considered a surviving spouse. The amount of the survivors' pension depends on the number of beneficiaries The amount is at its highest when the beneficiaries include the surviving spouse and at least two children. In that case, the total survivors' pension is of the same amount as the deceased person's pension. If the surviving spouse is the only beneficiary, the survivors' pension is up to half of the pension of the deceased spouse. The surviving spouse's pension may be somewhat reduced or reduced to zero by the surviving spouse's own pension in payment or accrued pension. As of 2022, the surviving spouse's pension is granted for a fixed term for surviving spouses born in 1975 or later. As a rule, the pension is paid for 10 years. Surviving spouse's pensions that have begun earlier are permanent benefits, but their amounts may change as underage children come of age.

2.2.2 National pension and guarantee pension

The national pension and the guarantee pension secure an income for pensioners with a small or non-existing earnings-related pension. The national pension can be paid as an old-age or a disability pension. The retirement age in the national pension scheme is 65 years until the retirement age in the earnings-related pension reaches 65 years. After that, the retirement age in the national pension scheme will rise along with that of the earnings-related pension scheme. No partial disability pensions or partial old-age pensions are paid from the national pension scheme. Kela's survivors' pensions are paid only to persons under the age of 65 years.

The amount of the national pension depends on the size of the earnings-related pension and on the pension recipient's family status. At year-end 2022, the full national pension is 703 euros per month for a single person. For a married or cohabiting person, it is 628 euros per month.

The amount of the national pension decreases as the amount of the earnings-related pension increases. Half of the monthly earnings-related pension that exceeds 59 euros is deducted from the national pension, until there is no national pension left to pay.

However, the increase for late retirement and the lump-sum increase paid to young recipients of an earnings-related disability pension is not deducted from the national pension. The deduction for early retirement made to the earnings-related pension does not raise the national pension. The VEKL benefit that has accrued from periods of childcare and studies is not considered when determining the amount of the national pension.

Pensions and compensations paid from abroad usually reduce the amount of the national pension. In addition, the amount of the national pension is proportionate to the time that the pensioner has lived in Finland or an EU/EEA country.

The guarantee pension raises the smallest pensions to a minimum pension level. At year-end 2022, the level of the guarantee pension is 886 euros per month. All statutory pensions paid from Finland and corresponding foreign benefits affect the amount of the guarantee pension. Such pensions are fully deducted from the guarantee pension until there is no guarantee pension left to be paid out.

All benefits and earnings limits of the national pension, as well as the amount of the guarantee pension, are tied to the national pension index. Its value depends on changes in the consumer price index. A benefit once defined through the national pension scheme will not be recalculated due to subsequent index adjustments of the earnings-related pension. Instead, the national pension in payment will be adjusted with the national pension index.

By a decision of Parliament, the national and guarantee pensions have undergone occasional discretionary increases. The national pension and the guarantee pension were last increased in 2020. In addition to occasional discretionary increases, the national pension was cut and frozen in 2015 and in 2017–2019. An extra index increase was made to pensions paid by Kela in August 2022. In turn, the increase will reduce the 2023 index increase correspondingly.

For a more detailed description of how pensions paid by Kela are determined, see Ritola & Tuominen (2022).

2.2.3 Special pensions

Special pensions refer to pensions and life annuities paid under the Motor Liability Insurance Act, the Workers' Compensation Act and the Act on Compensation for Military Accidents and Service-related Illnesses. Based on the Motor Liability Insurance Act, a disability pension is paid if a permanent injury has led to a loss of earnings. Based

on the Workers' Compensation Act, compensation is paid for accidents at work or occupational diseases. A pension based on this Act is paid to the injured after a fixed period of a daily allowance. As a rule, events giving rise to a claim that occurred before the currently valid acts came into force are compensated under the laws valid at the time of the event.

As a rule, special pension benefits are primary in relation to the earnings-related pension. They also reduce the national pension and the guarantee pension in the same way as an earnings-related pension does.

2.3 Financing

The pension financing regulations in Finland are scheme-specific. Most earnings-related pensions are partly funded, but the degree of funding varies from one scheme to another. Pensions under the Self-employed Persons' Pensions Act are not funded, and as for MYEL pensions, mainly those that accrue based on grants are funded.

The earnings-related pension scheme of private sector wage-earners applies a financing technique that uses partial funding. A given part of the annual pension accrual is prefunded while the rest of the pension is financed with annual contribution income through the pay-as-you-go (PAYG) system.

State and municipal earnings-related pensions were financed according to the PAYG principle until the end of the 1980s. After that, public sector pensions were funded to curb the growth of pension contributions. Current public sector pensions under JuEL have considerable pension funds which are managed by Keva (municipalities and wellbeing services counties), the State Pension Fund (State) and the Church Pension Fund (Evangelical-Lutheran Church). By nature, public sector pension funds are buffer funds, governed by less detailed financial regulations than private sector pension funds.

The pension expenditure of the self-employed and farmers are financed according to the PAYG principle. The State pays the part that the pension contributions do not cover.

The State finances national pensions and the guarantee pension solely according to the PAYG system.

The Employment Fund pays a contribution (TR contribution) to the earnings-related pension scheme each year. The Employment Fund's share of the earnings-related pension expenditure is used to finance pensions that accrue during periods of earnings-related unemployment and training and benefits received during job alternation leaves.

2.3.1 TyEL and MEL

Old-age and disability pensions are divided into a funded and a pooled component. The assets for the funded component are accumulated by the pension provider in which the employee is insured. The assets for the pooled component are collected according to the PAYG principle during the year in which the pension is paid. Survivors', partial old-age and years-of-service pensions are financed in full using the PAYG system.

Old-age pensions are funded from all insured work done before retirement. Disability pensions, on the other hand, are funded when the pension begins. Using a common set of actuarial principles, each pension provider calculates the amount of technical provisions caused by funded pension components. A nominal three-per-cent discount rate is used when calculating technical provisions.

In most years, the return on pension assets exceeds the nominal three-per-cent discount rate used to calculate the technical provision. The realised surplus from investments increases the solvency of pension providers. Based on the average solvency of pension providers and the average returns of their equity investments, the funded components of old-age pensions are increased. In addition, part of the contributions of 53–62-year-old employees are used to increase the funded components until the end of 2025. The larger the funded parts of the old-age pension become, the less pension contributions are needed to cover the annual pension expenditure when the pension is in payment.

Increases to funded pensions can be targeted in varying amounts to different age groups to achieve a steady development of the contribution rate. The targeting affects the dissolving of funded pension components. The older the individuals are for whom the increases are targeted, the faster the increases dissolve. As a result, the contribution rate decreases.

Pension expenditure based on the Seafarer's Pensions Act is financed by employers, employees and the State. In 2022, the contribution rate was 19.0 per cent of the wage sum. The employer's share of the contribution is 11.4 per cent and the average employee contribution is 7.6 per cent. The employee's share of the contribution is determined according to TyEL.

2.3.2 YEL and MYEL

The pension expenditure and administrative costs of the self-employed workers and farmers are financed with pension contributions and tax funds. The State pays the part that the pension contributions do not cover. The pensions of MYEL grant recipients are funded to a large extent. The YEL contribution rate corresponds roughly to the average TyEL contribution rate. The average MYEL contribution rate equals slightly more than half of the TyEL contribution rate.

In 2021, the State paid approximately 25 per cent of the YEL expenditure. The State stood for more than 80 per cent of the MYEL expenditure in 2021. The large role of the State regarding MYEL financing is due to an unfavourable age structure of the insured and the low MYEL contribution rate.

3 Assumptions of the baseline projection

The projections made in this report are, by nature, trend projections. It means that observed developments have been continued into the future. In the projections, the laws and other regulations governing the operations of the scheme are based on current legislation. Any exceptions to this principle are separately stated in the report. The principle is that future legal amendments which were known at the time of making the projections but which come into force in the future are taken into account. For example, some of the regulations of the 2017 pension reform will come into force later in the 2020s.

To make projections that describe the future pension expenditure and its financing, assumptions have to be made regarding demographic development, employment, retirement rates, earnings growth, the return on pension assets and inflation.

The selection of assumptions is steered by, among other things, the International Standard of Actuarial Practice 2 (ISAP2). As instructed by the standard, we have tried to select as neutral assumptions as possible in the baseline projection. That means that they are neither underestimates nor overestimates and that we have not used safeguarding assumptions in our projections. When available, we have turned to domestic and international sources, expert estimates and our own analyses when selecting the assumptions.

3.1 Population

The population projection in this report is based on Statistics Finland's population projection from 2021 (Statistics Finland 2021), but the preliminary data on mortality rates in 2021 and 2022 (Statistics Finland 2022) have been taken into account in the starting level of mortality. The selections made are described in more detail in Appendix 2. The life expectancy at birth has been shorter in 2018–2021 than previously projected, and according to preliminary data from Statistics Finland, life expectancy has declined strongly also during early 2022. The population forecast has been extended beyond 2070. In other respects, the baseline population projection in this report adheres to the assumptions of the projection of Statistics Finland.

The starting year for the population projection is 2021. The main assumptions made in the projection are as follows:

- The total fertility rate is 1.45.
- Net migration is 20,000 persons in 2021, after which it is 15,000 persons per year.
- The mortality rate of under-50-year-olds is assumed to decline in the same way as it has been observed to decline when comparing the mortality rates of the periods 1987–1991 and 2016–2020. The mortality rate of those who have turned 50 is assumed to decline in the same way as it has been observed to decline when comparing the mortality rates of the periods 1997–2001 and 2016–2020.

The population projection has been extended beyond 2070 according to the assumptions above. However, the decrease in the mortality rate has been reduced to half after 2070 since, typically, in other population projections, life expectancy extends slower than in the projections of Statistics Finland. For example, the projected life expectancies in 2070 in a report by the Working Group of Ageing Populations and Sustainability (AWG) (European Commission 2020) are lower in all Member States, including Finland, than what is projected in Statistics Finland's projection. The mortality rates of different projections have been compared in more detail in Nopola (2021).

In the long term, the decreasing mortality rates used in the projection will result in a considerable increase in longevity. The male life expectancy at age 65 will rise from 18.5 years in 2021 to 26.1 years in 2090. For women, the projected rise during the same period goes from 22.0 years to 28.4 years. However, because mortality rates are decreasing, these so-called period life expectancies underestimate the expected remaining lifetime of each age cohort since they are calculated using the available mortality rates for a given calendar year. A better estimate for the remaining lifetime of people born in a given year is the cohort-specific life expectancy. It is calculated by using projected future mortality rates for the cohort of interest. In 2021, the cohort life expectancy for men at age 65 was 20.6 years and for women 24.1 years. (Appendix 3).

The mortality rates of pensioners differ to some degree from one pension scheme to another. For example, the money-weighted life expectancies of both genders at the retirement age are around 0.7 years higher in the municipal sector than those of TyEL pension recipients. The difference in money-weighted life expectancies is taken into account in the projections in so far as it is explained by the differences in how the size of the pension explains mortality in different pension schemes.

The old-age dependency ratio depicts the ratio of persons aged 65 and over to 15–64-year-olds. The ratio will rise from 37.4 per cent in 2021 to 44.8 cent by 2040. In 2090, the old-age dependency ratio will be 65.4 per cent. The old-age dependency ratio will grow both due to the growing number of people who have turned 65 years and due to the shrinking number of working-age people.

Table 3.1.
Population forecast for the years 2021–2090

3.1.1. Life expectancy at birth, years

	2021	2025	2030	2040	2050	2070	2090
Total	81.8	82.7	83.7	85.5	87.1	89.8	91.0
Men	79.2	80.2	81.3	83.4	85.3	88.4	89.7
Women	84.5	85.2	86.0	87.5	88.9	91.3	92.3

3.1.2. Life expectancy at age 65, years

	2021	2025	2030	2040	2050	2070	2090
Total	20.3	21.0	21.7	23.0	24.2	26.3	27.2
Men	18.5	19.3	20.0	21.5	22.8	25.1	26.1
Women	21.9	22.6	23.2	24.4	25.6	27.6	28.4

3.1.3. Population (1,000) and the old-age dependency ratio (persons aged 65 and over to 15–64-year-olds, %)

	2021	2025	2030	2040	2050	2070	2090
Total	5,548	5,571	5,591	5,577	5,512	5,368	5,077
0–14-year-olds	852	809	758	739	711	633	582
15–64-year-olds	3,417	3,409	3,389	3,341	3,237	2,980	2,719
65 years and over	1,279	1,353	1,444	1,497	1,564	1,756	1,777
Old-age dependency ratio, %	37.4	39.7	42.6	44.8	48.3	58.9	65.4

3.2 Employment and pension incidence rates

The method used to project employment rates is described in Appendix 6. In the employment projection, it is assumed that the current rate of structural unemployment is 7.9 per cent. This assumption is in line with, for example, the structural unemployment rate of Finland estimated by the Bank of Finland (Bank of Finland 2018). In our projection, the abolishment of the additional days of the unemployment allowance is assumed to reduce and the rising retirement age to increase unemployment compared to this level. For the years 2023–2027, unemployment is assumed to be temporarily below the long-term trend for cyclical reasons.

Disability pension incidence rates are high, particularly among the older age groups. As retirement rates go down, the probability of labour market exit also goes down. In other respects, the age- and gender-specific transition probabilities into or out of the labour force have been assumed to remain constant in the future. The employment development in 2020 was abnormal due to the corona pandemic and related lockdowns, so the probabilities have been estimated based on register data for 2017–2019. However, since this period saw an improvement in the economic situation, which caused the employment rate to rise, we have assumed the future transition probabilities out of the labour force to be slightly higher than estimated.

Retirement rates refer to the relative proportion of people retiring during one year as a percentage of the base population. As a rule, the assumed retirement rates for the different pension types during the projection period are based on the observed levels in 2021. As of 2022, the retirement rates are assumed to be affected by the trends described below. In particular, the rising retirement age affects the retirement rates.

The future development of the disability incidence rate is based on a past trend for the period 1996–2021. During that period, the five-year moving average of the age-adjusted disability pension incidence rate decreased by 1.6 per cent, on average, per year. In this report, the past trend is extrapolated to continue, but the rate of decrease has been slowed down by five per cent per year. Without the slowdown, the disability incidence rate would end up at an implausibly low level. With the assumptions used in the projection, disability incidence will decrease by 10 per cent by 2030. By 2070, it will decrease by 25 per cent compared to the 2022 level.

The rise in life expectancy will raise the retirement age. As a result, new age groups that would have been eligible for the old-age pension had the retirement age not risen will

become at risk of disability. In previous years, the disability incidence rate has been the higher the older the workers are. This trend has been estimated from observed disability risks and extrapolated to continue every time the retirement age will rise. The disability risk leading to full disability pension for over 50-year-olds is presented for a few years in Figure 3.1.

Figure 3.2 presents the disability risk leading to full disability pension for persons insured under TyEL and JuEL (municipal) in 2050. The deviation in sector-specific risks is minor. The disability incidence risk leading to a partial disability pension, on the other hand, is more than double in the municipal sector compared to the partial disability incidence risk under TyEL. (Figures 3.2 and 3.3).

Figures 3.1–3.3 present the disability incidence risk without separating them by gender, but in the projection, the disability incidence risks are gender-specific. The disability incidence rate depicts the beginning of a disability that leads to retirement on a disability pension. Due to the primary nature of the sickness allowance, the disability pension typically begins about a year after the onset of disability. In the projection, a full disability pension begins a year after the disability began while a partial disability pension begins in the same year as the disability.

Figure 3.1.
Age-specific disability incidence rates leading to full disability pension of insured working persons over the age of 50 at various cross-sectional years, per cent

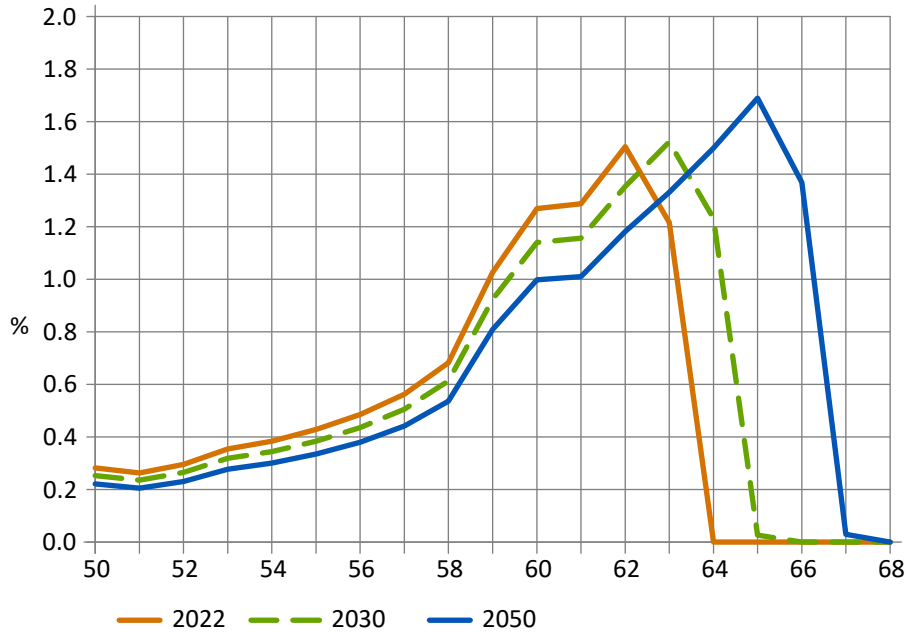


Figure 3.2.
Age-specific disability incidence rates leading to full disability pension of insured working persons over the age of 50 in 2050, TyEL and JuEL (municipal), per cent

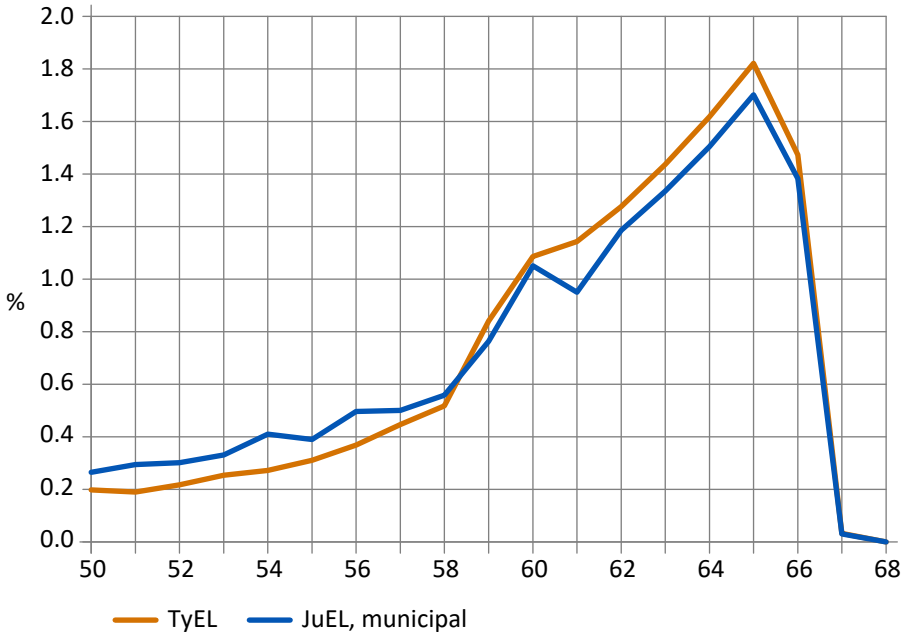
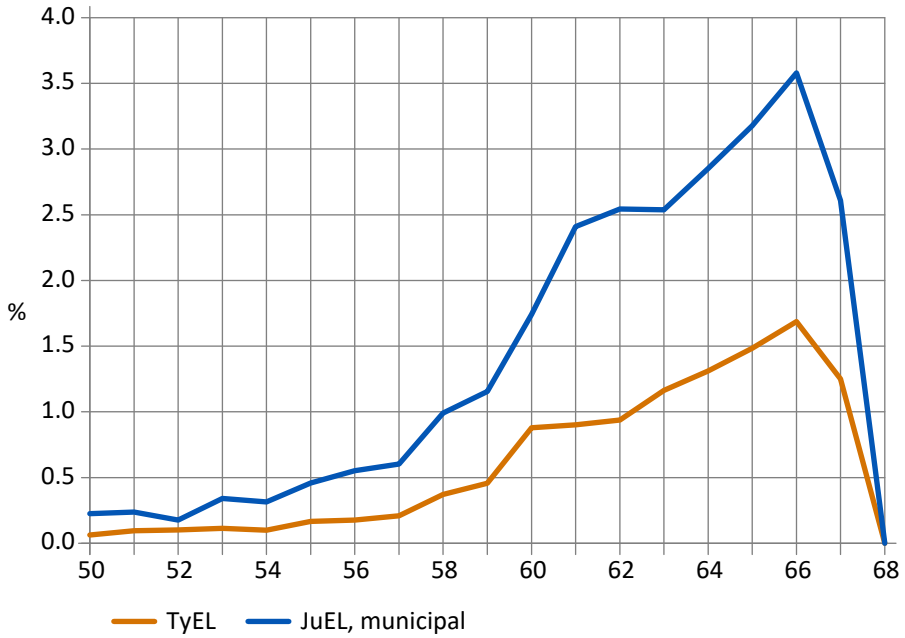


Figure 3.3.
Age-specific disability incidence rates leading to partial disability pension of insured working persons over the age of 50 in 2050, TyEL and JuEL (municipal), per cent



The projection assumes that people retire on an old-age pension at or after the retirement age of their age cohort. The lower retirement ages of the public sector, MEL and the supplementary pensions under TEL-L form exceptions. For the most part, these lower retirement ages will cease to exist during the 2040s at the latest. All persons who have accrued earnings-related pension are assumed to retire on an old-age pension by the time they have reached the age at which their insurance obligation ends, even though the realised data shows that some small pensions are not claimed.

The partial old-age pension and years-of-service pension incidence rates are based on the observations for the period 2017–2021. As age limits rise, the incidence before the benefit-specific age limits of these pension benefits, as well, is prevented. For the ages at which it is possible to retire, the incidence rate has been assumed based on age profiles of realised incidence rates.

3.3 Growth in earnings level and inflation

The long-term real growth in labour costs is assumed to be 1.2 per cent and inflation 2.0 per cent per year. Both assumptions have changed compared to the long-term projection of 2019. The inflation assumption is compatible with the 2021 monetary policy strategy of the European Central Bank. In the new strategy, the long-term inflation target is 2.0 per cent (European Central Bank 2021). In the previous strategy, the target was an inflation of less than two per cent.

Compared to previous projections, we have changed the way we make assumptions regarding earnings growth. In previous reports, we have made an assumption on the real growth of earnings. In this report, we have introduced the praxis of assuming the growth in labour costs. Labour costs include wages and the employer's pension contribution and other indirect statutory expenses. The earnings-related pension contribution used is the TyEL contribution rate received as a result of the projection. Other indirect expenses are assumed to remain at the level of the starting year relative to wages. This method means that the growth in earnings slows down as the earnings-related pension contribution rises. We have made this change so that the rising pension contributions would not create new money in the economy or significantly change the functional income distribution. In individual projections, this is of little importance,[9] but in the projections made in this new manner, the comparability of different alternative projections is improved.

The labour costs are assumed to grow long term at the growth rate of productivity. The productivity growth assumption is based on multiple sources. One of these is the long-term economic projection by the Bank of Finland. According to it, the growth in productivity will vary between 0.8 and 1.3 per cent per decade until 2070 (Kokkinen et. al 2021 and Mäki-Fränti et al. 2021). The OECD has estimated that the Finnish GDP per capita will grow by around 1.2 per cent long term (Guillemette and Turner 2021). In the projections of the Working Group on Ageing Populations and Sustainability (AWG),

9 In the period after the short-term economic forecast, as of 2027, the real growth of earnings is around 1.18 per cent per year in the baseline projection, that is, around 0.02 percentage points slower than the real growth of labour costs.

the long-term assumption of the real growth in earnings is 1.5 per cent (European Commission 2020). Historically, the real growth in earnings has varied from one period to another (Table 3.2).

The assumptions concerning the earnings growth and inflation for the early years of the projection period (2022–2027) are based on the short-term economic forecast drawn up at the Finnish Centre for Pensions in May 2022. The inflation outlook for 2022–2023 was updated in August 2022. In 2022, the average annual real growth in earnings is -3.7 per cent and between 2023–2027 it averages 0.9 per cent per year. After that it is determined based on the labour cost growth assumption. Inflation is 6.5 per cent in 2022 and 2.7 per cent in 2023 and 1.8 per cent in 2024. After that, it is assumed to be at the long-term level.

The inflation assumption has no significant impact on the results if the real earnings growth rate and the real investment return rate are given. However, inflation does play a role in the way in which technical provisions are generated and dissolved under TyEL since funding is partly guided by nominal parameters. For example, a nominal interest rate of three per cent is used for calculating the technical provisions of pension providers.

Table 3.2.
Growth of real earnings, 1982–2021

Length of period	Years	Growth rate*, %
40 years	1982–2021	1.59
20 years	1982–2001	1.89
	2002–2021	1.30
10 years	1982–1991	2.51
	1992–2001	1.27
	2002–2011	1.96
	2012–2021	0.65

* Geometric mean

Source: Own calculation, Statistics Finland (consumer price index [KHI 1977] and index of wage and salary earnings [ATI 1962]).

3.4 Return on pension assets

Investment returns are associated with a high level of uncertainty. On the other hand, the return on pension assets has a considerable impact on the development of TyEL contributions and assets. In the long-term projections, the real rate of return for pension assets is based on a survey directed at large pension investors and asset managers, as well as on the views of international asset managers (Arinen and Suhonen 2022). We make separate short-term (2022–2031) and long-term (2032–2090) assumptions for investment returns since the low interest rate in recent years makes it challenging to reach the accustomed long-term return rate. In addition, the rising interest rates that are on the horizon under the lead of the ECB, as well as the growing risks on the financial markets, at least temporarily lower the outlook of the total return on pension asset investments.

In the survey, institutional investors gave real growth assumptions per investment type separately for the periods 2022–2031 and 2032–2051. The outlooks of international asset managers in late 2021 concerning long-term returns of different investment type were also collected. These outlooks spanned 5–15 years. When the survey's investment returns per investment type are weighted according to the allocation of TyEL pension providers at year-end 2021, the real return-expectation for the first 10 years is 2.9 per cent per year, and for the next 20 years, 3.4 per cent per year. Based on the assessments of international asset managers, we get an alternative assessment of the return expectation for about ten years which, given the allocations of TyEL pension providers, would be around 1.7 per cent.[10]

The expected return of pension assets in line with the survey and the review of international literature has been specified in Tables 3.3 and 3.4. In the tables, the return has been weighted with the investment allocation of TyEL insurance companies per 31 December 2021. Historically speaking, this investment allocation had a lot of risk investments. The 2017 pension reform and the recent legal amendment that made it possible to change the formula for the supplementary coefficient allowed for higher-than-before risk levels and, consequently, higher return expectations.

The lower expected return of international asset managers is partly explained by their investment allocations that differ from those of the Finnish actors. Particularly the higher weight on American stocks combined with their current high valuation reduces the expected return of international investors compared to Finnish pension investors. Another explaining factor is the low duration of the investment portfolios of Finnish pension investors. Based on this, a credible expected return for the first ten years has been set between the estimates of the Finnish and the international actors.

In the 2019 long-term projection, we assumed a real rate of return on pension assets of 2.5 per cent per year during the first 10 years and 3.5 per cent per year after that. The survey gave us no cause to change this baseline assumption. This means that, in this report, the annual real rate of return is 2.5 per cent for the years 2022–2031 and 3.5 per cent for the years 2032–2090. To be precise, for 2022 we use the realised investment returns for January-July and the aforementioned expected return for August-December. When the realised returns of the first half of the year are taken into consideration, the real rate of return for 2022–2031 is 1.7 per cent (Table 3.5).

10 Under Keva's investment allocation, the expected return for the first decade would be the same as that for TyEL pension providers with both short-term return assumptions. The expected return for the 20 years following that would be 3.5 per cent per year based on the survey's return per investment type. When using the investment allocation of the State Pension Fund, the expected returns would be lower.

Table 3.3.
Real return assumption of pension assets per investment type according to the survey and the review of international asset managers 2022–2031, %

	Share 31 December 2021*	Survey	International asset managers
Money market investments	5.0	-1.1	-2.0
Bonds and loans	24.7	0.3	-0.8
Real estate	10.6	3.1	2.1
Shares and other investments	59.7	4.3	3.0
Total	100.0	2.9	1.7

* TyEL pension providers. Source: TELA (2022).

Table 3.4.
Assumed real return on pension assets by asset type, 2032–2041 (%)

	Share 31 December 2021*	Survey
Money market investments	5.0	-0.4
Bonds and loans	24.7	1.2
Real estate	10.6	3.1
Shares and other investments	59.7	4.7
Total	100.0	3.4

* TyEL pension providers. Source: TELA (2022).

Table 3.5.
Return on assets, growth in earnings level and inflation, 1997–2090 (%)

Year	Inflation[c]	Growth in earnings[d]		Return on pension assets	
		Nominal	Real	Nominal	Real[b]
1997–2021[a]	1.5	2.8	1.3	6.1	4.5
2002–2011[a]	1.6	3.6	2.0	4.5	2.7
2012–2021[a]	1.1	1.7	0.6	7,1	5.9
2017	0.7	0.2	-0.5	7.4	6.9
2018	1.1	1.7	0.6	-1.6	-2.7
2019	1.0	2.1	1.1	12.1	11.1
2020	0.3	1.9	1.6	4.7	4.5
2021	2.2	2.4	0.2	16.1	12.2
2022–2031[a]	2.5	3.0	0.5	4.3	1.7
2032–2090[a]	2.0	3.2	1.2	5.6	3.5

a) geometric mean
b) the real return has been calculated based on changes in price levels at the end of the year
c) change in consumer price index, annual mean value
d) change in the index of wage and salary earnings, annual mean value
Source: Own calculations, Statistics Finland and The Finnish Pension Alliance TELA (2022).

3.5 Indexing of Kela pensions

Under the act on the national pension index, Kela pensions follow the national pension index, which is tied to changes in consumer prices. In addition to the annual index adjustment, the level of Kela pensions has been increased from time to time through legislative changes. The most recent discretionary increase to the national pension and the guarantee pension was made in 2020.

Overall, the growth of Kela pensions has exceeded the long-term increase in consumer prices but has lagged behind the long-term growth in earnings. The real value of the full national pension rose by approximately 11 per cent from 2000 to 2021. Real earnings grew by 32 per cent during the same period. Taking the guarantee pension into account, the real growth of the minimum pension was 40 per cent during the same period. This is a slightly more rapid growth than the growth in earnings. However, the increase to the guarantee pension affects only a portion of those who receive pensions paid by Kela.

In this report, we have assumed that Kela pensions are indexed according to the national pension index and that discretionary increases are made to the pensions as of 2028. The discretionary increases amount to half of the real growth in earnings. In other words, the assumption of the outlook for Kela pensions deviates from present legislation. The long-term assumption is the same as in Kela's actuarial report (Kela 2015). Until 2027, Kela pensions follow the development of consumer prices.

Appendix 1 includes two alternative projections of the future development of Kela pensions. In one of them, Kela pensions follow consumer prices throughout the projection period. In the other, discretionary increases corresponding to the real growth in earnings are made as of 2028.

4 Pension expenditure and benefits

The statutory pension expenditure consists of expenditure for earnings-related pensions, pensions paid by Kela and special pensions. Section 4.2 presents the aggregated earnings-related pension expenditure as part of the statutory pension expenditure. In section 4.3, the earnings-related pension expenditure is discussed separately for the different pension acts and benefit types. Each pension expenditure is presented in euros at the price level of the starting year (2021) and relative to its financing base. The financing base of earnings-related pensions is the equivalent sum of earned income. The ultimate financing base of the entire statutory pension scheme is the national economy, so the statutory pension expenditure is presented in proportion to the gross domestic product (GDP). This also serves international comparisons.

The development of the pension levels is described in section 4.4 by considering the average pension of persons living in Finland who receive a pension in their own right, as well as the median pensions by educational level and gender. Section 4.5 describes the pension distributions by gender.

In addition to the above-mentioned main results, the projection includes results on the development of employment, the retirement age, the life expectancy coefficient, the target retirement age and the expected effective retirement age.

The pension expenditure projection is based on the employment projection. It is based on the population projection, the labour force entry and exit probabilities, retirement rates and the assumed development of the unemployment rate. The projected development of the retirement age and the life expectancy coefficient follow from the mortality rates and life expectancies of the population projection.

The data for 2021 are partly a result of the projection and may differ slightly from their values in official statistics. The money amounts are in 2021 prices.

4.1 Employment, retirement and number of pension recipients

The long-term employment projection for the total population has been made using the cohort component method. The method makes use of observed age- and gender-based labour force participation rates, as well as labour force entry and exit probabilities. A short description of the method is presented in Appendix 6.

The employment rate in 2021 for 15–64-year-olds was 72.3 per cent. It will rise from this level and temporarily exceed 74 per cent at the end of the 2020s. After that it will settle at between 73 and 74 per cent. Since the employment rate is calculated for the 15–64-year-olds, the rise of the retirement age beyond 65 years does not affect the development of the employment rate when it is measured in this way. The employment rate of the over-65-year-olds rises steadily throughout the projection period.

The number of employed persons will grow by 64,000 persons in the period 2022–2027 and take a downward turn after that. During the projection period, the number of employed will go down by 310,000 persons. This is due to the reduced number of working-age people. (Table 4.1.)

The way in which the labour force is divided into persons insured under different pension schemes has implications for the expenditure and financing under the individual pension acts. However, these pension scheme boundaries hold a limited relevance for the total pension expenditure since the pension benefits are, by and large, uniform under the different pension acts.

The relative allocation of employed persons covered by different pension acts is assumed to stay at the 2020 levels. Three exceptions to this are assumed.

Because of the corona pandemic, a vast number of persons insured under MEL were laid off. The wage sum insured under MEL shrank in 2020 by about one quarter compared to 2019. The number of insured persons is expected to rise to pre-pandemic levels by 2023.

The number of MYEL insured has decreased steadily, and this trend is assumed to continue. In 2020, there were 56,000 persons insured under MYEL. The number is assumed to decrease by 48 per cent by 2050. After that, the proportion of MYEL insured of all in employment will stay constant. As the number or persons insured under MYEL decreases, the number of persons insured under TyEL is assumed to increase. The assumption regarding the development of the number of persons insured under MYEL follows roughly the estimate made by Mela.

The number of state employees has also decreased. This trend will continue in the future. Primary and secondary school teachers and employees of state-aided institutions are insured under the state pension scheme of JuEL if they were born before 1970 and fulfil the relevant requirements for continuous employment. Those born in and after 1970 are insured under the municipal pension scheme of JuEL. University employees born before 1980 are insured under the state pension scheme of JuEL, and those born in and after 1980 under TyEL.

Because of these regulations, the proportion of State employees of the labour force will decrease while the proportions of persons insured under the JuEL municipal pension scheme and TyEL will increase. The projected development of the number of persons transferring between schemes follows the estimates made by Keva. However, the total number of persons insured under JuEL has not been matched up with Keva's estimate.

The division of the labour force under different earnings-related pension schemes may also be a result of other things. As the number of older people grows, the demand for municipal services and those offered by the wellbeing services counties increases. On the other hand, the incorporation and outsourcing of public services may reduce the number of municipal and wellbeing services county workers. Trends of this kind are difficult to anticipate and have not been included in the projection.

The employment and unemployment rates in Table 4.1 have been adjusted to correspond to the concepts that Statistics Finland uses in its Labour Force Survey.

The Labour Force Survey is based on a survey, whereas our projections are based on register data that depict the employment situation at the end of each calendar year. There are more employed persons and less unemployed persons in the survey data compared with the register data.

Table 4.1.
Employment, 2021–2090

4.1.1. Number of employed (1,000)

	2021	2025	2030	2040	2050	2070	2090
TyEL	1,548	1,596	1,605	1,611	1,592	1,503	1,386
YEL	216	220	220	219	216	204	188
MYEL	55	48	40	31	29	28	26
JuEL, State	124	112	100	88	85	81	75
JuEL, municipal	520	537	544	548	539	509	469
Private sector	1,824	1,870	1,870	1,866	1,843	1,740	1,604
Public sector	669	674	670	661	649	613	565
Total	2,390	2,439	2,435	2,423	2,389	2,256	2,080

4.1.2. Employment and unemployment rates, %

	2021	2025	2030	2040	2050	2070	2090
Employment rate, 15–64-year-olds	71.5	74.1	73.9	73.4	73.4	73.3	73.3
Share of employed population	43.1	43.8	43.6	43.4	43.4	42.0	41.0
Unemployment rate	7.9	6.5	6.8	7.9	8.0	8.2	8.4

The retirement age will rise by three months per age cohort, starting from those born in 1955, until it is 65 years for those born in 1962. For those born in 1965 or later, the retirement age will be adjusted to changes in life expectancy. (Table 4.2.)

The estimate of the development of the retirement age is based on the population projection. Since life expectancy is assumed to rise throughout the projection period, the retirement age will also rise. It will be 66 years for those born in 1972, 67 years for those born in 1982, and 68 years for those born in 1993. (Table 4.2.)

The retirement age in the national pension scheme is 65 years up to the age cohort born in 1964. After that, it will rise in line with the retirement age of the earnings-related pension scheme.

In 2021, a total of 1,350,000 persons had reached their retirement age, and the youngest cohort to reach its retirement age was born in 1957. Their retirement age is 63 years and 9 months. In 2040, the people reaching their retirement age will be those who were born in 1957. Their retirement age is 66 years and 3 months. At that time, a total of 1,417,000 persons will have reached their retirement age. In 2090, at the end of the projection period, the retirement age will be reached by people born in 2021 whose retirement age is 69 years and 8 months. At that time, a total of 1,491,000 persons will have reached their retirement age. (Table 4.3.)

In 2021, around 3,163,000 adults had not yet reached their retirement age. By 2040, the number will grow to 3.3 million, after which it will start to decline. In 2090, around 2.9 million adults will not yet have reached their retirement age. (Table 4.3.)

Table 4.2.
Age limits of the earnings-related pension scheme for those born between 1955 and 2005

	Retirement age	Target retirement age*	Age at which insurance obligation ends
1955	63 yrs 3 mos	64 yrs 1 mo.	68 yrs
1956	63 yrs 6 mos	64 yrs 5 mos	68 yrs
1957	63 yrs 9 mos	64 yrs 9 mos	68 yrs
1958	64 yrs	65 yrs 1 mo.	69 yrs
1959	64 yrs 3 mos	65 yrs 5 mos	69 yrs
1960	64 yrs 6 mos	65 yrs 9 mos	69 yrs
1961	64 yrs 9 mos	66 yrs	69 yrs
1962	65 yrs	66 yrs 3 mos	70 yrs
1963	65 yrs	66 yrs 4 mos	70 yrs
1964	65 yrs	66 yrs 5 mos	70 yrs
1965	65 yrs 2 mos	66 yrs 7 mos	70 yrs
1966	65 yrs 3 mos	66 yrs 9 mos	70 yrs
1967	65 yrs 5 mos	67 yrs	70 yrs
1968	65 yrs 7 mos	67 yrs 2 mos	70 yrs
1969	65 yrs 8 mos	67 yrs 4 mos	70 yrs
1970	65 yrs 10 mos	67 yrs 6 mos	70 yrs
1975	66 yrs 4 mos	68 yrs 3 mos	70 yrs
1980	66 yrs 10 mos	69 yrs	70 yrs
1985	67 yrs 4 mos	69 yrs 8 mos	70 yrs
1990	67 yrs 9 mos		70 yrs
1995	68 yrs 2 mos		70 yrs
2000	68 yrs 7 mos		70 yrs
2005	68 yrs 11 mos		70 yrs

* A target retirement age has not been calculated for the youngest age cohorts since their target retirement age would be higher than the age at which their insurance obligation ends.

Table 4.3.
Number of adults who have reached their retirement age and of adults who have not yet reached their retirement age (1,000)

	2021	2025	2030	2040	2050	2070	2090
Persons aged 18 years or older who have not reached their retirement age	3,163	3,199	3,218	3,263	3,235	3,093	2,877
Number of persons who have reached their retirement age	1,350	1,371	1,432	1,417	1,413	1,506	1,491

The estimate of the development of the life expectancy coefficient is based on the population projection. As life expectancy increases, the life expectancy coefficient becomes smaller which, in turn, reduces the level of earnings-related pensions. The life expectancy coefficient is confirmed for each age cohort for the year in which the cohort turns 62.

The projected life expectancy in 2022 is lower than that of 2021. As a result, the life expectancy coefficient confirmed for 2024 is higher, for the first time, than the life expectancy coefficient confirmed for the previous year.

As of those born in 1965, the changes in retirement age will be taken into account when calculating the life expectancy coefficient. That means that the definition of the life expectancy coefficient will change to take into consideration the changing retirement age. It follows that the rate of decrease in the life expectancy coefficient will slow down as of the year 2027. The value of the life expectancy coefficient confirmed for persons who turn 62 years in 2022 is 0.94659. According to the population projection, mortality will decrease in such a way that the life expectancy coefficient for a 62-year-old is 0.930 in 2030 and 0.895 in 2050. (Table 4.4.)

The target retirement age is the age at which the reduction in the pension amount caused by the life expectancy coefficient is offset by the increase in the pension amount due to late retirement. That means that the target retirement age is determined based on the retirement age and the value of the life expectancy coefficient.

The expected effective retirement age depicts the level in retirement rates in a similar way as life expectancy depicts mortality rates. The calculation formulas for the expected effective retirement age are posted on the website of the Finnish Centre for Pensions.[11] The assumptions regarding retirement rates used in the projection have been described in Chapter 3. The expected effective retirement age for a 25-year-old person was 62.4 years in 2021. The expected effective retirement age rises to 62.7 years by 2025 and to 66.3 years by 2090. (Table 4.4.)

Retirement is postponed mainly because of the rising retirement age. However, the expected effective retirement age grows at a slower pace than the retirement age. The rising retirement age will result in, on the one hand, a growing number of disability pensions and, on the other hand, a reduced number of persons who will defer retirement past their retirement age. Towards the end of the projection period, deferring retirement will become less common also because the retirement age will be very close to 70, the age at which the insurance obligation ends.

At the end of 2021, roughly 1.62 million people received a statutory pension. This figure includes pensioners who live abroad and those who receive only a survivors' pension. In this report, the projected number of pensioners includes pension recipients who live in Finland and who receive a pension other than the survivors' pension, a part-time or a partial old-age pension. In 2021, approximately 1.51 million pension recipients met this definition. (Table 4.4.)

11 https://www.etk.fi/en/research-statistics-and-projections/statistics/effective-retirement-age/

The demographic development and retirement rates are the key factors determining the number of pension recipients. The number of pension recipients will grow until 2030, when it will be 1.57 million. The growth will slow down in the 2030s, when a large share of the baby boomers born after the wars die. The growth will pick up again at the latter half of the 2040s. The number of pension recipients will finally decrease in the 2080s as the number of the elderly will decline. At most, pension recipients will number 1.72 million at the end of the 2070s. (Table 4.4.)

The number of persons aged over 65 will grow from 1.28 million at year-end 2021 to 1.82 million in 2080. That means that the number of elderly people will grow faster than the number of pensioners. The gap is explained by the fact that at the end of the projection period, people retire at a higher age than presently.

In 2021, there were 63 pension recipients per 100 employed persons. Together, the decreasing number of employed persons and the growing number of pension recipients will lead to a considerable growth of this ratio in the projection. The number of pension recipients per 100 employed persons will be 66 by 2050 and 81 by 2090.

Table 4.4.
Life expectancy coefficient, expected effective retirement age and number of pension recipients

4.4.1. Life expectancy coefficient at age 62, 2021–2090

	2021	2025	2030	2040	2050	2070	2090
Coefficient	0.950	0.941	0.930	0.912	0.895	0.869	0.857

4.4.2. Expected effective retirement age for a 25-year-old, years

	2021	2025	2030	2040	2050	2070	2090
Expected effective retirement age	62.4	62.7	63.3	64.2	64.9	65.9	66.3

4.4.3. Pension recipients and employed persons (1,000)

	2021	2025	2030	2040	2050	2070	2090
Employed	2,390	2,439	2,435	2,423	2,389	2,256	2,080
Pension recipients	1,505	1,523	1,572	1,576	1,585	1,701	1,692
Pension recipients/employed	0.63	0.62	0.65	0.65	0.66	0.75	0.81

4.2 Total pension expenditure

Earnings-related pensions accrue based on earnings from work, so the size of the labour force and the earnings level have a major effect on the pension expenditure in the long run. In addition, the indexes of the earnings-related pension scheme partly follow earnings levels. The projected development of the sum of earned income (Table 4.5) is based on the employment projection and the growth in earnings.

The projected development of gross domestic product (GDP) is based on the development of labour costs. In 2021, total labour costs were 46 per cent relative to GDP. The projection assumes, in line with the short-term economic forecast, that the ratio will decrease in the next few years to a level of 45 per cent. Later, the ratio will remain at this level.

The ratio of statutory pension expenditure to GDP remained at slightly over 10 per cent during the period 2000–2008. Rapid economic growth kept the expenditure ratio at a stable level despite the ageing population. However, after 2008, the expenditure ratio has increased quickly. In 2021, the statutory pension expenditure amounted to 13.2 per cent of GDP. Until 2035, the number of pensioners will grow but the level of the average pension relative to the average earnings will decrease slightly. The ratio of pension expenditure to GDP will rise slightly during that period. The year 2022 forms an exception as the rapid nominal growth in GDP reduces the ratio temporarily to 12.9 per cent. The strong index increases in 2023 will return the ratio to 13.4 per cent. After 2035, the growth in the number of pensioners will stop, which will decrease the pension expenditure relative to GDP. The ratio will go down to 12.7 per cent by 2045. (Table 4.5 and Figure 4.1).

Around 2050, the decrease in the average pension relative to the average wage will slow down and the number of pension recipients will start to grow. As a result, the ratio of pension expenditure to GDP will start to grow. This trend will continue during the latter half of the century. In 2090, statutory pension expenditure will be at 14.4 per cent of GDP. The pension benefit levels are reviewed in more detail in sections 4.4 and 4.5.

Earnings-related pensions accounted for 91 per cent of the statutory pension expenditure in 2021. During the projection period, this percentage will rise further. The development of the overall pension expenditure is largely explained by the development of the earnings-related pension expenditure. The earnings-related pension expenditure is discussed in more detail in section 4.3.

The pension expenditure for the national and guarantee pensions is assessed based on the projected earnings-related pensions and the population projection. In the baseline projection, discretionary increases are made to the euro amounts of Kela pensions each year. Their value is half of the real growth of earnings. This means that Kela pensions increase at a slower pace than the average earnings. This, in addition to the rising retirement age for the national pension, will reduce the expenditure of Kela pensions relative to GDP throughout the projection period.

In the future, a considerable share of Kela pension recipients will belong to the immigrant population. The amount of their national pension will be set in proportion to the time they have lived in Finland or EU/EEA countries. There is no similar proportioning in the guarantee pension; a person is entitled to a full guarantee pension after living in Finland for three years. Alternative calculations of the indexing of Kela pensions are presented in Appendix 1.

As for special pensions, the projection does not aim for elaborate details. Instead, we give a simple estimate that is based on the given demographic and economic development. The starting point is the current pension expenditure, grouped by age and gender. For the working-age population, the projected special benefits develop in line with earnings. The special pensions of persons of a pensionable age follow the earnings-related pension index. In addition, the effects of the life expectancy coefficient are taken into consideration.

Table 4.5.
Total pension expenditure in 2021–2090 (at 2021 prices)

4.5.1. GDP and sum of earned income (billion euros)

	2021	2025	2030	2040	2050	2070	2090
GDP	252.9	259.9	275.0	308.4	343.0	410.9	480.1
Sum of earned income	96.7	98.3	103.5	115.7	128.4	153.1	178.8

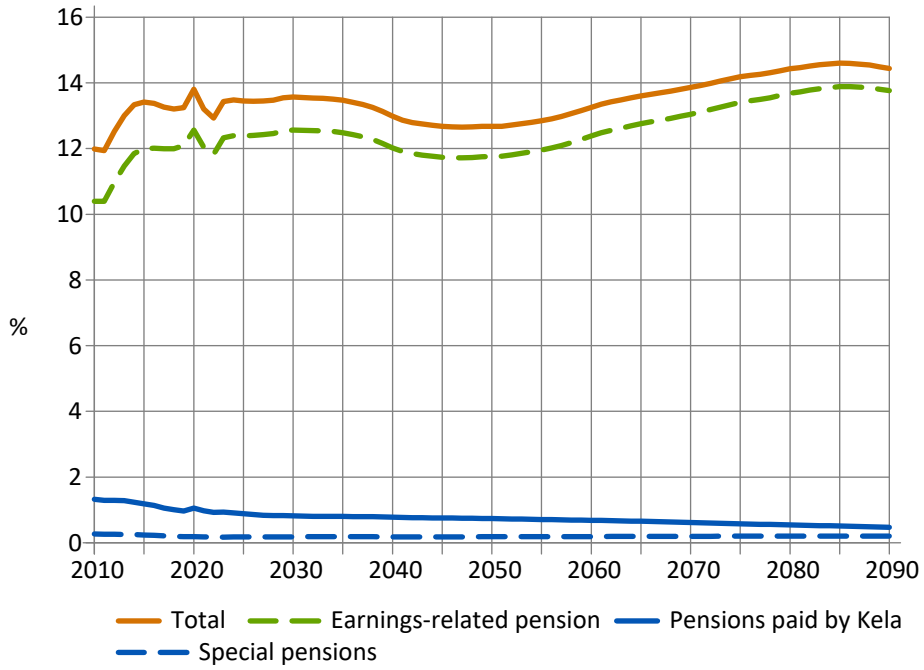
4.5.2. Pension expenditure (billion euros)

	2021	2025	2030	2040	2050	2070	2090
Total	33.4	35.0	37.3	40.0	43.5	57.0	69.3
Earnings-related pensions	30.5	32.2	34.6	37.1	40.3	53.6	66.1
Pensions paid by Kela	2.5	2.3	2.3	2.4	2.5	2.5	2.3
Special pensions	0.5	0.5	0.5	0.6	0.6	0.8	1.0

4.5.3. Pension expenditure relative to GDP (%)

	2021	2025	2030	2040	2050	2070	2090
Total	13.2	13.5	13.6	13.0	12.7	13.9	14.4
Earnings-related pensions	12.0	12.4	12.6	12.0	11.8	13.0	13.8
Pensions paid by Kela	1.0	0.9	0.8	0.8	0.7	0.6	0.5
Special pensions	0.2	0.2	0.2	0.2	0.2	0.2	0.2

Figure 4.1.
Statutory pension expenditure relative to GDP 2010–2090



4.3 Earnings-related pension expenditure

The development of the earnings-related pension expenditure is mainly explained by the development of the old-age pension expenditure. The population will age rapidly between 2022 and 2035. At the same time, the earnings-related pension benefits will still be maturing.[12] However, the rising retirement age and the decreasing average pension relative to the average earnings will slow down the growth in old-age pension expenditure, and the old-age pension expenditure relative to the sum of earned income will return close to its 2021 level in the 2030s and the 2040s. In the latter half of the century, the growing number of retirees combined with the declining number of employed people will make the ratio grow again. (Table 4.6 and Figure 4.3).

The disability pension expenditure relative to the sum of earned income has decreased throughout the 2000s. The development is a result of the decreasing number of disability pension recipients and the decline in the average disability pension relative to the average earnings.

The rising old-age retirement age increases the number of disability pension recipients since it is possible to retire on a disability pension at a higher age and pensions are paid over a longer period. On the other hand, the age-conditioned disability risk is assumed to decrease in the future, which will curb the growth in the number of disability pensioners.

As the number of disability pensioners grows, the disability pension expenditure relative to the sum of earned income will start to rise. In addition, the disability pension expenditure will grow as the disability pension level will improve because of the 2017 pension reform. In 2000, the disability pension expenditure amounted to 4.2 per cent of the sum of earned income. In 2021, the corresponding figure was 1.9 per cent. From 2022 to 2039, the expenditure will remain at around two per cent. After that, it will start to rise. The disability pension expenditure is projected to rise to over three per cent of the sum of earned income by 2090.

The first partial old-age pensions were granted in 2017. During the maturing period, the expenditure will grow to 0.4 per cent of the sum of earned income by 2025. As the age at which people can retire early on a partial old-age pension rises, the number of its recipients will go down. In addition, the life expectancy coefficient will reduce starting pensions relative to average earnings. For these reasons, the expenditure relative to the sum of earned income will take a slight downward turn after 2025 and stay at 0.3 per cent throughout the projection period.

In 2023, the earnings-related pension index is estimated to rise faster than the wage coefficient. This will create a strong economic incentive to take out a partial old-age pension at the end of 2022 for persons who are eligible for that pension. This may raise the incidence rate of the partial old-age pension in 2022. The effect of this has not been considered in this report.

12 The maturing phase will end when the entire working lives of all pension recipients have occurred after the time when the earnings-related pension acts first came into effect.

Years-of-service pensions have been granted since 2018. At the beginning, it was possible to draw the pension for only three months before reaching the retirement age. Years-of-service pensions were paid to 75 persons at year-end 2021. The annual number of recipients of the years-of-service-pension will grow by the end of the 2020s to around 300 persons and remain close to this level throughout the projection period. After the end of the maturation period, the pension expenditure in 2030 will be around six million euros (at 2021 prices). Relative to the sum of earned income, the expenditure is thus 0.006 per cent and remains at this level until 2090. The low expenditure is due to the assumed low pension incidence rate and to the fact that years-of-service pensions are paid for a maximum period of two years.

Part-time pensions have not been granted since the beginning of 2017. Part-time pensions already granted are still paid out, but they will soon end completely when their recipients retire on an old-age pension. In 2021, part-time pensions were paid to the amount of around two million euros.

Most survivors' pensions are paid to the widow after the death of her husband, who received an old-age pension. As the population ages, the number of deaths increase. As a result, the number of starting surviving spouse's pensions grow. As of the beginning of 2022, the surviving spouse's pension is paid for a fixed term to surviving spouses born in 1975 or later. This reduces the average time a surviving spouse's pension will be paid, even though the full effect of this change will not be felt until the latter half of the century. The development of the population projection's mortality rate also reduces the time a surviving spouse spends in retirement as the majority of deaths occur in a narrower band of ages than before. Consequently, the annual number of paid survivors' pensions will decrease. The size of the average survivors' pension relative to the average wage will also decrease as the gap between men's and women's earnings-related pensions narrows. The expenditure for the survivors' pension will decrease steadily from 1.8 per cent to 0.9 per cent from 2022 to 2070. It will remain at that level until the end of the projection period.

In 2021, the expenditure of farmers' special pensions was 34 million euros, or 0.03 per cent relative to the sum of earned income. These pensions are no longer granted, and the expenditure will almost come to an end in the 2030s.

The expenditure ratios differ considerably from one pension scheme to another. In 2021, the expenditure ratio was the highest for State pensions under JuEL and MYEL pensions. Conversely, the expenditure ratio of TyEL was lower than that of the other schemes. The gaps will widen until the early 2030s, as the expenditure ratio of JuEL (State) and MYEL pensions will grow more strongly than that of the other schemes. In the long run, however, the expenditure ratio for all pension schemes will converge towards the same level of about 37 per cent (Table 4.6). There are several reasons for the scheme-specific differences in the expenditure ratio. They are described below. Some are historical, and their effect will disappear over time, whereas others are permanent.

The number of workers insured under JuEL (State) and MYEL has declined. Therefore, the expenditure ratios of these systems are high. The continued decrease in the number of insured workers will keep the expenditure ratio of JuEL (State) pensions high. The expenditure ratio of MYEL pensions will grow considerably above its present level. Workers currently insured under JuEL (State) and MYEL are assumed to transfer mainly to work insured under TyEL, but partly also to the municipal sector.

The age and gender distributions of the insured differ greatly between pension schemes. A more male-dominant group of insured people leads to a lower expenditure ratio than a more female-dominant group of insured as women's life expectancy is around five years higher than men's (Appendix 3). The survivors' pension evens out some of the difference. When examined relative to the earned income, a group of younger insured persons gives rise to a lower expenditure than a group of older insured persons. The age structure affects future pension expenditure because older people are closer to retirement than younger people. In addition, the disability incidence rate increases with age, and the indexation of accrued pension rights gives a larger weight to earnings from later stages of working life. Up to 2025, the accrual rates are also higher for workers aged between 53 and 62 years.

Those insured under TyEL are younger than average. In addition, the proportion of men is higher than average among those insured under TyEL. The insured public sector workers and the self-employed are older than average. The proportion of women is high in the public sector, while self-employed workers are, on average, more often men. The projection assumes that the age structures of the different pension schemes will become more similar. By 2060, around one third of the differences in age structure is assumed to remain, except for the self-employed, where three fourths are assumed to remain. The differences in gender distributions, on the other hand, are assumed to remain nearly unchanged.

For the most part, pension accrues the same way under all pension acts. However, there are differences which influence the way in which pension expenditure develops under different schemes. Until the 1990s, public sector employees had more generous pension benefits than did private sector employees. These differences are still visible both in pensions in payment and starting pensions. Some state jobs will continue to have better-than-average pension benefits. Persons who have worked in the public sector for a long time have vocational and individual retirement ages which deviate from the cohort-specific retirement ages.

VEKL came into force at the beginning of 2005. The full impact of VEKL on expenditure will be realised decades from now since most of the people who accrue the VEKL benefit for studying and childcare are at the beginning of their working lives. VEKL benefits will have reached their maturity in about 60 years when those born in the 1980s are among the oldest of the pensioners. At that point, the VEKL expenditure will be 0.8 per cent of the economy's sum of earned income. The expenditure under VEKL is not included in the private or public sector pension expenditure, but it is part of the earnings-related pension expenditure for the overall economy.

Regulations on pension accrual during periods of earnings-related social benefits (or so-called unsalaried periods) were added to the earnings-related pension acts at the beginning of 2005. From the point of view of pension expenditure, the most significant social benefit is the earnings-related unemployment benefit. Like VEKL's impact on expenditure, the full impact of unsalaried periods on pension expenditure will be evident only after several decades. However, the maturing process is quicker because, contrary to the accrual periods of VEKL, earnings-related social benefits are on average paid to older persons. The pension expenditure accrued during unsalaried periods is included in the pension expenditure under each earnings-related pension scheme. The allocation between the earnings-related pension schemes is done in relation to the sum of earned income during the year in which the pension is paid.

Table 4.6.
Earnings-related pension expenditure per pension scheme and pension benefit 2021–2090 (at 2021 prices)

4.6.1. Sum of earned income (billion euros)

	2021	2025	2030	2040	2050	2070	2090
TyEL	63.9	65.7	69.5	78.3	87.1	103.8	121.3
YEL	4.6	4.7	5.0	5.6	6.2	7.4	8.7
MYEL	1.2	1.1	0.9	0.8	0.9	1.0	1.2
JuEL State	6.2	5.5	5.2	5.1	5.6	6.7	7.8
JuEL municipal	19.5	20.1	21.6	24.4	27.1	32.3	37.6
Private sector	70.0	71.7	75.7	85.0	94.5	112.7	131.6
Public sector	26.6	26.5	27.8	30.7	33.9	40.4	47.2
Total	96.7	98.3	103.5	115.7	128.4	153.1	178.8

4.6.2. Earnings-related pension expenditure per pension scheme and sector (billion euros)

	2021	2025	2030	2040	2050	2070	2090
TyEL	16.6	17.7	19.4	21.8	25.0	35.1	43.5
YEL	1.4	1.5	1.7	1.9	2.0	2.5	3.0
MYEL	0.9	0.9	0.8	0.7	0.6	0.4	0.4
JuEL State	4.9	4.8	4.7	4.0	3.2	2.3	2.7
JuEL municipal	5.9	6.5	7,1	7.8	8.5	11.4	14.1
Private sector	19.3	20.5	22.3	24.7	27.8	38.2	47.2
Public sector	11.2	11.7	12.2	12.3	12.2	14.3	17.4
VEKL	0.0	0.0	0.0	0.1	0.4	1.2	1.5
Total	30.5	32.2	34.6	37.1	40.3	53.6	66.1
of which for unsalaried periods	0.2	0.3	0.5	0.8	1.3	2.4	3.0

4.6.3. Earnings-related pension expenditure per pension scheme and sector, relative to sum of earned income (%)

	2021	2025	2030	2040	2050	2070	2090
TyEL	26.0	27.0	28.0	27.9	28.7	33.8	35.9
YEL	30.2	32.1	33.5	33.3	32.7	34.0	35.0
MYEL	69.5	80.1	90.6	91.2	68.9	41.9	36.1
JuEL State	77.9	87.3	90.0	78.3	56.8	35.1	34.2
JuEL municipal	30.3	32.1	32.8	31.8	31.6	35.3	37.4
Private sector	27.5	28.6	29.5	29.0	29.4	33.9	35.8
Public sector	42.0	44.0	43,9	39,9	35.9	35.3	36.9
VEKL*	0.0	0.0	0.0	0.1	0.3	0.8	0.8
Total	31.5	32.8	33.4	32,0	31.4	35.0	36.9
of which for unsalaried periods	0.2	0.3	0.4	0.7	1.0	1.6	1.7

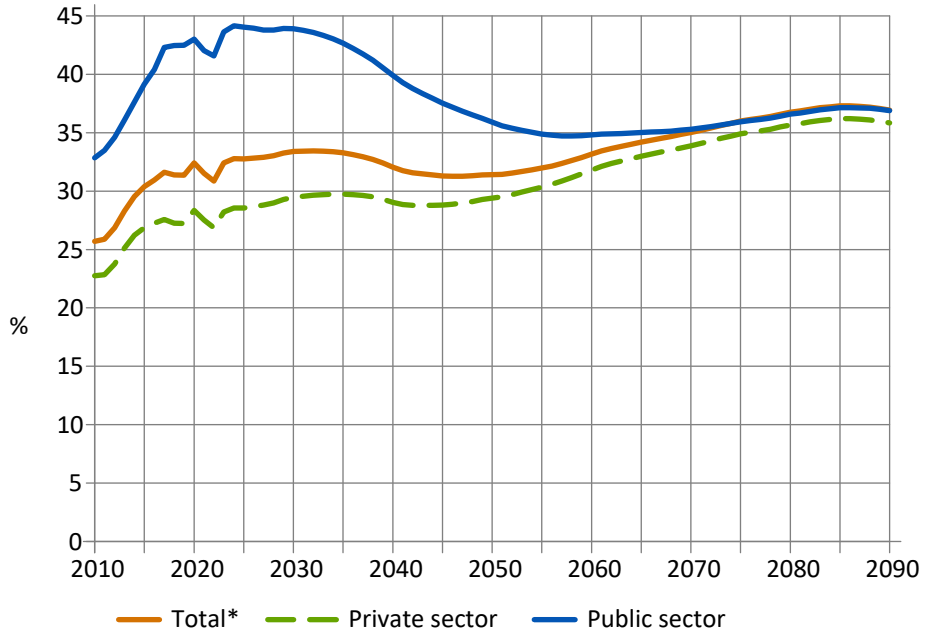
* Relative to the sum of earned income of the overall economy

4.6.4. Earnings-related pension expenditure per pension benefit, relative to sum of earned income (%)

	2021	2025	2030	2040	2050	2070	2090
Old-age pension*	27.5	28.6	29.4	28.0	27.4	31.0	32.8
Partial old-age pension	0.3	0.4	0.3	0.3	0.3	0.3	0.3
Disability pension	1.9	2.0	1.9	2.1	2.3	2.7	2.9
Years-of-service pension	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Survivors' pension	1.8	1.8	1.8	1.7	1.4	0.9	0.9
Total	31.5	32.8	33.4	32,0	31.4	35.0	36.9

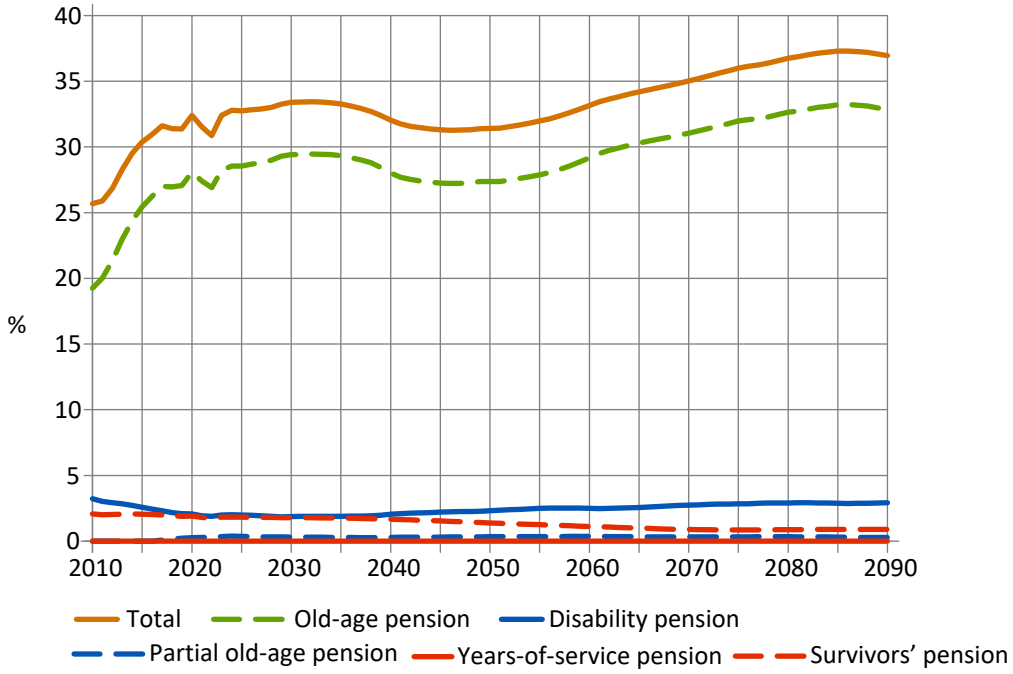
* The figures for old-age pension do not include the partial old-age pension.

Figure 4.2.
Earnings-related pension expenditure relative to sum of earned income 2010–2090, by sector



* Includes VEKL expenditure

Figure 4.3.
Earnings-related pension expenditure relative to sum of earned income 2010–2090, by pension benefit



4.4 Benefit levels

Pension levels are measured using the total pension of people living in Finland and receiving a pension in their own right. Those who receive only a part-time pension, a partial old-age pension or a survivors' pension have not been considered. In addition to earnings-related pensions, national pensions received in one's own right, the guarantee pension and special pensions are taken into account when calculating the average pension.

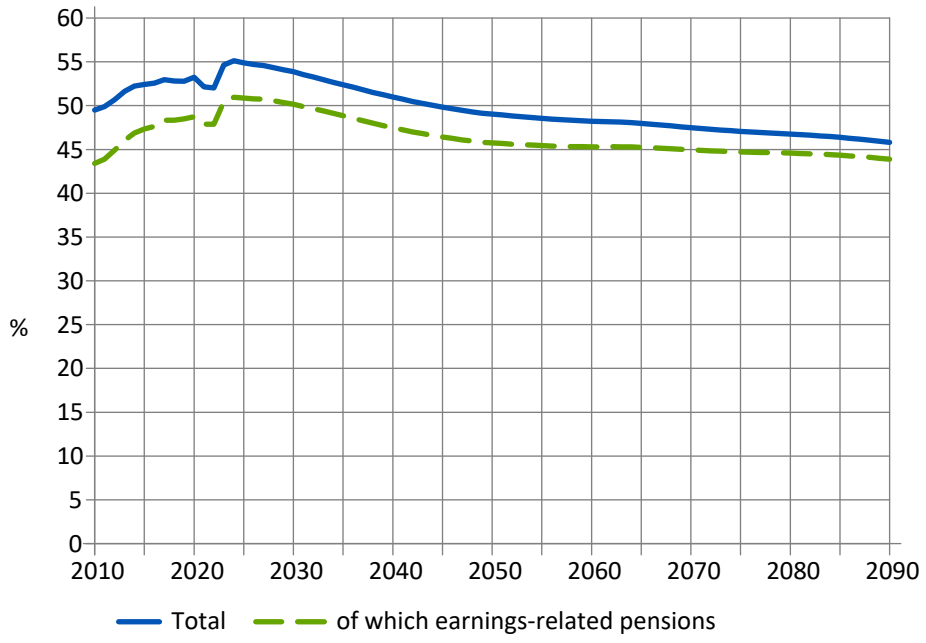
The purchasing power of the average monthly pension will grow from 1,784 euros to approximately 3,300 euros in the period 2022–2090 (Table 4.7). The growth in purchasing power follows mainly from an increase in earnings since earnings-related pensions are tied to earnings via accrual rates and indexing. The average pension will start growing more rapidly in the 2040s. The faster growth as of 2050 is explained by the 2017 pension reform, which extends working lives, abolishes the reduction of the pensionable wages based on paid pension contributions, increases the projected pension component of disability pensions and considers the higher retirement age when calculating the life expectancy coefficient. In addition, the abolishment of the final salary principle in 2005 and of the higher accrual rates of the public sector (compared to the private sector) in the 1990s will slow down the growth of the average pension in the near decades. In the long run, the share of Kela pensions in the average pension will decrease since the national pension index is assumed to follow the growth in earnings and the growth in prices on a fifty-fifty basis.

In 2021, the average pension was slightly over 52 per cent of the average earnings of the insured.[13] The large index increase projected for 2023 will increase the ratio to nearly 55 per cent. After that, pensions will grow more slowly than average wages. By 2050, the ratio of the average pension to average earnings will decrease to 49 per cent, and by 2090 to 46 per cent, mainly due to the life expectancy coefficient. The average pensioner will also become older in the next few decades as the baby boomers grow old. This will reduce the level of pensions relative to earnings since the indexing of pensions is only partly tied to earnings development. The ratio will decrease slower in the next few years because the earnings-related pension scheme is still maturing. The working lives of the oldest pensioners partly date back to the time before the earnings-related pension acts came into force. In contrast, new pensions are already based on a full working life. (Table 4.7 and Figure 4.4).

Table 4.7.
Average pension and average earnings (at 2021 prices)

	2021	2025	2030	2040	2050	2070	2090
Average earnings, €/month	3,422	3,359	3,539	3,983	4,476	5,646	7,154
Average pension, €/month	1,784	1,844	1,907	2,031	2,195	2,681	3,277
of which earnings-related pension, €/month	1,639	1,708	1,776	1,891	2,048	2,537	3,140
% of average earnings	52.1	54.9	53.9	51.0	49.0	47.5	45.8

Figure 4.4.
Average pension relative to average earnings 2010–2090



13 The gross pension is compared to gross earnings. Often in the literature on income distributions, comparisons are made using equivalent disposable income. In that case, household sizes and other income, as well as taxes, are considered. That approach would lead to a higher relative income of pensioners.

The benefit level of statutory pensions can also be described by considering the median[14] of pensions received in one's own right, per gender and educational level. These statistics have been calculated using the ELSI microsimulation model. Survivors' pensions and special pensions are not included in these figures since they are not included in the ELSI microsimulation model. A description of the ELSI model is presented in Appendix 7. However, survivor's pensions generated by a rough approximation have been considered as benefits that reduce the national and guarantee pensions. The educational levels are primary education, secondary education, lower tertiary education and higher tertiary education. Individuals are classified according to the highest degree they have attained. Secondary education includes high school and vocational school education. Lower tertiary education includes bachelor's degrees and polytechnic degrees. Higher tertiary education includes master's degrees and doctorate degrees.

By and large, the factors that affect median pensions are the same as those affecting average pensions. The real values of median pensions per educational level remain virtually unchanged until the 2050s. After that, they will start to grow. The median pension of the whole population develops faster than the median pensions of the different educational levels since, in the younger age groups, the average educational level is considerably higher than that of the pensioners in the starting year of this projection period. This is emphasized for women since the differences in educational levels among the older and the younger age groups are larger than for men. Relative to median earnings[15], median pensions will decline as of the mid-2020s throughout the projection period, but the decline will slow down as of the 2050s.

The development of median pensions differs per educational level. As of the 2030s, the pensions of those with a primary education will lag behind the pensions of those with a secondary education. This is because, on average, the younger age groups have a higher educational level than the older age groups. As a result, in younger age groups the group of people with no more than a primary education includes a higher proportion of underprivileged people and more of them have a shorter working life than those in older age groups.

The share of immigrants will increase in the group of persons with no more than a primary education. The average pensions of immigrants are smaller than those of the original population for multiple reasons. First, the working life for which pension accrues begins for immigrants at the time of immigration at the earliest. Second, the employment rate of immigrants is lower than that of the original population. On average, immigrants also have lower earnings than the original population. Some immigrants receive a pension from abroad based on work they have done abroad. These pensions from abroad are not included in the pensions presented in this report.

The median pensions of those with a tertiary education will slightly decrease in real terms until around 2040. Among the older age groups, the number of people with a tertiary education is lower; in other words, this group is more selective than the

14 Median refers to the middle observation of a set of observations arranged according to size. In a typical pension or income distribution, the median is lower than the average.

15 The median earnings of all employed persons in the ELSI model are used as the median earnings.

corresponding group among the younger age groups. In addition, the final salary principle that was used before the 2005 pension reform favoured those with a tertiary education as they tended to have higher earnings towards the end of their working life. (Table 4.8 and Figures 4.5–4.8.)

The average pension in Table 4.7 includes the survivors' pension of those who receive a pension in their own right. The median figures in Table 4.8 do not include the survivors' pension. Some of the differences in Tables 4.7 and 4.8 are also explained by the fact that we have used different statistics. The medians are clearly lower than the averages also in realised pension distributions.

The gap between the pensions of men and women will narrow during the simulation period. This reflects the realised wage and employment gaps with a delay of several decades. If the survivors' pensions were included in these results, the gender gaps in pensions would be somewhat smaller than what is presented here. The role of survivors' pensions will decrease during the simulation period.

Table 4.8.
Median pension received in one's own right, by educational level and gender, as well as median earnings (€/month at 2021 prices)

	2021	2025	2030	2040	2050	2070	2090
Men, €/month	1,696	1,744	1,789	1,865	1,977	2,321	2,805
primary education, €/month	1,392	1,398	1,371	1,256	1,165	1,308	1,546
secondary education, €/month	1,588	1,624	1,668	1,751	1,864	2,158	2,540
lower tertiary education, €/month	2,409	2,382	2,337	2,290	2,330	2,613	3,103
upper tertiary education, €/month	3,551	3,517	3,466	3,450	3,584	4,163	5,003
Women, €/month	1,292	1,357	1,423	1,522	1,639	2,026	2,526
primary education, €/month	1,110	1,145	1,169	1,136	1,026	1,194	1,450
secondary education, €/month	1,258	1,285	1,315	1,361	1,426	1,680	1,967
lower tertiary education, €/month	1,773	1,782	1,782	1,800	1,870	2,222	2,689
upper tertiary education, €/month	2,598	2,555	2,502	2,507	2,666	3,185	3,874
All, €/month	1,433	1,492	1,555	1,648	1,772	2,160	2,657
primary education, €/month	1,215	1,237	1,248	1,193	1,103	1,266	1,514
secondary education, €/month	1,373	1,402	1,436	1,495	1,579	1,856	2,209
lower tertiary education, €/month	1,978	1,962	1,939	1,936	2,007	2,361	2,846
upper tertiary education, €/month	3,037	2,970	2,874	2,806	2,931	3,471	4,213
Median earnings, €/month	2,931	2,876	3,018	3,396	3,820	4,819	6,093
Median pension, % of median earnings	48.9	51.9	51.5	48.5	46.4	44.8	43.6

Figure 4.5.
Median pension received in one's own right, by educational level, men (€/month at 2021 prices)

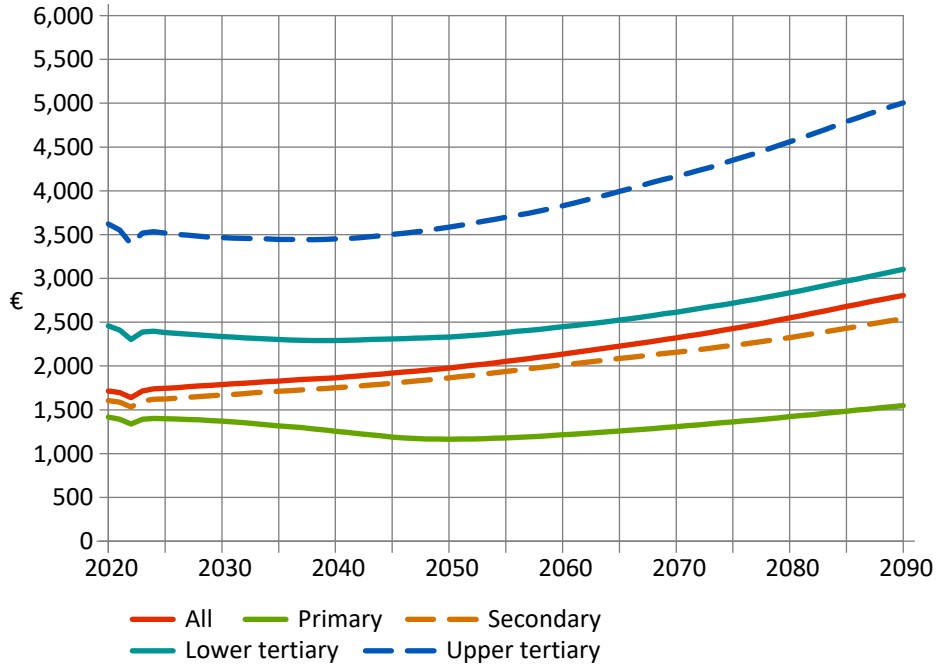


Figure 4.6.
Median pension received in one's own right, by educational level, women (€/month at 2021 prices)

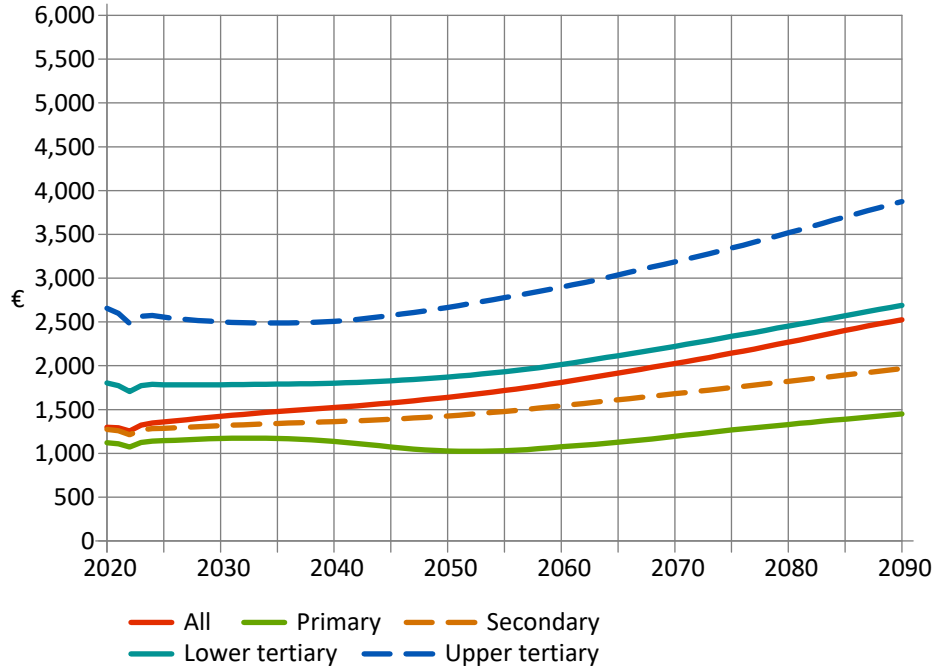


Figure 4.7.
Median pension received in one's own right relative to the median earnings of all employed persons, by educational level, men

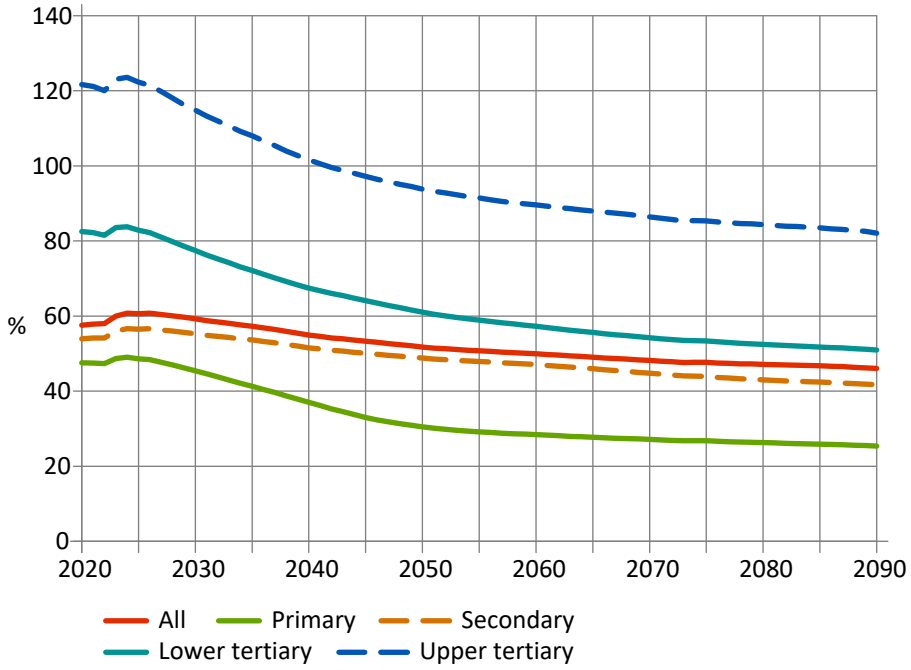
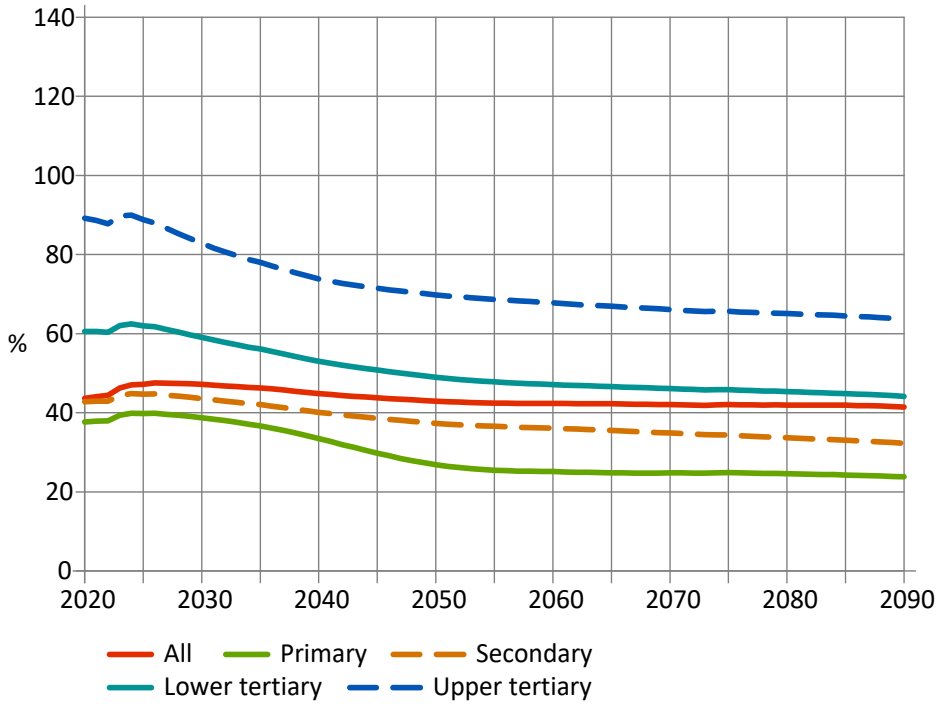


Figure 4.8.
Median pension received in one's own right relative to the median earnings of all employed persons, by educational level, women



4.5 Pension distributions

The distribution of pensions received in one's own right is examined by gender using percentiles. Pensions from both the earnings-related, national and guarantee pension schemes have been included. The distributions have been calculated using the ELSI microsimulation model.

The distributions are illustrated by their 10th, 25th, 50th, 75th and 90th percentiles. The 50th percentile is also called the median. Half of the pensions lie between the 25th and 75th percentiles, that is, between the lower and the upper quartiles. Correspondingly, 80 per cent of observations fall between the 10th and 90th percentiles. The 10th percentile depicts the development of the level of the smallest pensions.

The relative width of the distributions of pensions received in one's own right remain almost constant in the first decades of the projection period but the distributions start to widen slightly as of the 2050s. Particularly the ratio of the highest pensions to the smallest pensions grows during the projection period. This is partly because, in the future, a greater share of retirees will be immigrants whose average pensions will be small. The size of the smallest pensions depends on the levels of the national and guarantee pensions, which are assumed to grow at a slower pace than the earnings level and lag behind the development of earnings-related pensions. In addition, the highest pensions grow slightly faster than the median pension.

The 10th percentile of the women's pension distribution is of the amount of the guarantee pension throughout the projection period. For men, it is of the amount of the guarantee pension as of 2024. The median of women's pension distribution exceeds the maximum income limit of the national pension around 2027. After that, women who receive a median pension no longer qualify for a national pension. Men receiving a median pension do not qualify for a national pension at any point of the projection period. More than one quarter of both women's and men's pensions are below the income limit of the national pension scheme throughout the projection period. (Table 4.9 and Figures 4.9–4.10.)

The differences in pension levels are mainly caused by divergence in earnings-related pensions. The individual differences in earnings-related pensions reflect differences in employment and earnings history. The national pension and the guarantee pension even out pension gaps. The significance of these pensions paid by Kela is reduced during the projection period as the national pension index is assumed to grow at a slower pace than earnings.

Table 4.9.
Distribution of pensions received in one's own right, by gender (€/month at 2021 prices)

	2021	2025	2030	2040	2050	2070	2090
Men							
10%	838	851	865	918	974	1,095	1,233
25%	1,178	1,201	1,234	1,298	1,380	1,593	1,855
median	1,696	1,744	1,789	1,865	1,977	2,321	2,805
75%	2,371	2,430	2,475	2,558	2,711	3,306	4,097
90%	3,245	3,320	3,372	3,480	3,741	4,789	5,984
Women							
10%	823	851	865	918	974	1,095	1,233
25%	948	1,007	1,072	1,173	1,273	1,533	1,813
median	1,292	1,357	1,423	1,522	1,639	2,026	2,526
75%	1,735	1,811	1,884	2,009	2,200	2,847	3,598
90%	2,274	2,360	2,448	2,616	2,905	3,755	4,707
All							
10%	838	851	865	918	974	1,095	1,233
25%	1,037	1,081	1,133	1,219	1,312	1,558	1,831
median	1,433	1,492	1,555	1,648	1,772	2,160	2,657
75%	2,016	2,080	2,142	2,254	2,442	3,061	3,824
90%	2,760	2,838	2,904	3,024	3,276	4,182	5,226

Figure 4.9.
Distribution of pensions received in one's own right, men (€/month at 2021 prices)

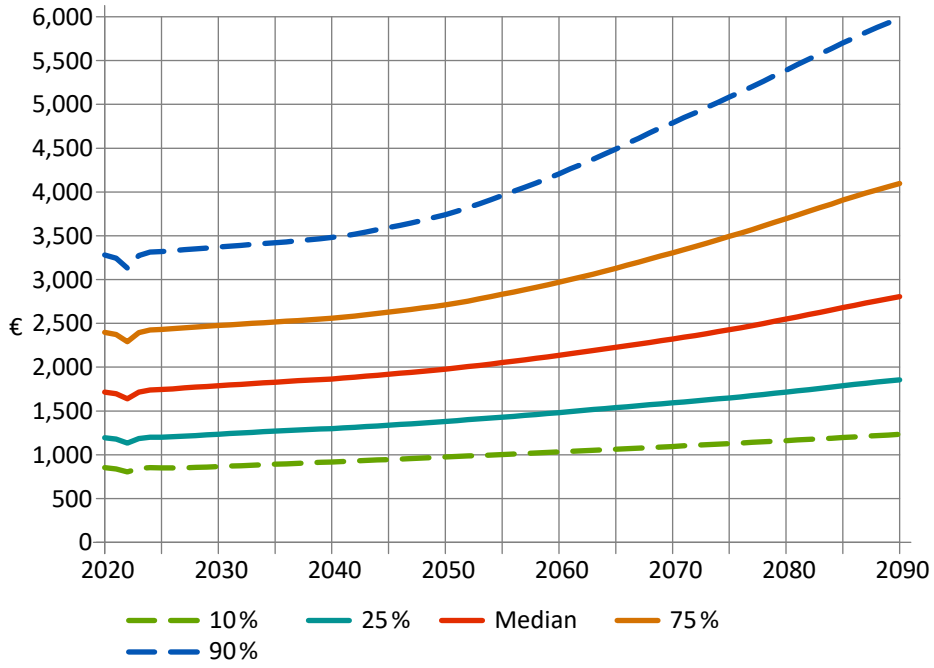
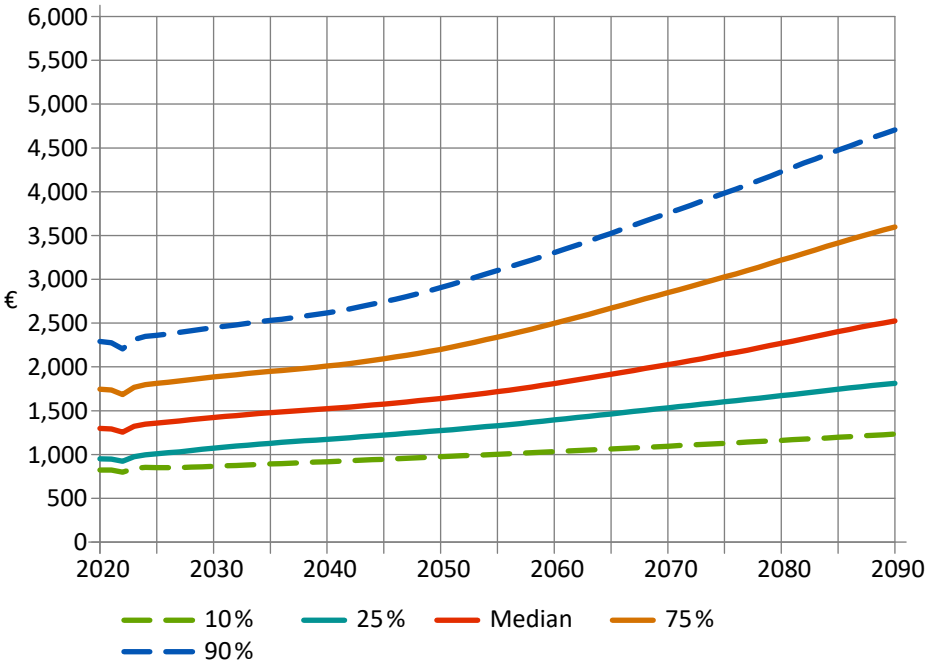


Figure 4.10.
Distribution of pensions received in one's own right, women (€/month at 2021 prices)



5 Financing of earnings-related pensions

In this chapter, various projections on the financing of earnings-related pensions are presented. First, financial projections for private sector earnings-related pensions based on current regulations are presented. The most important of these is the projection of the development of TyEL contributions and assets over time. In connection with this projection, the financial status of the TyEL scheme at the end of the projection period is evaluated. In addition, projections on YEL and MYEL contributions and level of state shares are presented.

These projections, which mimic the financing method defined by legislation, are followed by supplementary theoretical analyses on the future development of pension financing. First, calculations on sufficient constant contributions are presented. A sufficient constant contribution level means a contribution level that, under current legislation and assumptions used in the projection, would be sufficient to finance future pension expenditure on a permanent basis without future increases or reductions in contributions. Sufficient constant contribution rates are calculated for the TyEL scheme, municipal pensions and the entire statutory earnings-related pension scheme.

Second, estimates are given of the value of accrued pension rights. These estimates are extended to a funding balance analysis by also considering pension rights to be accrued in the future and the present value of the future contribution income corresponding to the current contribution rate. By relating the pension assets to the value of accrued pension rights we can calculate the funding rates for the different pension schemes.

The third theoretical analysis presents the real return of TyEL pension contributions by generation and gender.

5.1 Financing of private sector earnings-related pensions under current legislation

5.1.1 Financing of pension expenditure under the Employees Pensions Act

The yearly pension contributions paid into the pension scheme of private sector wage earners have exceeded the pension expenditure until the early 2010s, except for a few years during the depression in the 1990s. From 2009 to 2012, the TyEL pension expenditure and contribution income were roughly equal. After that, the expenditure exceeds the contribution income on a permanent basis. The difference is financed with pension assets.

One of the aims of the pension reform in 2017 was an even and appropriate contribution development. In 2016, the central labour market organisations agreed in the competitiveness pact that the average TyEL contribution rate would be 24.4 per cent in 2020 and 2021. However, due to the corona pandemic, the contribution in 2020 was reduced by 2.6 percentage points as of 1 May 2020. The reduction was allocated

only to the employer's share of the contribution. At the same time, it was agreed that the contribution reduction would be reclaimed from employers in 2022–2025. In 2022, the contribution rate has been increased by 0.45 per cent of the wage sum to pay back the reduction. A corresponding increase has been taken into account in the projections for the years 2023–2025.

In 2022, the employee's basic contribution is 7.15 per cent of their wage. Between 2017 and 2025, the employee's raised contribution paid by employees aged between 53 and 62 years is 1.5 percentage points higher than the basic contribution. After that, employees of all ages will pay an earnings-related pension contribution that is of the same size as the basic contribution. (Table 5.2 and Figure 5.1).

The TyEL financing projection starts at the end of 2021. In addition, the realised investment returns of 2022 up to the end of July have been taken into account. At year-end 2021, the TyEL assets exceeded the technical provisions by 36 per cent. In other words, the average TyEL solvency ratio was 136 per cent. The asset reserve used to buffer jointly financed pension expenses exceeded its minimum limit by nearly 10 per cent of the wage sum.

Over the next decade, the TyEL solvency ratio will decline in the projection from the starting level at year-end 2021. This is because of the low realised investment returns in early 2022 and the lower return expectation of the first ten years of the projection period. After that, the solvency ratio will again take an upward turn. By 2090, the solvency ratio will rise to around 139 per cent. The rising solvency ratio is explained in the projection partly by a change made at the beginning of 2023 regarding how the supplementary coefficient is determined. As a result of the change, additional funding of old-age pensions decreases and solvency improves also when the solvency ratio is high. The change made in the projection is based on a legal amendment approved in 2022 (Government proposition 30/2022) and the related supporting projections.

The TyEL contribution takes into account the reclaim in 2022–2025 of the 2020 contribution reduction. As a result, the contribution is 24.85 per cent of the wage sum. After this, the TyEL contribution relative to the wage sum will be kept at 24.4 per cent until the latter half of the 2030s.

The TyEL contribution rate must be increased to 26.2 per cent of the wage sum by 2090. The need to increase the contribution is a result of the changing population structure, which leads to a rise in the TyEL contribution rate. The TyEL pension expenditure relative to the TyEL wage sum will peak in 2085, at which time the pension expenditure will be 36.3 per cent of the wage sum. (Table 5.2 and Figure 5.1.)

The TyEL contribution can be divided into the pooled component, the funded component and operating costs. In addition, the total TyEL contribution also depends on client bonuses which are determined based on investment returns and the solvency situation. The pooled component is used to cover jointly financed pension expenditure. The funded component is transferred to pension funds to await the payment of the accrued funded pension. The funded component will grow steadily throughout the projection period due to the rising retirement age and extended working lives. The pooled component will be reduced to even out the total contribution level until the 2040s, after which the pooled component must be increased along with the TyEL

contribution to prevent the provision for pooled claims from sinking below its minimum limit. In these projections, it is assumed that the amount of operating expenses relative to the TyEL wage sum remains stable throughout the projection period.

In this report, the TyEL assets are presented in proportion to both the wage sum and the pension expenditure. Presenting them in proportion to the wage sum depicts the significance of the assets as part of the TyEL financing base. Presenting them in proportion to pension expenditure depicts the amount of assets relative to their purpose of use. The ratio of assets to expenditure approximates the evolution of the funding ratio but, unlike the funding ratio, it does not depend on assumptions about the future.

The amount of TyEL assets at year-end 2021 was slightly over 250 per cent of the wage sum. (Table 5.2 and Figure 5.2). The predicted lower returns for 2022 will reduce the amount of assets from its peak in 2021, after which the assets relative to the wage sum will remain at around 240 per cent until the early 2030s. The amount of assets relative to the wage sum will take an upward turn when the real return assumption of the assets rises from 2.5 per cent to 3.5 per cent in 2032. By the end of the projection period, the amount of assets will grow to 365 per cent of the wage sum.

The amount of the TyEL assets relative to pension expenditure will decrease until the 2030s, after which it will take an upward turn and rise to slightly above 1,000 per cent in the 2050s. This is equivalent to ten years of pension expenditure. (Figure 5.3).

In the long run, the growth of assets relative to the wage sum is a result of, above all, the growth in old-age pension liabilities and solvency capital.

The technical provisions from old-age pensions that are the responsibilities of the pension providers grow as life expectancy grows. Old-age pensions will become more funded as the life expectancy coefficient is not applied to the funded components. On the other hand, the old-age pension funds of individual insured persons will be dissolved at an increasingly later age as the retirement age rises. In addition, as working lives lengthen and the employment rate increases, more funded old-age pensions accrue to an increasingly wider group of people.

As a rule, disability pensions are funded in full when the pension starts. The funded component of the disability pension is paid until the individual reaches their old-age retirement age.

Disability pension liabilities grow as the retirement age rises. There are three reasons for this: disability pensions become old-age pensions at a higher age, the pensions are slightly higher due to the way the projected pension component is calculated, and disability pensions can start at later ages than currently.

When calculating the technical provision for old-age pensions, the TyEL mortality assumption is used to determine in advance how much of the assets must be reserved as pension liabilities in order to cover the funded components of future old-age pensions. If the mortality assumption does not correspond to the realised mortality rates, the funding of old-age pensions will result in either a surplus or a deficit which, in turn, will either increase or reduce the solvency under TyEL. This rule on how to handle the surplus or deficit is abandoned in the projection as of 2030. Instead, the

surplus or deficit is transferred annually to the provision for pooled claims. We made this change so that the projection would better depict reality, where the mortality assumption is adjusted from time to time to correspond to observed mortality rates. In the projection, the funding of old-age pensions runs slight deficits for a long time but starts creating surpluses in the 2070s.

Under the Employees Pensions Act, funded old-age pensions are increased based on the return on pension assets. These increases may be targeted at different age groups in order to achieve a steady development of the contribution rate. The older the individuals are for whom the increases are targeted, the faster the funded pensions will dissolve, causing the contribution rate to decrease.

In the projections of this report, the increases are targeted in line with current practices at those aged 55 and over in the years 2022–2024. In 2025–2059, the increases will be targeted at those aged 45 and over so that the provision for pooled claims does not become abnormally high. From 2060 onwards, the increases will be targeted at those aged 65 and over to even out the pressure to raise the contribution.

If the increases were targeted in line with current practices throughout the projection period, the pressure to raise the contribution would have been smaller in the first half and larger in the latter half of the projection period. Without changing the targeting, the TyEL contribution would be higher, on average, and more assets would accumulate in the long run.

5.1.2 Financial standing under TyEL in 2090

The TyEL pension expenditure relative to the wage sum will grow in the latter half of the projection period until 2085. After that, the pension expenditure relative to the wage sum will decrease slightly due to changes in demography.

According to the projection, the TyEL contribution will be 26.2 per cent of the wage sum in 2090. It corresponds to a sufficient constant TyEL contribution rate as of 2090. Hence, there is no pressure to change the contribution at the end of the projection period. The calculation of the constant contribution rate is depicted in more detail in section 5.2.1.

The funding rate refers to the ratio of assets to accrued pensions. In other words, the funding rate expresses how large a share of the accrued pensions could be financed with accumulated pension assets. TyEL is a partially funded scheme in which the funding rate is not fixed. The funding rate can change during the projection period, which speaks of how the weighting of pension financing changes over time between a funded and a pay-as-you-go system.

The TyEL funding rate will grow during the projection period from the starting level of 35.4 per cent to 48.3 per cent by 2090 (Table 5.3). There is no pressure to change the TyEL contribution after 2090, which means that the growth in the funding rate is not a sign of excessive funding. The growth of the funding rate during the projection period is due to the growth of TyEL assets which, in turn, is explained by the growth in old-age pension liabilities and solvency capital as described earlier. The calculation of the funding rate is depicted in more detail in section 5.2.2.

Thanks to the rising funding rate, the TyEL system is in balance at the end of the projection period, even though the contribution increases are clearly smaller than the growth in pension expenditure relative to the wage sum.

Table 5.1.
TyEL financing in 2021–2090 (€ million at 2021 prices)

5.1.1. Contribution income and wage sum

	2021	2025	2030	2040	2050	2070	2090
Wage sum	63,924	65,691	69,466	78,299	87,111	103,836	121,305
Contribution income	15,597	16,324	16,950	19,138	21,717	27,149	31,778
Employer	10,816	11,420	11,879	13,406	15,127	18,662	21,833
Employee, basic contribution	3,563	3,707	5,071	5,732	6,590	8,486	9,945
Employee, raised contribution	1,219	1,197	-	-	-	-	-
Funded component*	3,074	3,089	3,200	4,023	4,821	6,424	7,907

5.1.2. Pension expenditure

	2021	2025	2030	2040	2050	2070	2090
Old-age pension	14,213	15,179	16,846	18,821	21,537	30,955	38,521
Partial old-age pension	181	243	219	239	311	369	379
Disability pension	1,163	1,223	1,221	1,527	1,930	2,747	3,409
Years-of-service pension	1	4	5	5	6	8	8
Survivors' pension	1,037	1,099	1,158	1,249	1,204	998	1,215
Total	16,596	17,748	19,448	21,841	24,988	35,076	43,533
of which funded	3,946	4,515	5,178	6,005	7,290	12,735	15,906

5.1.3. Assets and cash flows

	2021	2025	2030	2040	2050	2070	2090
Assets per 1 January	139,795	154,331	163,753	194,055	243,795	350,067	430,248
Contribution income, TyEL	15,597	16,324	16,950	19,138	21,717	27,149	31,778
Contribution income, TR	603	430	516	705	833	1,093	1,312
Return on investments	22,443	6,995	7,407	10,756	13,518	19,345	23,734
Expenditure, TyEL	-16,596	-17,748	-19,448	-21,841	-24,988	-35,076	-43,533
Expenditure, other**	-316	-277	-246	-173	-118	-98	-116
Operating costs	-380	-331	-350	-394	-439	-523	-611
Assets per 31 December	161,147	159,725	168,582	202,246	254,317	361,956	442,812

5.1.4. Assets, technical provisions and solvency capital at end of year

	2021	2025	2030	2040	2050	2070	2090
Old-age pension liabilities	96,428	104,572	112,300	133,008	165,743	241,805	290,908
Total technical provisions	118,258	122,885	131,446	151,981	190,178	265,702	319,084
Solvency capital	42,889	36,840	37,136	50,265	64,139	96,254	123,729
Assets per 31 December	161,147	159,725	168,582	202,246	254,317	361,956	442,812

* The funded component of the contribution includes the funded old-age and disability pension contributions. Correspondingly, the funded expenditure includes the funded components of the old-age and disability pensions in payment.

** Supplementary pension provision under TEL, contribution losses, additional net expenses from TyEL-MEL pooling.

Table 5.2.
TyEL financing, 2021–2090, (wage sum million euros at 2021 prices; other quantities % of wage sum)

5.2.1. Contribution income and wage sum

	2021	2025	2030	2040	2050	2070	2090
Wage sum	63,924	65,691	69,466	78,299	87,111	103,836	121,305
Contribution income	24.4	24.9	24.4	24.4	24.9	26.1	26.2
Employer	16.9	17.4	17.1	17.1	17.4	18.0	18.0
Employee, basic contribution	7.2	7.2	7.3	7.3	7.6	8.2	8.2
Employee, raised contribution	8.7	8.7	-	-	-	-	-
Funded component*	4.8	4.7	4.6	5.1	5.5	6.2	6.5

5.2.2. Pension expenditure

	2021	2025	2030	2040	2050	2070	2090
Old-age pension	22.2	23.1	24.3	24.0	24.7	29.8	31.8
Partial old-age pension	0.3	0.4	0.3	0.3	0.4	0.4	0.3
Disability pension	1.8	1.9	1.8	1.9	2.2	2.6	2.8
Years-of-service pension	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Survivors' pension	1.6	1.7	1.7	1.6	1.4	1.0	1.0
Total	26.0	27.0	28.0	27.9	28.7	33.8	35.9
of which funded	6.2	6.9	7.5	7.7	8.4	12.3	13.1

5.2.3. Assets and cash flows

	2021	2025	2030	2040	2050	2070	2090
Assets per 1 January	218.7	234.9	235.7	247.8	279.9	337.1	354.7
Contribution income, TyEL	24.4	24.9	24.4	24.4	24.9	26.1	26.2
Contribution income, TR	0.9	0.7	0.7	0.9	1.0	1.1	1.1
Return on investments	35.1	10.6	10.7	13.7	15.5	18.6	19.6
Expenditure, TyEL	-26.0	-27.0	-28.0	-27.9	-28.7	-33.8	-35.9
Expenditure, other**	-0.5	-0.4	-0.4	-0.2	-0.1	-0.1	-0.1
Operating costs	-0.6	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
Assets per 31 December	252.1	243.1	242.7	258.3	291.9	348.6	365.0

5.2.4. Assets, technical provisions and solvency capital at end of year

	2021	2025	2030	2040	2050	2070	2090
Old-age pension liabilities	150.8	159.2	161.7	169.9	190.3	232.9	239.8
Total technical provisions	185.0	187.1	189.2	194.1	218.3	255.9	263.0
Solvency capital	67.1	56.1	53.5	64.2	73.6	92.7	102.0
Assets per 31 December	252.1	243.1	242.7	258.3	291.9	348.6	365.0

* The funded component of the contribution includes the funded old-age and disability pension contributions. Correspondingly, the funded expenditure includes the funded components of the old-age and disability pensions in payment.
** Supplementary pension provision under TEL, contribution losses, additional net expenses from TyEL-MEL pooling.

Table 5.3.
TyEL funding rate in 2021–2090 (%)

	2021	2025	2030	2040	2050	2070	2090
Funding rate	35.4	36.3	37.1	39.0	41.9	46.4	48.3

Figure 5.1.
TyEL expenditure and contribution income relative to wage sum in 2010–2090

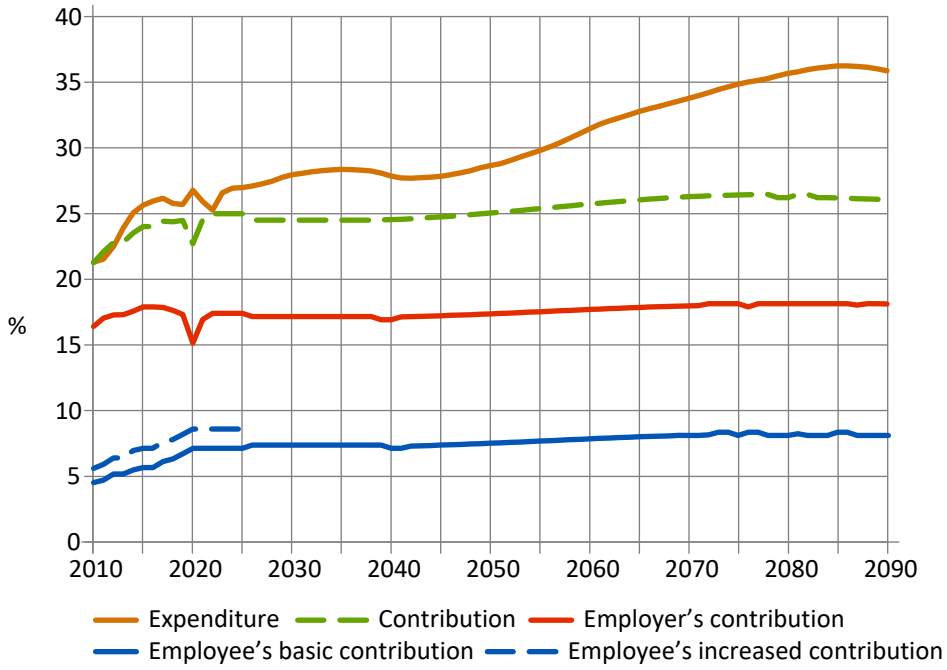


Figure 5.2.
TyEL assets and technical provisions relative to wage sum in 2010–2090

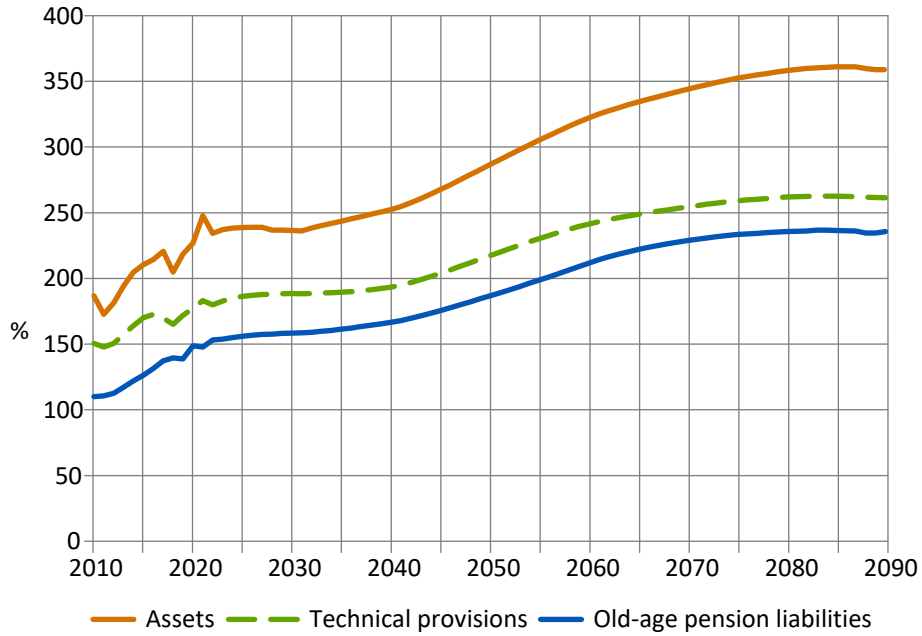
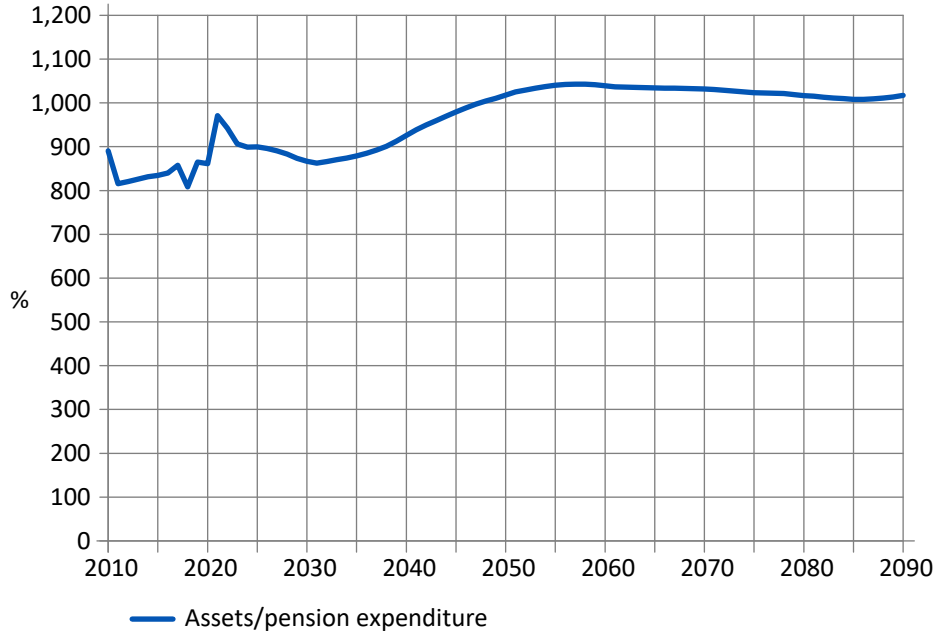


Figure 5.3.
TyEL assets relative to TyEL pension expenditure 2010–2090



5.1.3 Financing of pension expenditure under YEL and MYEL

Pensions under the Self-employed Persons' Pensions Act (YEL) are fully financed from the PAYG system, as are those under the Farmers' Pensions Act (MYEL) for the most part. The YEL contribution is linked to the average TyEL contribution rate, but it is always at a slightly lower level owing to the contribution discount granted to newly self-employed workers. In addition, the temporary increase for the employers' share of the contribution agreed on for the years 2022–2025 is not considered when defining the YEL contribution. In 2021, the YEL contribution income was 23.1 per cent of the insured sum of earned income.

The confirmed incomes under YEL relative to the general earnings level have decreased steeply in recent years. However, this projection assumes that this decline will end. That assumption is explained in more detail in Chapter 1.

The administrative costs of YEL are based on the number of self-employed persons and persons receiving a pension under YEL. In the projection, it is assumed that the administrative costs are adjusted annually with an index in which changes in earnings and consumer prices weigh 50 per cent each. In recent years, the administrative costs have either not been adjusted at all or adjusted in accordance with inflation. The deviating assumption in this projection has been made so that the administrative expenses relative to the confirmed income under YEL would not decline significantly in the long run when compared to their current level.

The State pays the share of the expenditure that the contribution income does not cover. A large part of the growing TyEL expenses can be financed with the returns of TyEL funds. That way, the TyEL contribution increases less than does the TyEL expenditure. Since YEL contributions are not funded, the corresponding part of YEL pensions will be financed by the State.

In 2021, the State financed approximately 26 per cent of the YEL expenditure. The State's share will grow strongly until the mid-2030s, at which time the State's share of the expenditure will be around 35 per cent. By 2050, the State's share will decrease slightly as the contribution income grows faster than the pension expenditure. The State's share of the expenses will stabilize at around 30 per cent and remain close to that level for the rest of the projection period. (Table 5.4 and Figure 5.4).

In 2021, the MYEL contribution income amounted to slightly less than 14 per cent of the insured sum of earned income. This is slightly more than half of the TyEL contribution income level. As the average size of farms grows, the average MYEL contribution will grow slightly in relation to the TyEL contribution. This projection assumes that the MYEL administrative expenses will be adjusted each year with the wage coefficient according to MYEL's actuarial principles.

The State financed 81 per cent of the MYEL expenditure in 2021. The State's share of the expenditure will grow slightly until the mid-2030s, after which it will begin to decrease. However, the State will still finance more than half of the MYEL expenditure in 2090. The most significant reason for the high level of State financing is the unfavourable ratio of active farmers to MYEL pension recipients. The low contribution rate also raises the State's share.

These projections do not take into account the MYEL funds, which consist mainly of funded pensions of grant recipients. These assets amounted to around 156 million euros at year-end 2021. If these assets were considered, the State's share of the MYEL expenses would be a few million euros smaller each year. (Table 5.4 and Figure 5.5).

Table 5.4.
YEL and MYEL financing 2021–2090

5.4.1. YEL cash flows, € million at 2021 prices

	2021	2025	2030	2040	2050	2070	2090
Sum of earned income	4,638	4,717	5,001	5,591	6,210	7,408	8,654
Contribution income	1,073	1,091	1,156	1,295	1,467	1,836	2,149
State's share	380	481	580	637	634	767	971
Pension expenditure	1,400	1,513	1,674	1,863	2,029	2,521	3,033
Operating costs	60	60	63	68	73	81	86

5.4.2. YEL cash flows, % of the sum of earned income

	2021	2025	2030	2040	2050	2070	2090
Contribution income	23.1	23.1	23.1	23.2	23.6	24.8	24.8
State's share	8.2	10.2	11.6	11.4	10.2	10.3	11.2
Pension expenditure	30.2	32.1	33.5	33.3	32.7	34.0	35.0
Operating costs	1.3	1.3	1.3	1.2	1.2	1.1	1.0

5.4.3. MYEL cash flows, € million at 2021 prices

	2021	2025	2030	2040	2050	2070	2090
Sum of earned income	1,238	1,063	934	809	865	1,035	1,208
Contribution income	172	150	134	120	135	175	205
State's share	718	723	731	635	477	277	253
Pension expenditure	860	851	846	738	596	434	436
Operating costs	24	21	19	17	17	19	22

5.4.4. MYEL cash flows, % of sum of earned income

	2021	2025	2030	2040	2050	2070	2090
Contribution income	13.9	14.1	14.3	14.8	15.6	16.9	17.0
State's share	58.0	68.0	78.3	78.5	55.1	26.8	21.0
Pension expenditure	69.5	80.1	90.6	91.2	68.9	41.9	36.1
Operating costs	2.0	2.0	2.1	2.1	1.9	1.8	1.8

Figure 5.4.
YEL expenditure and contribution relative to the sum of earned income 2010–2090

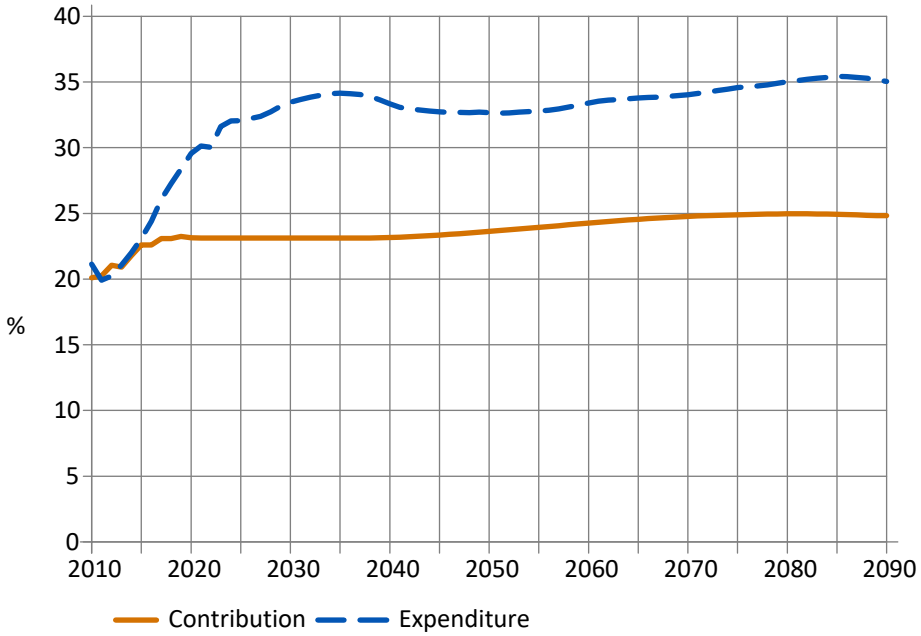
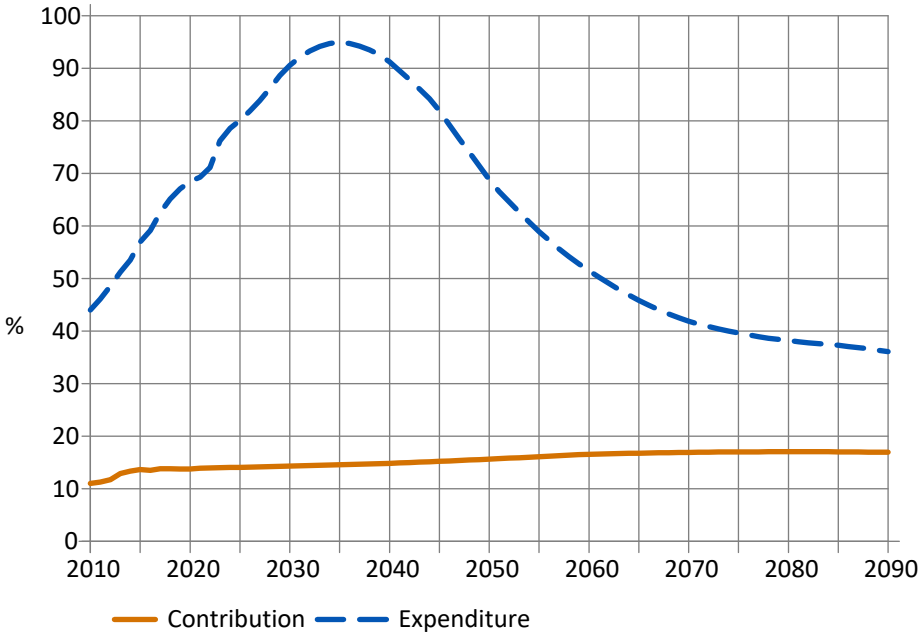


Figure 5.5.
MYEL expenditure and contribution relative to the sum of earned income 2010–2090



5.2 Supplementary analyses of earnings-related pension financing

5.2.1 Sufficient constant contribution

The financial status of the earnings-related pension scheme can be assessed by defining a theoretical constant contribution rate that, together with the accumulated assets, their return and the TR contribution, would be sufficient to finance all future expenditure. In other words, a sufficient constant contribution is the contribution level at which current and future pensions can be financed (in principle, permanently) without future increases to or decreases of the contribution rate. Conceptually, the constant contribution includes the state shares but not the TR contribution.

To determine a constant contribution rate, the baseline projection has been extended to the year 2110. After that point, the pension expenditure relative to the wage sum is assumed to stay unchanged. The growth rate of pension expenditure relative to the wage sum slows down and the ratio starts to slowly decrease in the 2080s. This is mainly due to the age structure of the population.

A sufficient TyEL contribution rate would be 25.3 per cent of the TyEL wage sum. In 2021, the TyEL contribution was 24.4 per cent. In 2022–2025, a temporary contribution increase is collected to cover the reduction in the provision for pooled claims due to the contribution discount in 2020. The increase is 0.45 per cent of the wage sum under TyEL. (Table 5.5.)

The sufficient constant contribution rate of municipal pensions under JuEL would be 26.1 per cent (Table 5.6). In 2021, the contribution income under JuEL municipal was 28.2 per cent of the wage sum (Keva 2022). It is assumed to be 27.9 per cent of the wage sum in 2022.

The constant contribution rate sufficient to finance all earnings-related pensions would be 27.8 per cent of the sum of all earned income. A comparable contribution income relative to the sum of earned income was 29.2 per cent in 2021. That means that the average contribution level of the earnings-related pension scheme could be sustainably reduced by 1.4 percentage points. The total contribution income, excluding the TR contribution, was 28.3 billion euros, and the sum of earned income 96.7 billion euros. (Table 5.7.)

The constant contribution sufficient to finance all earnings-related pensions is higher than the sufficient constant contribution of both TyEL and JuEL municipal pensions. This is mainly because the pension expenditure of JuEL State pensions and MYEL pensions are much higher relative to their sums of earned income than of any other pension schemes. The expenditure of JuEL municipal pensions is close to the expenditure of all earnings-related pensions relative to the wage sum, but the large amount of pension assets lowers the contribution. In addition, the VEKL pension expenditure raises the sufficient constant contribution for the whole system.

Table 5.5.
Sufficient constant TyEL contribution rate, wage sum billion euros at 2021 prices; other quantities % of wage sum

	2022	2025	2030	2040	2050	2070	2090	2110
Wage sum, billion euros	64.0	65.7	69.5	78.3	87.1	103.8	121.3	143.0
Assets per 1 January	236.5	236.2	241.0	263.5	306.7	375.3	392.2	409.1
TyEL contribution	25.3	25.3	25.3	25.3	25.3	25.3	25.3	25.3
TR contribution	0.7	0.7	0.7	0.9	1.0	1.1	1.1	1.1
Return on investments	2.8	10.7	10.9	14.6	17.0	20.7	21.6	22.5
Pension expenditure	-25.3	-27.0	-28.0	-27.9	-28.7	-33.8	-35.9	-35.1
Operating costs	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
Other costs*	-0.5	-0.4	-0.4	-0.2	-0.1	-0.1	-0.1	-0.1
Assets per 31 December	239.0	244.9	249.0	275.7	320.6	388.0	403.7	422.3

* Supplementary pension provision under TEL and additional net expenses from TyEL-MEL pooling caused by MEL.

Table 5.6.
Sufficient constant JuEL municipal contribution rate, wage sum billion euros at 2021 prices; other quantities % of wage sum

	2022	2025	2030	2040	2050	2070	2090	2110
Wage sum, billion euros	19.3	20.1	21.6	24.4	27.1	32.3	37.6	44.4
Assets per 1 January	329.5	315.8	302.8	306.0	337.0	403.4	434.0	461.0
Contribution income	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2
TR contribution	0.7	0.7	0.7	0.9	1.0	1.1	1.1	1.1
Return on investments	3.9	14.2	13.6	16.9	18.6	22.2	23.9	25.4
Pension expenditure	-30.0	-32.1	-32.8	-31.8	-31.6	-35.3	-37.4	-37.5
Operating costs	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
Assets per 31 December	330.0	324.4	310.3	317.9	350.8	417.3	447.4	475.8

Table 5.7.
Sufficient constant contribution rate for all earnings-related pensions, sum of earned income billion euros at 2021 prices; other quantities % of the sum of earned income

	2022	2025	2030	2040	2050	2070	2090	2110
Sum of earned income, billion euros	96.0	98.3	103.5	115.7	128.4	153.1	178.8	210.7
Assets per 1 January	251.9	244.2	236.6	236.6	263.5	320.4	336.1	351.2
Contribution income	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8
TR contribution	0.6	0.6	0.7	0.8	0.9	1.0	1.0	1.0
Return on investments	3.0	11.0	10.6	13.1	14.6	17.7	18.5	19.3
Pension expenditure	-30.9	-32.8	-33.4	-32.0	-31.4	-35.0	-36.9	-36.3
Operating costs	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
Assets per 31 December	252.0	250.3	241.8	245.8	274.9	331.4	346.0	362.5

5.2.2 Value of accrued pension rights and funding balance analysis

The annual earnings-related pension expenditure to be paid in the ongoing year consists of the pensions accrued in the past. Correspondingly, pensions to be paid in the future can be split into pensions accrued in the past and pensions to be accrued in the future. The value of the pensions accrued at a particular point in time is the amount of money which, along with its return, would be enough to cover the pensions accrued by that point in time.

The value of accrued pension rights can be evaluated with a *closed group* analysis in which pension rights and pension assets accumulated up to a certain point in time are examined. This analysis is significant particularly in the case of the Finnish earnings-related pension scheme since the accumulated pension rights are property that is subject to constitutional protection.[16]

An *open group* analysis takes into account not only the pension rights and pension assets that have accrued up to a certain point in time but also pension rights to be accrued in the future and future contribution income. The open group analysis expands the closed group analysis into a funding balance analysis of the pension scheme.

The analyses are presented with three different discount rates. The discount rate of the baseline option is the return assumption of the baseline projection. The return assumptions of the low and high return scenarios in the sensitivity analyses in section 6.5 are used as the low and high discount rates.

- *Baseline:* The real discount rate is 2.5 per cent in 2023–2031 and 3.5 per cent as of 2032. The discount rate in 2022 is -5.0 per cent.
- *Low discount rate:* The real discount rate is 1.3 per cent in 2023–2031 and 2.3 per cent as of 2032. The discount rate in 2022 is -5.0 per cent.
- *High discount rate*: The real discount rate is 3.7 per cent in 2023–2031 and 4.7 per cent as of 2032. The discount rate in 2022 is -5.0 per cent.

Closed group analysis

When assessing the value of accrued pension rights, a line must be drawn to determine which components of future pensions are to be interpreted as having accrued in the past and which as something that will accrue in the future. The following pension components are considered to have accrued in the past:

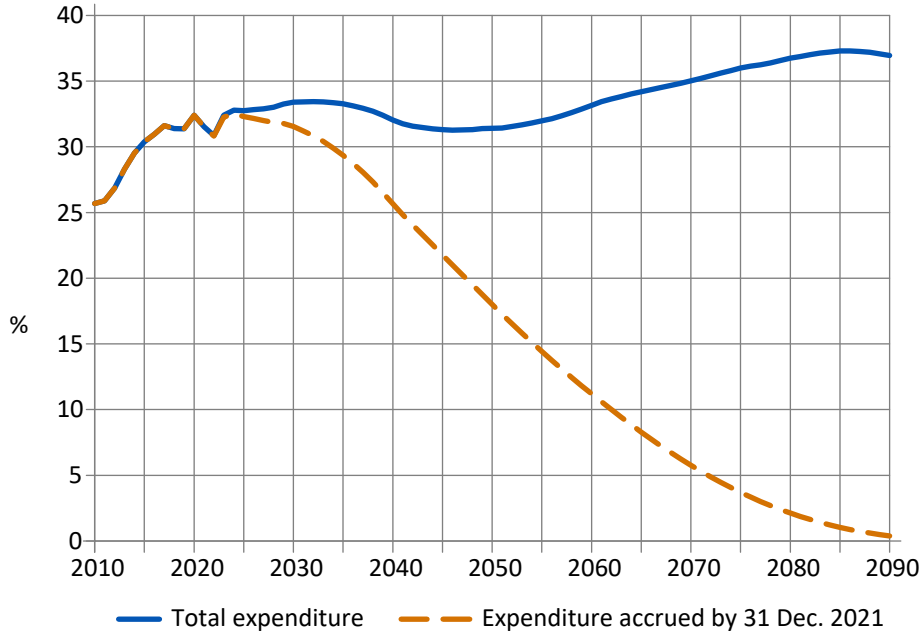
- All earnings-related pensions already in payment, including their future index increases.
- The old-age, partial old-age, disability, years-of-service and survivors' pension components that are based on an already realised employment history or realised periods of social benefits. These pensions include future adjustments with the wage coefficient, the life expectancy coefficient and the earnings-related pension index.

16 The property subject to constitutional protection likely deviates somewhat from what is presented in this report. The Constitutional Law Committee takes a stand on the protection of property only on a case-by-case basis when it assesses the constitutional nature of proposed amendments.

Pensions accrued in the past do not include pension components that are based on future work or future periods of social benefits. Similarly, the projected pension component of disability pensions starting in the future are not counted as already accrued pensions.

Figure 5.6 presents the earnings-related pension expenditure that has accrued by 31 December 2021 and the total earnings-related pension expenditure relative to the sum of earned income. At the beginning of the projection period, the whole pension expenditure consists of already accrued pensions. The pension expenditure that is based on pensions accrued by 31 December 2021 will drop to nearly zero by the end of the projection period.

Figure 5.6.
Total earnings-related pension expenditure and earnings-related pension expenditure accrued by 31 December 2021 relative to the sum of earned income (%)



The discount rate used for future pensions has a substantial impact on the value of accrued pensions. Table 5.8 presents a baseline in which the report's return assumption is used as the discount rate. This means a real discount rate of 2.5 per cent from August 2022 to the end of year 2031 and 3.5 per cent as of 2032. For the first half of 2022, realised returns are used as the discount rate.

With these assumptions, the total value of earnings-related pensions accrued by the end of 2021 was 771.1 billion euros, of which TyEL pensions accounted for 455.0 billion euros.

In a low discount rate scenario, the real discount rate is assumed to be 1.3 per cent from 2023 until 2031 and 2.3 per cent as of 2032. For 2022, the baseline discount rate is used. This corresponds to the low investment return scenario in section 6.5. (Table 5.9).

In a high discount rate scenario, the real discount rate is assumed to be 3.7 per cent from 2023 until 2031 and 4.7 per cent as of 2032. For 2022, the baseline discount rate is used. (Table 5.10).

The funding ratio is the amount of pension assets divided by the value of accrued pensions. Using baseline assumptions, the funding ratio of all earnings-related pensions at year-end 2021 is 33.4 per cent. In the projection with a low discount rate, the funding ratio is 27.7 per cent and with a low discount rate, 39.3 per cent.

Table 5.8.
Results of closed group analysis for 2021 with baseline discount rate (billion euros at 2021 prices)

	TyEL	JuEL State	JuEL municipal	All earnings-related pensions
Assets per 31 Dec. 2021	161.1	23.6	67.7	257.5
Accrued pensions per 31 Dec. 2021	455.0	93.4	150.6	771.1
Funding ratio per 31 Dec. 2021 (%)	35.4	25.3	45.0	33.4

Table 5.9.
Results of closed group analysis for 2021 with low discount rate (billion euros at 2021 prices)

	TyEL	JuEL State	JuEL municipal	All earnings-related pensions
Assets per 31 Dec. 2021	161.1	23.6	67.7	257.5
Accrued pensions per 31 Dec. 2021	553.1	108.2	180.1	928.7
Funding ratio per 31 Dec. 2021 (%)	29.1	21.8	37.6	27.7

Table 5.10.
Results of closed group analysis for 2021 with high discount rate (billion euros at 2021 prices)

	TyEL	JuEL State	JuEL municipal	All earnings-related pensions
Assets per 31 Dec. 2021	161.1	23.6	67.7	257.5
Accrued pensions per 31 Dec. 2021	383.5	81.9	128.6	655.1
Funding ratio per 31 Dec. 2021 (%)	42.0	28.8	52.6	39.3

Open group analysis

In the open group analysis, the contribution is assumed to remain at the 2021 level, with two exceptions. First, the temporary increases in the TyEL contribution in 2022–2025 have been taken into account. They relate to the repayment of the contribution reduction during the corona pandemic. Second, the contribution of JuEL municipal pensions is assumed to remain at the 2022 level. These changes affect both the pension-scheme-specific results and the projection for all earnings-related pension schemes. In addition to the pension contribution, the TR contribution and the State contributions are taken into account in the contribution income. The State's share of the contributions is assumed to remain at its present level relative to the sum of earned income throughout the projection period. The TR contribution develops as presented in the baseline projection.

To retain comparability with the constant contribution calculations in section 5.2.1, the reported contribution levels exclude the TR contribution component. As of 2026, the contribution level of all earnings-related pension schemes, excluding the TR contribution component, is 29.2 per cent of earned income. As of 2026, the employee's contribution rate under TyEL is 24.4 per cent of the wage sum. The temporary increase of the TyEL contribution in 2022–2025 is 0.45 per cent of the TyEL wage sum. As of 2022, the JuEL municipal pension contribution rate is 27.9 per cent of the wage sum in this analysis.

The baseline projection has been extended to 2110. In this analysis, we have assumed that the expenditure and contribution relative to the sum of earned income remain unchanged after that. As of 2110, the sum of earned income is projected to grow at a real rate of 1.2 per cent. This is the same as the assumed long-term labour cost growth rate.

Similarly to the closed group analysis, the results of the open group analysis are presented with three different discount rate assumptions.

The constant contribution calculation presented in section 5.2.1 is close to this analysis. If the charged contribution is less than the sufficient constant contribution, the balance ratio of the open group analysis is under 100 per cent. Correspondingly, if the charged contribution exceeds the sufficient constant contribution, the balance ratio exceeds 100 per cent.

The present value of the pension expenditure of the whole earnings-related pension scheme at year-end 2021 amounts to 1,557.5 billion euros, of which 771.1 billion euros has accrued before 31 December 2021 and 786.3 billion euros will accrue after that date. The combined present value of contributions and assets at year-end 2021 is 1,620.5 billion euros, which means that the ratio of the present value of contributions and assets to the present value of pension expenditure is around 104 per cent. The balance ratio in the TyEL system is 98 per cent

In the JuEL State pension scheme the balance ratio is 134 per cent. The ratio of pension expenditure to wage sum is currently very high in State pensions, which means that relative to the wage sum large amounts of money will be spent now and in the near future on the financing of pensions. When expenditure declines in the future, the need for budgeted funding relative to the wage sum will decrease.

The balance ratio in the JuEL municipal pension scheme is 105 per cent. This means that there is a pressure to raise the TyEL contribution rate while, in the long run, the contribution rates for JuEL State and JuEL municipal pensions can be reduced. (Table 5.11).

Table 5.11.
Results of open group analysis for 2021 with baseline discount rate (billion euros at 2021 prices)

	TyEL	JuEL State	JuEL municipal	All earnings-related pensions
Accrued pensions per 31 Dec. 2021	455.0	93.4	150.6	771.1
Pensions accrued after 1 Jan. 2022	503.9	37.7	176.6	786.3
Present value of pension expenditure per 31 Dec. 2021	958.9	131.1	327.2	1,557.5
Assets per 31 Dec. 2021	161.1	23.6	67.7	257.5
Present value of pension contributions per 31 Dec. 2021	775.0	151.7	275.7	1,362.9
Contributions and assets per 31 Dec. 2021	936.2	175.3	343.4	1,620.5
Contribution rate as of 2022*	24.4	71.0	27.9	29.2
Balance ratio 31 Dec. 2021, %**	97.6	133.7	105.0	104.0

*Contribution rate without the TR contribution. Present value of contributions includes the TR contribution. For 2022–2025, the agreed temporary TyEL contribution increases are also assumed in the analyses concerning TyEL and all earnings-related pensions. They relate to the repayment of the contribution reduction during the corona pandemic.

** Balance ratio is the ratio of the present value of contributions and assets to the present value of future pension expenditure.

Table 5.12.
Results of open group analysis for 2021 with low discount rate (billion euros at 2021 prices)

	TyEL	JuEL State	JuEL municipal	All earnings-related pensions
Accrued pensions per 31 Dec. 2021	553.1	108.2	180.1	928.7
Pensions accrued after 1 Jan. 2022	1,424.0	97.5	484.3	2,195.5
Present value of pension expenditure per 31 Dec. 2021	1,977.2	205.6	664.4	3,124.1
Assets per 31 Dec. 2021	161.1	23.6	67.7	257.5
Present value of pension contributions per 31 Dec. 2021	1,518.1	288.4	540.3	2,664.3
Contributions and assets per 31 Dec. 2021	1,679.2	312.0	608.0	2,921.8
Contribution rate as of 2022*	24.4	71.0	27.9	29.2
Balance ratio 31 Dec. 2021, %**	84.9	151.7	91.5	93.5

*Contribution rate without the TR contribution. Present value of contributions includes the TR contribution. For 2022–2025, the agreed temporary TyEL contribution increases are also assumed in the analyses concerning TyEL and all earnings-related pensions. They relate to the repayment of the contribution reduction during the corona pandemic.

** Balance ratio is the ratio of the present value of contributions and assets to the present value of future pension expenditure.

Table 5.13.
Results of open group analysis for 2021 with high discount rate (billion euros at 2021 prices)

	TyEL	JuEL State	JuEL municipal	All earnings-related pensions
Accrued pensions per 31 Dec. 2021	383.5	81.9	128.6	655.1
Pensions accrued after 1 Jan. 2022	249.5	20.3	90.0	394.1
Present value of pension expenditure per 31 Dec. 2021	633.0	102.2	218.7	1,049.2
Assets per 31 Dec. 2021	161.1	23.6	67.7	257.5
Present value of pension contributions per 31 Dec. 2021	528.9	106.1	188.0	931.5
Contributions and assets per 31 Dec. 2021	690.1	129.7	255.7	1,189.0
Contribution rate as of 2022*	24.4	71.0	27.9	29.2
Balance ratio 31 Dec. 2021, %**	109.0	126.9	116.9	113.3

*Contribution rate without the TR contribution. Present value of contributions includes the TR contribution. For 2022–2025, the agreed temporary TyEL contribution increases are also assumed in the analyses concerning TyEL and all earnings-related pensions. They relate to the repayment of the contribution reduction during the corona pandemic.

** Balance ratio is the ratio of the present value of contributions and assets to the present value of future pension expenditure.

Significance of the remote future

The open group analysis extends infinitely far into the future. In the low discount rate scenario, the pensions paid out after 2110 account for around 36 per cent of the present value of the pension expenditure of the whole earnings-related pension scheme. In the baseline discount rate scenario, the corresponding share is 13 per cent,

and in the high discount rate scenario, it is five per cent. The weightings per pension scheme are presented in Table 5.14. In the low discount rate scenario, the long-term discount rate (2.3%) differs only slightly from the real growth of the sum of earned income (1.2%). In this case, the pension expenditure paid in the far future receives a fairly high weight in the current value of pension expenditure. In the high discount rate scenario, the weight of the remote future is small.

Table 5.14.
Share of post-2110-period of present value with different discount rates (%)

5.14.1. Share of present value with discount rate of baseline scenario

	TyEL	JuEL State	JuEL municipal	All earnings-related pensions
Pension expenditure	13	6	13	13
Contribution income	12	11	12	12

5.14.2. Share of present value in low discount rate scenario

	TyEL	JuEL State	JuEL municipal	All earnings-related pensions
Pension expenditure	37	23	37	36
Contribution income	35	33	35	35

5.14.3. Share of present value in high discount rate scenario

	TyEL	JuEL State	JuEL municipal	All earnings-related pensions
Pension expenditure	5	2	5	5
Contribution income	4	4	4	4

5.2.3 Internal rate of return, TyEL

The way in which pension contributions and benefits of private sector wage earners are allocated by birth cohort and gender can be analysed by estimating how large an internal rate of return different groups receive for the pension contributions they have paid. The assessment includes the contributions and benefits of TyEL and its predecessors TEL, LEL and TaEL. The contribution includes the employee's and the employer's earnings-related pension contributions and the TR contribution that the Employment Fund credits to the earning-related pension scheme.

In addition to the internal rate of return, the pension contributions and benefits of different generations can be described with the present values of received benefits and paid contributions. The method is described in more detail in Risku (2015). For example, the effects of the 2017 pension reform have been described in Reipas & Sankala (2015) by reviewing the effects of the reform on present values of life cycle TyEL pensions and contributions of different age cohorts.

The internal rate of return is the higher the earlier a cohort was born. For those born in 1940, the real internal rate of return on the earnings-related pension contribution will be 6.6 per cent. For those born between 1975–2000, it will be approximately 1.8

per cent. The internal rate of return for the older generations is higher than that of the younger generations because earnings-related pensions are financed mainly through the PAYG system. The pension contributions paid by older generations have been lower than the present contributions. (Table 5.15).

On average, women receive a higher internal rate of return on their pension contributions than men do. This is because, on average, women receive more pension benefits relative to their earnings than men since women's life expectancy is higher than men's and most surviving spouse's pensions are paid to women.

Figure 5.7.
Real internal rate of return of pension contributions by birth year and gender

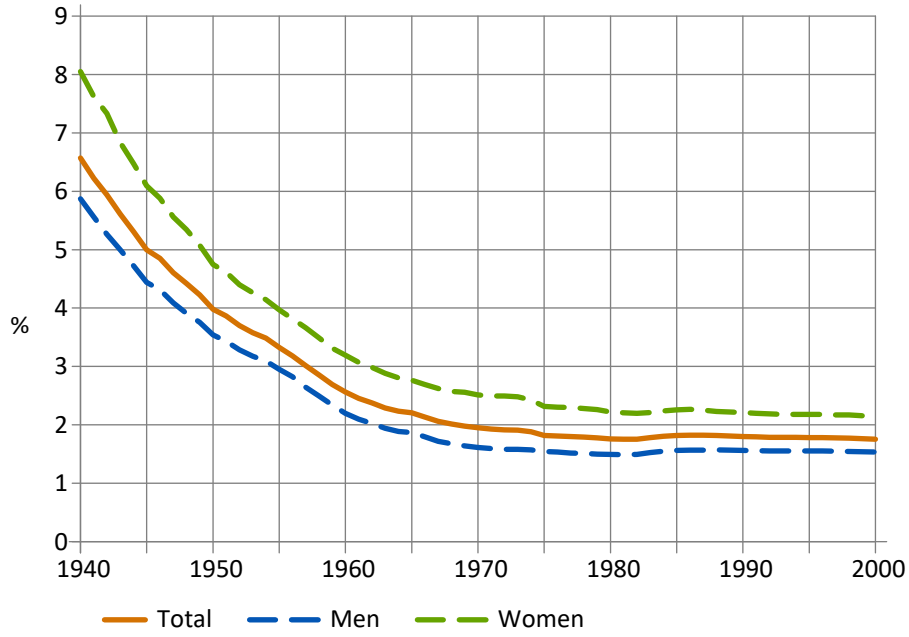


Table 5.15.
Real internal rate of return of pension contributions by birth year and gender (%)

Year of birth	Men	Women	Total
1940	5.9	8.1	6.6
1945	4.4	6.1	5.0
1950	3.5	4.7	4.0
1955	3.0	4.0	3.3
1960	2.2	3.2	2.6
1965	1.9	2.8	2.2
1970	1.6	2.5	1.9
1975	1.5	2.3	1.8
1980	1.5	2.2	1.8
1985	1.6	2.3	1.8
1990	1.6	2.2	1.8
1995	1.6	2.2	1.8
2000	1.5	2.1	1.8

6 Sensitivity analysis

In this chapter, we analyse the sensitivity of the results of the baseline projection. The following assumptions concerning demographic and economic development are analysed:

1. mortality,
2. birth rates,
3. growth in earnings,
4. employment rates, and
5. return on pension assets.

For each assumption, we present a scenario where the assumption is lower than in the baseline projection and a scenario where it is higher. In addition to analyses of the individual assumptions, we present a pessimistic and an optimistic economic scenario. In these scenarios, we have combined the sensitivity analyses of earnings, employment and return on pension assets.

The sensitivity analyses are not extreme alternatives. We have aimed at selecting the individual sensitivity analyses so that the long-term development would be between the low and the high scenario in around half of the cases. However, the sensitivity analysis scenarios for different assumptions are not fully comparable since we have used different sources and methods when selecting the scenarios. Nonetheless, the magnitudes of effects in the different scenarios can be compared with each other. The selection of the sensitivity analysis scenarios is explained in more detail in Appendix 8.

The factors under review may deviate from the baseline projection to a higher degree than assumed in the sensitivity analysis. Taken together, they may have an even stronger impact. The combined effects of multiple factors are presented in more detail in the updated Skeneraattori application (in Finnish).[17]

In addition, factors excluded from the review also influence pension levels and the financing of the pension scheme. Such factors include, for example, assumptions regarding migration and the incidence rates of pensions. The effects of these factors have been assessed in previous reports (Nopola 2019 and Kautto & Risku 2015). Supplementary analyses of disability pension incidence rates and starting levels of pension assets are included in the Skeneraattori application.

6.1 Mortality

The uncertainty of the development of the mortality rate has been assessed using the stochastic Lee-Miller method (Lilja 2017). This way we have received the 50-per-cent confidence intervals for mortality, the lower and upper bounds of which have been used as the low and high mortality scenarios. The mortality assumption deviates from the baseline projection in both alternatives as of 2023.

17 https://tilastot.etk.fi/chart/Skeneraattori/skeneraattori.html

Compared with the baseline projection, the change in life expectancy is larger in the projection in which mortality rates are assumed to be low than in the projection with high mortality rates. In 2040, life expectancy at birth is 86.4 years in the projection with low mortality rates, 85.5 in the baseline projection, and 84.4 years in the projection with high mortality rates. In 2090, the corresponding figures are 92.5, 91.0 and 88.6 years.

The realised mortality rates will affect the retirement ages of those born in 1965 or later. The retirement age of those born in 2005 will exceed that of the baseline projection by seven months in the projection with low mortality rates. In the projection with high mortality rates, it will be 11 months lower than in the baseline projection (Table 6.1).

In the projection with low mortality rates, the retirement age will be higher than the age at which the insurance obligation ends (70 years) as of those born in 2013. In the projection, the age at which the insurance obligation ends has been assumed to rise at the same pace as the retirement age from that point onwards. The difference in the expected effective retirement age between the scenarios is roughly half of the difference in the retirement age.

The life expectancy coefficient for those born in 2005 is 0.859 in the projection with low mortality rates, 0.872 in the baseline projection, and 0.887 in the projection with high mortality rates. (Table 6.1).

Table 6.1.
Retirement age and life expectancy coefficient in different mortality projections

	Retirement age			Life expectancy coefficient		
Year of birth	Baseline projection	Low mortality	High mortality	Baseline projection	Low mortality	High mortality
1965	65 yrs 2 mos	65 yrs 2 mos	65 yrs 1 mo.	0.939	0.936	0.939
1975	66 yrs 4 mos	66 yrs 8 mos	65 yrs 11 mos	0.916	0.909	0.923
1985	67 yrs 4 mos	67 yrs 9 mos	66 yrs 8 mos	0.900	0.888	0.911
1995	68 yrs 2 mos	68 yrs 9 mos	67 yrs 5 mos	0.884	0.874	0.900
2005	68 yrs 11 mos	69 yrs 6 mos	68 yrs	0.872	0.859	0.887

Mortality affects the retirement age and the level of pensions via automatic stabilising mechanisms. However, these mechanisms do not fully neutralise the effects on expenditure caused by the development in mortality rates. Neither mechanism affects those who have already retired, and the life expectancy coefficient does not apply to pensions paid by Kela. If the mortality rate is very low, the life expectancy coefficient and the rising retirement age no longer efficiently curb the growth of pension expenditure due to, among other things, the growing number of disability pensions.

Table 6.2.
Sufficient constant contributions under different mortality assumptions

	TyEL	JuEL municipal	All earnings-related pensions
Baseline	25.3	26.2	27.8
Low mortality	0.3	0.4	0.4
High mortality	-0.4	-0.5	-0.5

Figure 6.1.
Statutory pension expenditure relative to GDP under different mortality assumptions

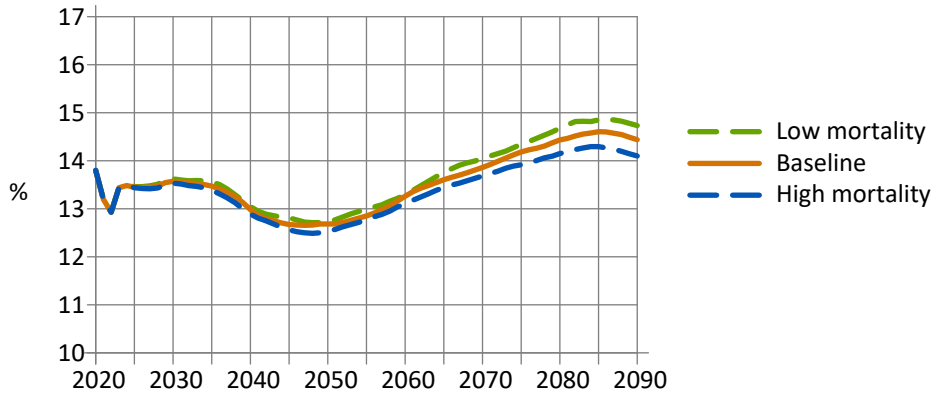


Figure 6.2.
Average pension relative to average earnings under different mortality assumptions

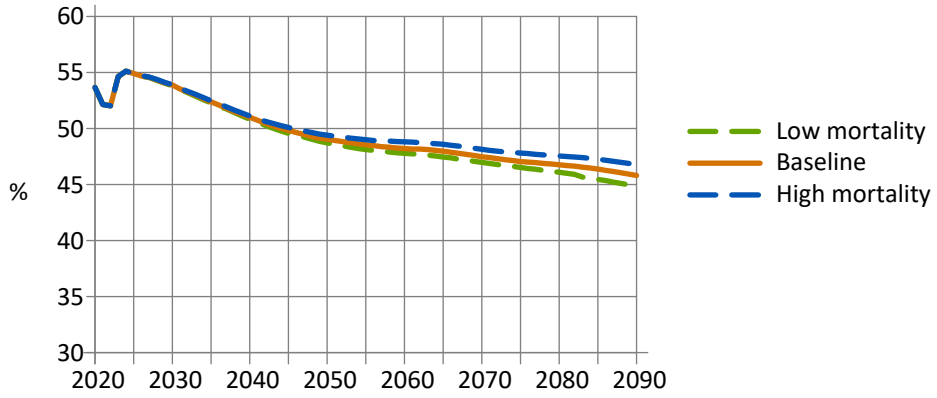


Figure 6.3.
TyEL contribution relative to TyEL wage sum under different mortality assumptions

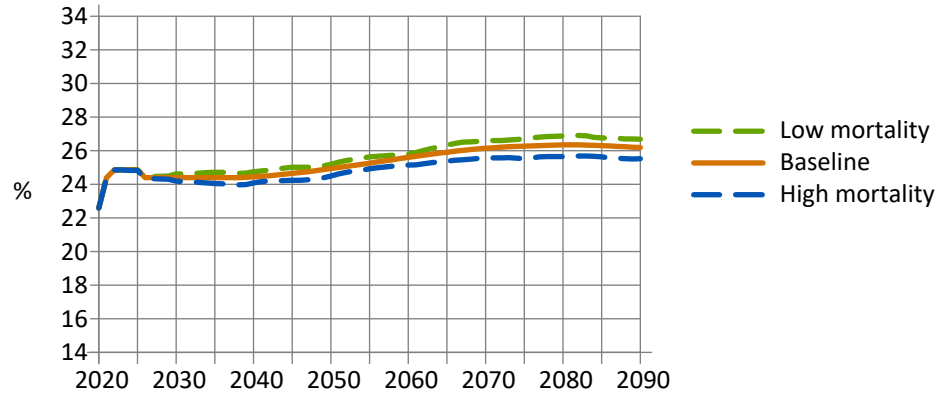


Table 6.3.
Sensitivity analysis, mortality (at 2021 prices)

6.3.1. Pension recipients (1,000)

	2021	2025	2030	2040	2050	2070	2090
Baseline	1,505	1,523	1,572	1,576	1,585	1,701	1,692
Low mortality	-	2	11	25	36	61	92
High mortality	-	-3	-9	-25	-44	-75	-107

6.3.2. Employed (1,000)

	2021	2025	2030	2040	2050	2070	2090
Baseline	2,390	2,439	2,435	2,423	2,389	2,256	2,080
Low mortality	-	0	1	10	18	18	16
High mortality	-	0	-4	-14	-21	-32	-32

6.3.3. Average pension, €/month and relative to average earnings

	2021	2025	2030	2040	2050	2070	2090
Euro/month							
Baseline	1,784	1,844	1,907	2,031	2,195	2,681	3,277
Low mortality	-	0	-2	-9	-18	-33	-78
High mortality	-	0	2	8	20	44	80
% of average earnings							
Baseline	52.1	54.9	53.9	51.0	49.0	47.5	45.8
Low mortality	-	0.0	-0.1	-0.2	-0.3	-0.5	-1.0
High mortality	-	0.0	0.0	0.1	0.4	0.7	1.0

6.3.4. Total pension expenditure

	2021	2025	2030	2040	2050	2070	2090
billion euros							
Baseline	33.4	35.0	37.3	40.0	43.5	57.0	69.3
Low mortality	-	0.0	0.2	0.4	0.5	1.2	1.9
High mortality	-	0.0	-0.2	-0.5	-0.9	-1.5	-2.6
% of GDP							
Baseline	13.2	13.5	13.6	13.0	12.7	13.9	14.4
Low mortality	-	0.0	0.1	0.1	0.0	0.2	0.3
High mortality	-	0.0	0.0	-0.1	-0.2	-0.2	-0.3

6.3.5. Earnings-related pension expenditure, % of wage sum

	2021	2025	2030	2040	2050	2070	2090
TyEL							
Baseline	26.0	27.0	28.0	27.9	28.7	33.8	35.9
Low mortality	-	0.0	0.1	0.1	0.0	0.5	0.8
High mortality	-	0.0	-0.1	-0.2	-0.3	-0.4	-0.9
JuEL municipal							
Baseline	30.3	32.1	32.8	31.8	31.6	35.3	37.4
Low mortality	-	0.0	0.1	0.2	0.1	0.5	0.7
High mortality	-	0.0	-0.1	-0.3	-0.4	-0.6	-0.9

6.3.6. TyEL expenditure, contribution and assets relative to TyEL wage sum (%)

	2021	2025	2030	2040	2050	2070	2090
Contribution							
Baseline	24.4	24.9	24.4	24.4	24.9	26.1	26.2
Low mortality	-	0.0	0.2	0.3	0.3	0.4	0.5
High mortality	-	0.0	-0.2	-0.4	-0.4	-0.6	-0.7
Assets							
Baseline	252.1	243.1	242.7	258.3	291.9	348.6	365.0
Low mortality	-	0.0	0.1	0.9	2.3	7.6	11.9
High mortality	-	0.0	0.1	-1.1	-3.3	-9.2	-15.6

6.2 Birth rates

In the baseline projection, the total fertility rate is assumed to be 1.45 as of 2021. This is close to the realised total fertility rate for 2021.

- *In the projection with low birth rates,* the total fertility rate is 1.30 as of 2023.
- *In the projection with high birth rates,* the total fertility rate is 1.60 as of 2023.

The birth rate scenarios have been selected so that, in the long run, the high and low birth rate scenarios would correspond roughly to the 50 per cent confidence interval of the average total fertility rate computed over multiple years. The scenarios are loosely based on Nisén et al. (2020). The grounds for the selection of the scenarios are presented in more detail in Appendix 8.

The number of working-age people declines in the long run both in the baseline projection and the two alternative birth rate projections. At year-end 2021, the population aged 15–64 years numbered 3.4 million. In the baseline projection, the number goes down to 2.7 million by 2090. In the projection with low birth rates, the number goes down to 2.4 million by end of year 2090, and in the projection with high birth rates, to 3.0 million.

In the projection with low birth rates, the wage sum is five per cent lower than in the baseline projection by 2070. By 2090, the difference grows to 10 per cent. In the projection with low birth rates, the ratio between pension expenditure and GDP is 0.6 percentage points higher than in the baseline projection in 2070 and 1.2 percentage points higher at the end of the projection period, in 2090. The TyEL contribution is one percentage point higher in 2070 and 1.8 percentage points higher in 2090 than in the baseline projection, reaching 28 per cent at the end of the projection period.

In the projection with high birth rates, the wage sum is five per cent higher than in the baseline projection by 2070, and 10 per cent higher by 2090 than in the baseline projection. At the end of the projection period, the ratio between pension expenditure and GDP is 1.1 percentage points lower than in the baseline projection. At the end of the projection period, the TyEL contribution is 1.6 percentage points lower than in the baseline projection. (Table 6.5).

Table 6.4.
Sufficient constant contribution under different birth rate assumptions

	TyEL	JuEL municipal	All earnings-related pensions
Baseline	25.3	26.2	27.8
Low birth rates	0.5	0.6	0.6
High birth rates	-0.6	-0.6	-0.6

Figure 6.4.
Statutory pension expenditure relative to GDP under different birth rate assumptions

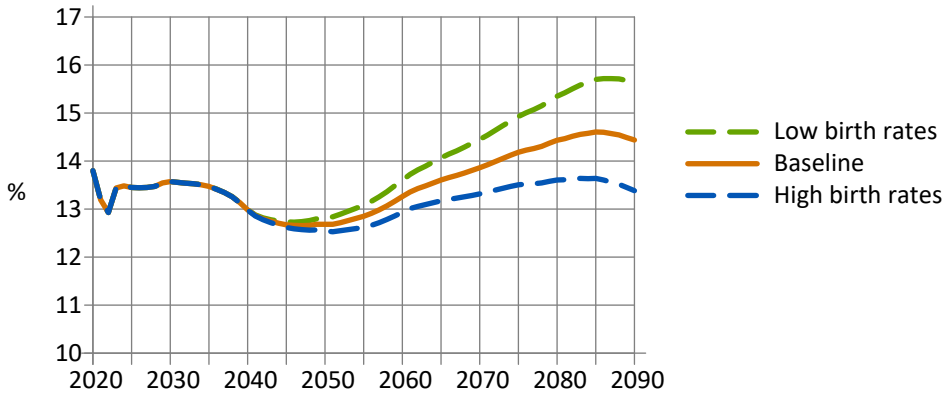


Figure 6.5.
Average pension relative to average earnings under different birth rate assumptions

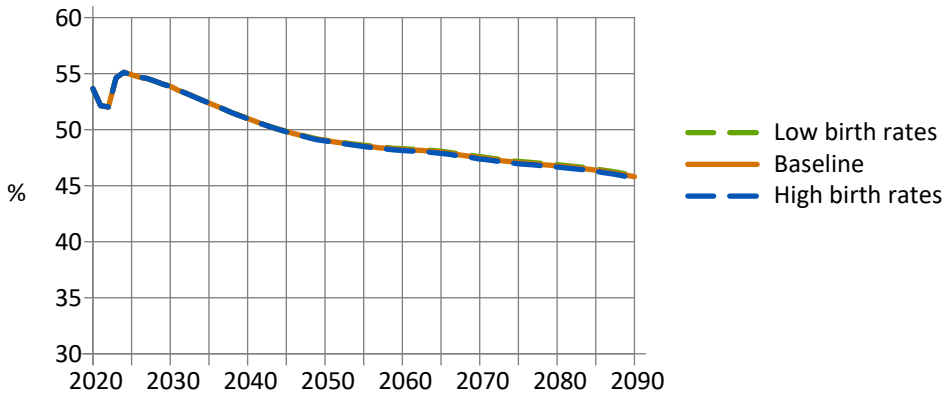


Figure 6.6.
TyEL contribution relative to TyEL wage sum under different birth rate assumptions

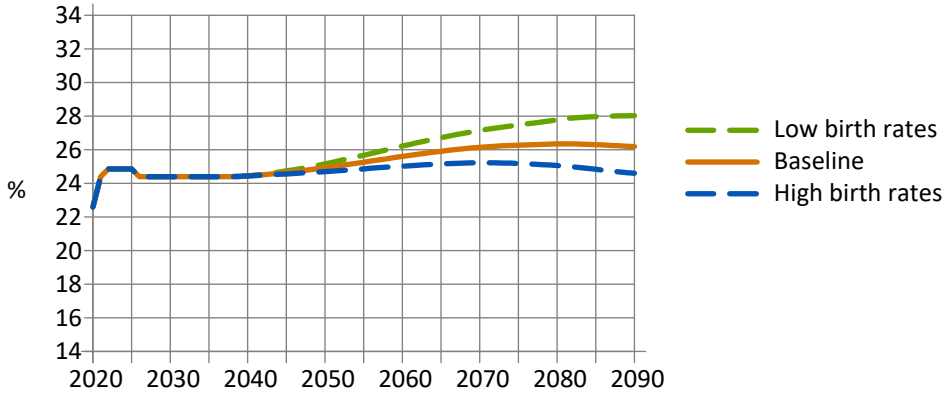


Table 6.5.
Sensitivity analysis, birth rates (at 2021 prices)

6.5.1. Pension recipients (1,000)

	2021	2025	2030	2040	2050	2070	2090
Baseline	1,505	1,523	1,572	1,576	1,585	1,701	1,692
Low birth rates	-	0	0	0	-1	-5	-21
High birth rates	-	0	0	0	1	5	21

6.5.2. Employed (1,000)

	2021	2025	2030	2040	2050	2070	2090
Baseline	2,390	2,439	2,435	2,423	2,389	2,256	2,080
Low birth rates	-	0	0	-2	-30	-106	-195
High birth rates	-	0	0	2	30	106	204

6.5.3. Average pension, €/month and relative to average earnings

	2021	2025	2030	2040	2050	2070	2090
€/month							
Baseline	1,784	1,844	1,907	2,031	2,195	2,681	3,277
Low birth rates	-	0	0	0	0	-5	-16
High birth rates	-	0	0	0	0	4	14
% of average earnings							
Baseline	52.1	54.9	53.9	51.0	49.0	47.5	45.8
Low birth rates	-	0.0	0.0	0.0	0.0	0.1	0.1
High birth rates	-	0.0	0.0	0.0	0.0	-0.1	-0.1

6.5.4. Total pension expenditure

	2021	2025	2030	2040	2050	2070	2090
billion euros							
Baseline	33.4	35.0	37.3	40.0	43.5	57.0	69.3
Low birth rates	-	0.0	0.0	0.0	0.0	-0.3	-1.2
High birth rates	-	0.0	0.0	0.0	0.0	0.3	1.2
% of GDP							
Baseline	13.2	13.5	13.6	13.0	12.7	13.9	14.4
Low birth rates	-	0.0	0.0	0.0	0.1	0.6	1.2
High birth rates	-	0.0	0.0	0.0	-0.1	-0.5	-1.1

6.5.5. Earnings-related pension expenditure, % of wage sum

	2021	2025	2030	2040	2050	2070	2090
TyEL							
Baseline	26.0	27.0	28.0	27.9	28.7	33.8	35.9
Low birth rates	-	0.0	0.0	0.0	0.4	1.6	3.4
High birth rates	-	0.0	0.0	0.0	-0.4	-1.5	-2.9
JuEL municipal							
Baseline	30.3	32.1	32.8	31.8	31.6	35.3	37.4
Low birth rates	-	0.0	0.0	0.0	0.4	1.7	3.4
High birth rates	-	0.0	0.0	0.0	-0.4	-1.6	-3.0

6.5.6. TyEL expenditure, contribution and assets relative to TyEL wage sum (%)

	2021	2025	2030	2040	2050	2070	2090
Contribution							
Baseline	24.4	24.9	24.4	24.4	24.9	26.1	26.2
Low birth rates	-	0.0	0.0	0.0	0.2	1.0	1.8
High birth rates	-	0.0	0.0	0.0	-0.2	-0.9	-1.6
Assets							
Baseline	252.1	243.1	242.7	258.3	291.9	348.6	365.0
Low birth rates	-	0.0	0.0	0.1	3.4	14.6	25.3
High birth rates	-	0.0	0.0	-0.1	-3.3	-13.3	-22.0

6.3 Growth in earnings

The growth in earnings level has varied across different periods. For example, in 2002–2011, the real earnings grew each year by 1.96 per cent on average. In 2012–2021, the annual growth was 0.65 per cent.

In the projections of the report, the earnings growth assumption follows from the labour cost growth assumption. In practice, this means that changes in the TyEL contribution slightly affect the growth in earnings. In most years, the effect is marginal. Below is a presentation of the growth in labour costs and earnings under various scenarios.

In the baseline projection, the annual real growth rate in earnings as of 2025 is 1.2 per cent. The assumptions concerning the growth in earnings-level and inflation for the early years of the projection period (2022–2024) are based on the short-term economic forecast drawn up at the Finnish Centre for Pensions in May 2022. In August 2022, the forecast was updated with the inflation outlook for 2022 and 2023.

- *In the slow growth projection*, the real growth rate in labour costs as of 2023 is 0.5 percentage points lower than in the baseline projection. In the long term, real labour costs thus grow by 0.7 per cent per year.
- *In the rapid growth projection*, the real growth rate in labour costs as of 2023 is 0.5 percentage points higher than in the baseline projection. In the long term, real labour costs thus grow by 1.7 per cent per year.

On average, during 2023–2090, earnings grow by 0.66 per cent in the slow growth projection, by 1.16 per cent in the baseline projection and by 1.66 per cent per year in the rapid growth projection. In the baseline projection, real earnings slightly more than double during the period 2023–2090. In the slow growth projection, they grow one and a half times, and in the rapid growth projection, they triple. The differences in the growth of earnings are directly reflected in the sum of earned income and GDP in the projection. The share of labour costs of GDP is equally large in all growth projections.

A rapid growth of earnings increases the purchasing power of pensions. In the baseline projection, the average pension in 2090 is 3,300 euros per month, while it is around 4,200 euros per month in the rapid growth projection (at 2021 prices).

Nevertheless, a rapid growth in earnings reduces the level of pensions in relation to the level of earnings since the earnings-related pension index and the wage coefficient follow the development of earnings only partly. Pensions paid by Kela also lag behind earnings since they follow the real changes in earnings only partly in the projection. The average pension in relation to average earnings is 3.5 percentage points below the baseline projection in 2090. The TyEL pension expenditure in relation to the wage sum is 2.5 percentage points below the baseline projection. (Table 6.7.)

The effect of the slow growth assumption is the opposite to that of the rapid growth assumption. In 2090, the average pension in the slow growth projection is approximately 2,600 euros per month. However, relative to average earnings, the average pension is 4.1 percentage points higher than in the baseline projection in 2090. The TyEL pension expenditure relative to the wage sum exceeds that of the baseline projection by 2.7 percentage points in 2090.

The growth in earnings has a significantly smaller impact on the TyEL contribution rate than on the expenditure rate. At the beginning, the slow growth in earnings raises the TyEL contribution level, but towards the end of the century, the direction of the effect reverses (Table 6.7). This is because of the interplay between pension assets, the level of investment returns and the growth rate of earnings.

The part of the return of the pension assets that exceeds the growth of the wage sum can be used to finance pensions without reducing the ratio of assets to the wage sum. As the earnings growth rate increases, a decreasing amount of investment returns is left to be used for the reduction of the contribution rate.

As a result, in a fully-funded scheme, a more rapid growth of earnings would increase the required contribution level. In a pure PAYG scheme, on the other hand, a more rapid growth in earnings would reduce the contribution and expenditure rates equally much.

In a partly funded scheme, a more rapid growth in earnings may increase or reduce the required contribution level. In this projection, the ratio of assets to wage sum grows so that the direction of the effect changes during the projection period.

Table 6.6.
Sufficient constant contribution under different growth assumptions

	TyEL	JuEL municipal	All earnings-related pensions
Baseline	25.3	26.2	27.8
Slow growth	0.2	0.1	0.5
Rapid growth	-0.2	-0.1	-0.5

Figure 6.7.
Statutory pension expenditure relative to GDP under different earnings growth assumptions

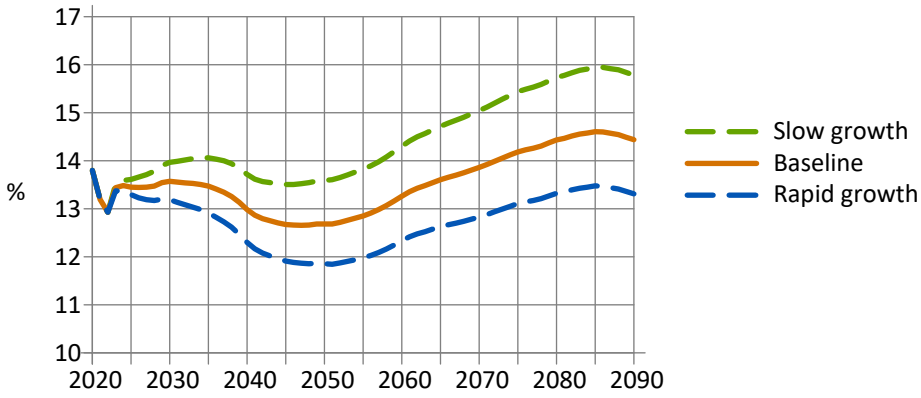


Figure 6.8.
Average pension relative to average earnings under different earnings growth assumptions

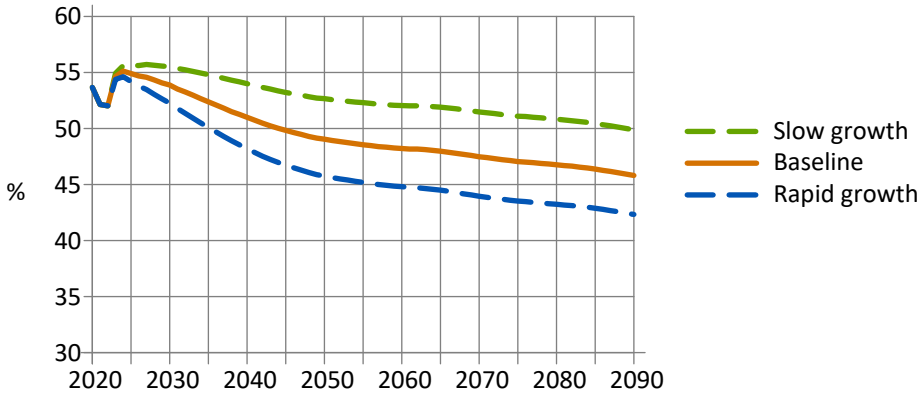


Figure 6.9.
TyEL contribution rate relative to TyEL wage sum under different earnings growth assumptions

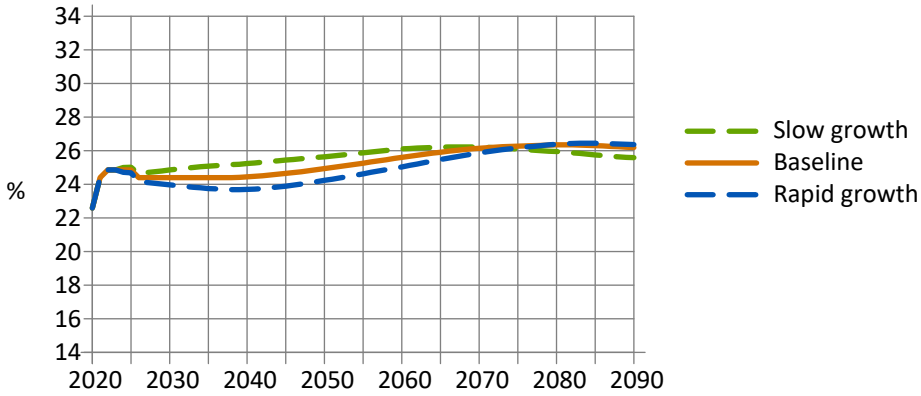


Table 6.7.
Sensitivity analysis, growth of earnings (at 2021 prices)

6.7.1. Pension recipients (1,000)

	2021	2025	2030	2040	2050	2070	2090
Baseline	1,505	1,523	1,572	1,576	1,585	1,701	1,692
Slow growth	-	-	-	-	-	-	-
Rapid growth	-	-	-	-	-	-	-

6.7.2. Employed (1,000)

	2021	2025	2030	2040	2050	2070	2090
Baseline	2,390	2,439	2,435	2,423	2,389	2,256	2,080
Slow growth	-	-	-	-	-	-	-
Rapid growth	-	-	-	-	-	-	-

6.7.3. Average pension, €/month and relative to average earnings

	2021	2025	2030	2040	2050	2070	2090
€/month							
Baseline	1,784	1,844	1,907	2,031	2,195	2,681	3,277
Slow growth	-	-4	-19	-69	-150	-392	-724
Rapid growth	-	4	20	72	164	469	955
% of average earnings							
Baseline	52.1	54.9	53.9	51.0	49.0	47.5	45.8
Slow growth	-	0.7	1.7	3.0	3.6	4.0	4.1
Rapid growth	-	-0.7	-1.6	-2.8	-3.3	-3.5	-3.5

6.7.4. Total pension expenditure

	2021	2025	2030	2040	2050	2070	2090
billion euros							
Baseline	33.4	35.0	37.3	40.0	43.5	57.0	69.3
Slow growth	-	-0.1	-0.4	-1,3	-2.9	-8.3	-15.2
Rapid growth	-	0.1	0.4	1.4	3.2	9.9	20.1
% of GDP							
Baseline	13.2	13.5	13.6	13.0	12.7	13.9	14.4
Slow growth	-	0.2	0.4	0.7	0.9	1.2	1.3
Rapid growth	-	-0.2	-0.4	-0.7	-0.8	-1.0	-1.1

6.7.5. Earnings-related pension expenditure, % of wage sum

	2021	2025	2030	2040	2050	2070	2090
TyEL							
Baseline	26.0	27.0	28.0	27.9	28.7	33.8	35.9
Slow growth	-	0.4	0.9	1.6	2.0	2.5	2.7
Rapid growth	-	-0.3	-0.8	-1.5	-1.8	-2.3	-2.5
JuEL municipal							
Baseline	30.3	32.1	32.8	31.8	31.6	35.3	37.4
Slow growth	-	0.4	1.0	1.9	2.2	2.6	2.8
Rapid growth	-	-0.4	-1.0	-1,7	-2.0	-2.4	-2.6

6.7.6. TyEL contribution and assets relative to TyEL wage sum (%)

	2021	2025	2030	2040	2050	2070	2090
Contribution							
Baseline	24.4	24.9	24.4	24.4	24.9	26.1	26.2
Slow growth	-	0.2	0.5	0.8	0.7	0.1	-0.6
Rapid growth	-	-0.2	-0.4	-0.8	-0.7	-0.3	0.2
Assets							
Baseline	252.1	243.1	242.7	258.3	291.9	348.6	365.0
Slow growth	-	3.4	8.6	19.0	29.4	48.5	54.5
Rapid growth	-	-3.3	-8.2	-17.4	-25.9	-40.7	-44.8

6.4 Employment

In the baseline projection, the employment rate exceeds 74 per cent in 2025 and settles as of the 2030s between 73.2 and 73.5 per cent. Employment rates are affected by assumptions regarding the levels of labour force flows and the level of unemployment.

- *In the low employment projection*, the employment rate is two percentage points lower than in the baseline projection.
- *In the high employment projection*, the employment rate is two percentage points higher than in the baseline projection.

In these scenarios, the number of employed gradually diverges from the baseline in 2023–2025. The number of employed changes at the same rate under all earnings-related pension acts and in all age and gender groups.

A two per cent change in the employment rate equals a change of slightly less than three per cent in the number of employed. At the end of 2025, the number of employed persons exceeds the baseline projection by around 66,000 in the high employment projection. In the low employment projection, the number of employed persons is around 66,000 below the baseline projection. As a result of the decreasing number of the working-age population, the gap will narrow throughout the projection period. At the end of the projection period, in 2090, the gap to the baseline projection will be around 57,000 persons.

In the high employment projection, the sum of earned income and GDP are on a higher level than in the baseline projection. As a result, pension expenditure relative to GDP is 0.3 percentage points lower than in the baseline projection in 2030. In the low employment projection, the ratio is 0.4 percentage points higher than in the baseline projection. (Table 6.9).

In the long run, pension expenditure will exceed that of the baseline projection as more pension accrues when the employment rate is higher. The ratio of pension expenditure to GDP under different employment rate assumptions deviates only slightly from that in the baseline projection in 2090. The employment growth will also reduce the TyEL contribution level for several decades. In the long run, however, the contribution returns to the level of the baseline projection.

The full impact of changes in employment on pensions is not seen until towards the end of the projection period. In 2090, the average pension at 2021 prices is 80 euros lower in the low employment projection and 82 euros higher in the high employment projection than in the baseline projection.

Table 6.8.
Sufficient constant contributions under different employment assumptions

	TyEL	JuEL municipal	All earnings-related pensions
Baseline	25.3	26.2	27.8
Low employment	0.2	0.2	0.3
High employment	-0.2	-0.2	-0.3

Figure 6.10.
Statutory pension expenditure relative to GDP under different employment assumptions

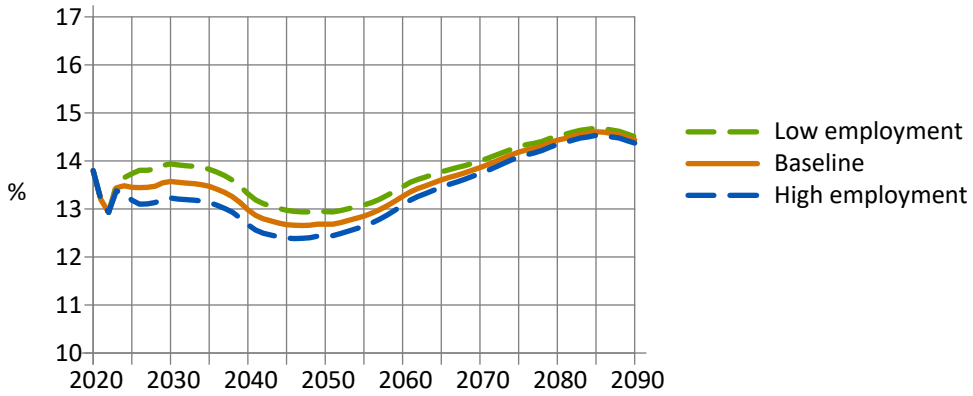


Figure 6.11.
Average pension relative to average earnings under different employment assumptions

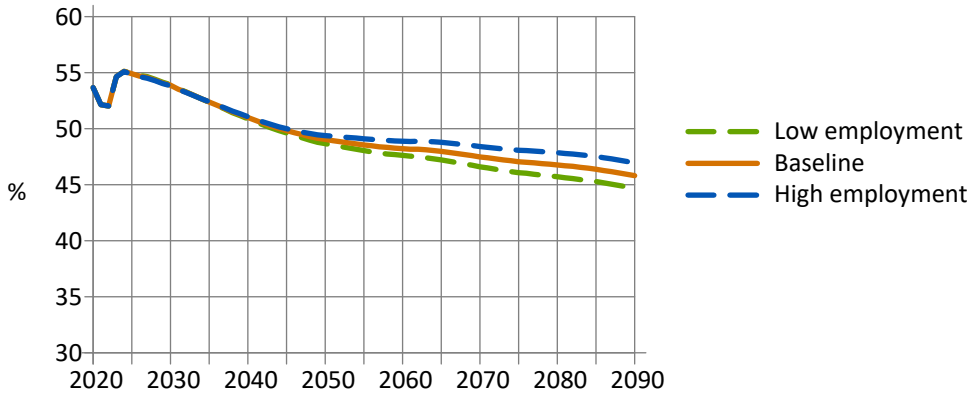


Figure 6.12.
TyEL contribution relative to TyEL wage sum under different employment assumptions

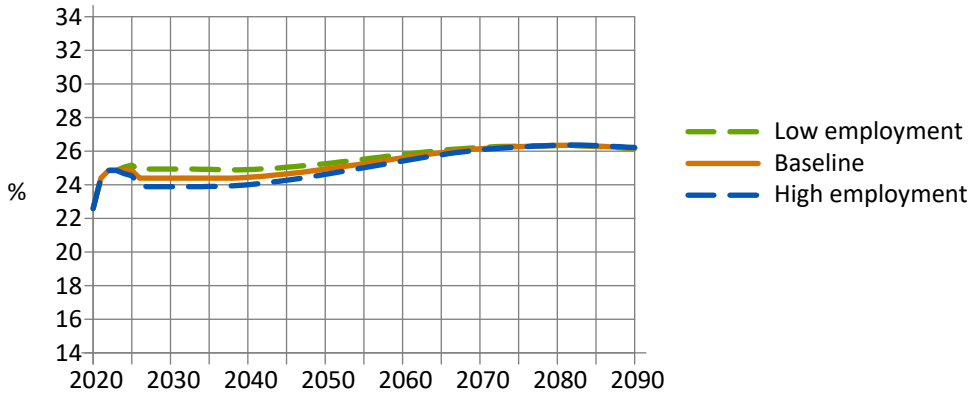


Table 6.9.
Sensitivity analysis, employment (at 2021 prices)

6.9.1. Pension recipients (1,000)

	2021	2025	2030	2040	2050	2070	2090
Baseline	1,505	1,523	1,572	1,576	1,585	1,701	1,692
Low employment	-	0	0	2	3	2	2
High employment	-	0	-1	-2	-1	-2	-3

6.9.2. Employed (1,000)

	2021	2025	2030	2040	2050	2070	2090
Baseline	2,390	2,439	2,435	2,423	2,389	2,256	2,080
Low employment	-	-66	-66	-66	-65	-62	-57
High employment	-	66	66	66	65	62	57

6.9.3. Average pension, €/month and relative to average earnings

	2021	2025	2030	2040	2050	2070	2090
€/month							
Baseline	1,784	1,844	1,907	2,031	2,195	2,681	3,277
Low employment	-	0	-1	-8	-20	-51	-80
High employment	-	0	1	8	19	54	82
% of average earnings							
Baseline	52.1	54.9	53.9	51.0	49.0	47.5	45.8
Low employment	-	0.0	0.1	-0.1	-0.4	-0.9	-1.1
High employment	-	0.0	0.0	0.1	0.3	0.9	1.1

6.9.4. Total pension expenditure

	2021	2025	2030	2040	2050	2070	2090
billion euros							
Baseline	33.4	35.0	37.3	40.0	43.5	57.0	69.3
Low employment	-	0.0	0.0	-0.1	-0.3	-1.0	-1.6
High employment	-	0.0	0.0	0.1	0.3	1.0	1.6
% of GDP							
Baseline	13.2	13.5	13.6	13.0	12.7	13.9	14.4
Low employment	-	0.3	0.4	0.3	0.3	0.1	0.1
High employment	-	-0.3	-0.3	-0.3	-0.2	-0.1	-0.1

6.9.5. Earnings-related pension expenditure, % of wage sum

	2021	2025	2030	2040	2050	2070	2090
TyEL							
Baseline	26.0	27.0	28.0	27.9	28.7	33.8	35.9
Low employment	-	0.6	0.8	0.7	0.6	0.2	0.0
High employment	-	-0.6	-0.8	-0.7	-0.5	-0.2	0.0
JuEL municipal							
Baseline	30.3	32.1	32.8	31.8	31.6	35.3	37.4
Low employment	-	0.8	0.9	0.8	0.5	0.2	0.0
High employment	-	-0.7	-0.9	-0.7	-0.5	-0.2	0.0

6.9.6. TyEL contribution and assets relative to TyEL wage sum (%)

	2021	2025	2030	2040	2050	2070	2090
Contribution							
Baseline	24.4	24.9	24.4	24.4	24.9	26.1	26.2
Low employment	-	0.3	0.5	0.5	0.3	0.1	0.0
High employment	-	-0.3	-0.5	-0.4	-0.3	-0.1	0.0
Assets							
Baseline	252.1	243.1	242.7	258.3	291.9	348.6	365.0
Low employment	-	5.2	5.9	5.0	3.8	1.7	0.4
High employment	-	-5.0	-5.6	-4.7	-3.6	-1.6	-0.4

6.5 Return on pension assets

In the baseline projection, the assumed real return on investments for the period 2023–2031 is 2.5 per cent per year, and 3.5 per cent as of 2032. The assumptions in the alternative projections are the following:

- *In the low return projection*, the real return assumption is 1.2 percentage points lower than in the baseline projection as of 2023.
- *In the high return projection*, the real return assumption is 1.2 percentage points higher than in the baseline projection as of 2023.

The return on pension assets has a major impact on the amount of TyEL assets and on the long-term development of the TyEL contribution rate. To begin with, the investment returns buffer pension providers' solvency capitals and the equity-linked buffer fund. After that, solvency allowing, part of the return is transferred to strengthen old-age pension funds and part of the return is divided between the policy holders as client bonuses. Assets are transferred from the equity-linked buffer fund to fund old-age pension liabilities if the equity linked buffer fund exceeds the upper limit determined for it in law. The paid client bonuses decrease the TyEL contribution immediately, and the additional funding of old-age pensions reduces the need to raise TyEL contributions in the future. When assets yield a weaker return, the client bonuses and the additional funding of old-age pensions are smaller, in which case the contributions must be increased.

In the baseline projection, the amount of assets relative to the wage sum grows throughout the projection period, which emphasises the role of the return of pension assets. In the high return projection, the additional return would allow the TyEL contribution rate to be steadily reduced by nearly 10 percentage points by 2090. The large difference to the baseline projection is explained by the growth in assets, which is due to higher investment returns, and to the fact that significant contribution decreases are made only in the latter half of the projection period. The realised return is known only afterwards, so the contribution decreases inevitably come with a delay. In the low return projection, the TyEL contribution must be increased, leading to a contribution that is 5.6 percentage points higher than that in the baseline projection at the end of the projection period. (Table 6.11.)

In the constant contribution projections, the amount of TyEL assets develops in a way that deviates from the projections presented above. That is also why the contribution effects are substantially different. A high return reduces the sufficient constant contribution rate under TyEL by 3.2 percentage points while a low return increases it by 3.9 percentage points. In the projection that covers all earnings-related pensions, both impacts are slightly smaller. (Table 6.10).

In the projection, the annual real growth in labour costs has been fixed at 1.2 per cent in the long run. As a result, the increases to the TyEL contribution slow down the growth in earnings, which is accelerated by decreases in the TyEL contribution. In the end, the return on pension assets is reflected this way in the wage sum and pension levels. In the high return projection, the TyEL wage sum is 4.1 per cent higher than in the baseline projection by 2090. The TyEL expenditure relative to the wage sum is 0.4 percentage points lower than in the baseline projection. In the low return projection, the TyEL contribution is 2.3 per cent lower than in the baseline projection while the ratio between TyEL pension expenditure and the wage sum is 0.2 per cent higher than in the baseline projection.

Relative to GDP, the pension expenditure in the low return projection is lower than in the baseline projection and higher in the high return projection. The labour costs relative to GDP has been assumed to be the same in the alternative projections as in the baseline projection. The sum of earned income, on the other hand, changes as the TyEL contribution changes.

Both in the baseline projection and in the alternative projections, the return on assets is assumed to develop evenly with no annual fluctuations. Uncertainty relating to investment returns and its effects on the financing of the TyEL scheme are discussed in Sankala et al. (2018).

Table 6.10.
Sufficient constant contributions under different return assumptions

	TyEL	JuEL municipal	All earnings-related pensions
Baseline	25.3	26.2	27.8
Low return	3.9	4.5	3.5
High return	-3.2	-3.8	-2.9

Figure 6.13.
Statutory pension expenditure relative to GDP under different return assumptions

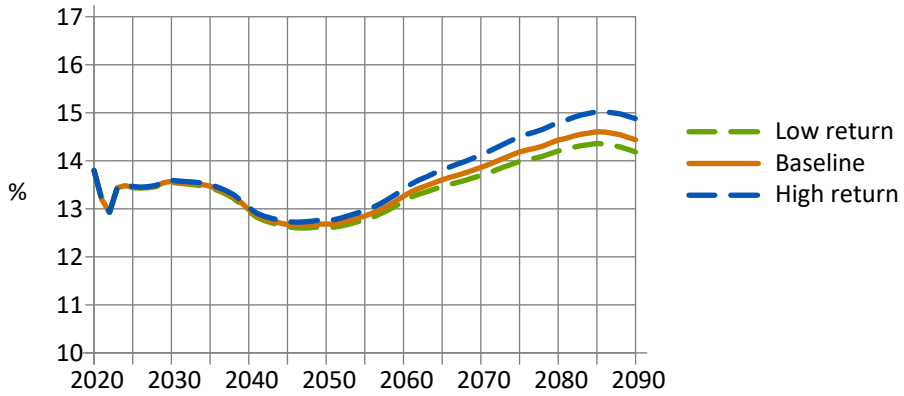


Figure 6.14.
Average pension relative to average earnings under different return assumptions

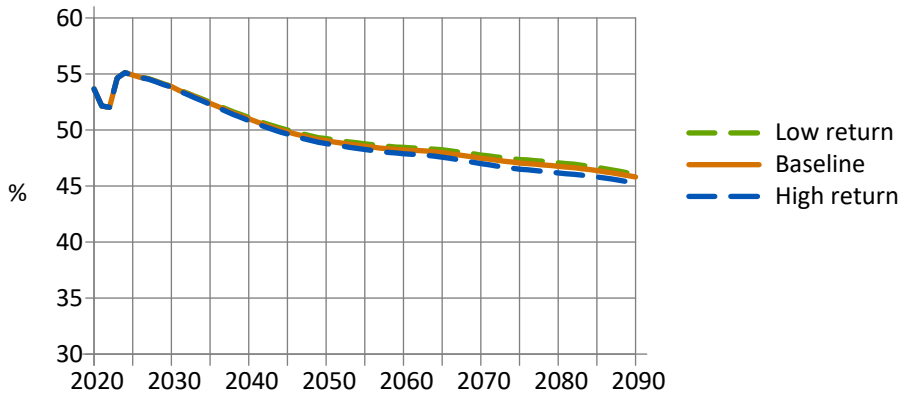


Figure 6.15.
TyEL contribution relative to TyEL wage sum under different return assumptions

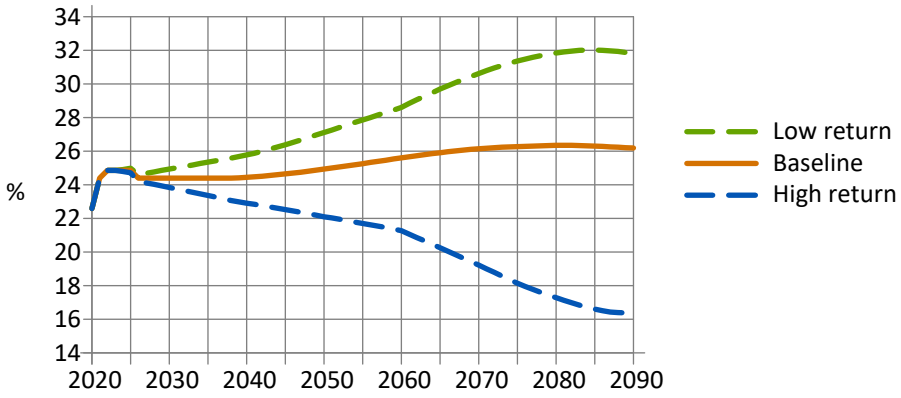


Table 6.11.
Sensitivity analysis, return on investments (at 2021 prices)

6.11.1. Pension recipients (1,000)

	2021	2025	2030	2040	2050	2070	2090
Baseline	1,505	1,523	1,572	1,576	1,585	1,701	1,692
Low return	-	-	-	-	-	-	-
High return	-	-	-	-	-	-	-

6.11.2. Employed (1,000)

	2021	2025	2030	2040	2050	2070	2090
Baseline	2,390	2,439	2,435	2,423	2,389	2,256	2,080
Low return	-	-	-	-	-	-	-
High return	-	-	-	-	-	-	-

6.11.3. Average pension, €/month and relative to average earnings

	2021	2025	2030	2040	2050	2070	2090
€/month							
Baseline	1,784	1,844	1,907	2,031	2,195	2,681	3,277
Low return	-	0	0	-3	-7	-26	-58
High return	-	0	0	3	9	37	97
% of average earnings							
Baseline	52.1	54.9	53.9	51.0	49.0	47.5	45.8
Low return	-	0.0	0.0	0.1	0.2	0.3	0.2
High return	-	0.0	0.0	-0.2	-0.2	-0.5	-0.5

6.11.4. Total pension expenditure

	2021	2025	2030	2040	2050	2070	2090
billion euros							
Baseline	33.4	35.0	37.3	40.0	43.5	57.0	69.3
Low return	-	0.0	0.0	-0.1	-0.1	-0.5	-1.2
High return	-	0.0	0.0	0.1	0.2	0.8	2.0
% of GDP							
Baseline	13.2	13.5	13.6	13.0	12.7	13.9	14.4
Low return	-	0.0	0.0	0.0	-0.1	-0.2	-0.3
High return	-	0.0	0.0	0.0	0.1	0.3	0.4

6.11.5. Earnings-related pension expenditure, % of wage sum

	2021	2025	2030	2040	2050	2070	2090
TyEL							
Baseline	26.0	27.0	28.0	27.9	28.7	33.8	35.9
Low return	-	0.0	0.0	0.1	0.1	0.2	0.2
High return	-	0.0	0.0	-0.1	-0.1	-0.3	-0.4
JuEL municipal							
Baseline	30.3	32.1	32.8	31.8	31.6	35.3	37.4
Low return	-	0.0	0.0	0.1	0.1	0.2	0.2
High return	-	0.0	0.0	-0.1	-0.2	-0.4	-0.4

6.11.6. TyEL contribution and assets relative to TyEL wage sum (%)

	2021	2025	2030	2040	2050	2070	2090
Contribution							
Baseline	24.4	24.9	24.4	24.4	24.9	26.1	26.2
Low return	-	0.1	0.5	1.3	2.2	4.5	5.6
High return	-	-0.1	-0.6	-1.5	-2.8	-6.9	-9.8
Assets							
Baseline	252.1	243.1	242.7	258.3	291.9	348.6	365.0
Low return	-	-8.4	-20.8	-42.7	-62.4	-93.0	-94.0
High return	-	8.6	22.6	51.8	83.6	143.6	155.9

6.6 Combined scenarios

The optimistic economic scenario combines the following projections discussed earlier: rapid earnings growth, high employment and high investment returns. The pessimistic economic scenario combines slow earnings growth, low employment and low investment returns.

In the optimistic economic scenario, the high employment rate and rapidly growing earnings improve the sum of earned income and accrued pensions. The average pension exceeds that in the baseline projection by 36 per cent by 2090. The statutory pension expenditure exceeds that in the baseline projection by nearly as much. The earnings level and the sum of earned income grow faster than the pension expenditure. The TyEL expenditure relative to wage sum ends up nearly three percentage points

below that of the baseline projection. Relative to GDP, the pension expenditure ends up a level that is nearly one percentage point below that of the baseline projection. As a result of the lower expenditure ratio and the higher investment returns, the TyEL contribution decreases from its present value and ends up 7.5 percentage points below that in the baseline projection. (Figure 6.18 and Table 6.13).

In the pessimistic economic scenario, the average pension and statutory pension expenditure end up around one quarter below that in the baseline scenario by 2090. However, the growth in earnings and in the sum of earned income lag behind the growth in pension expenditure, so the ratio of the pension expenditure to GDP will grow to 1.1 percentage points higher than in the baseline projection. The TyEL pension expenditure relative to the wage sum exceeds that of the baseline projection by around three percentage points. The TyEL contribution rate will start to rise steadily already in the near future and be 6.4 percentage points higher than in the baseline projection by 2090.

The differences between the optimistic and pessimistic scenarios and the baseline projection deviate only slightly from the sum of the effects of the sensitivity analyses on earnings, employment and investment returns, except for the effect on the TyEL contribution. In the pessimistic scenario, the TyEL contribution is 6.4 percentage points above the baseline projection in 2090. Calculated as a sum of the separate alternative projections, the TyEL contribution rate would be 5.0 percentage points above the baseline projection. The difference is mainly due to the joint effect of the low return and slow earnings growth assumptions. When the pension assets are smaller due to the low return on investments, the focus in the financing of pensions shifts towards a PAYG system. This makes the growth in earnings increasingly important in the financing of pensions.

In the optimistic scenario, the TyEL contribution rate is 7.5 percentage points below the baseline projection in 2090. Calculated as a sum of the separate alternative projections, the contribution rate would be 9.6 percentage points below the baseline projection. When the pension assets exceed those in the baseline projection due to the high investment returns, the focus in the financing of pensions shifts towards the funds. In that case, the more rapid growth in earnings is not as beneficial as with the lower return in the baseline projection. Instead, the effect of the rapid growth in earnings is to raise the TyEL contribution level as of the 2060s.

Table 6.12.
Sufficient constant contributions under different scenarios

	TyEL	JuEL municipal	All earnings-related pensions
Baseline	25.3	26.2	27.8
Pessimistic	4.3	4.8	4.3
Optimistic	-3.6	-4.0	-3.6

Figure 6.16.
Statutory pension expenditure relative to GDP under different scenarios

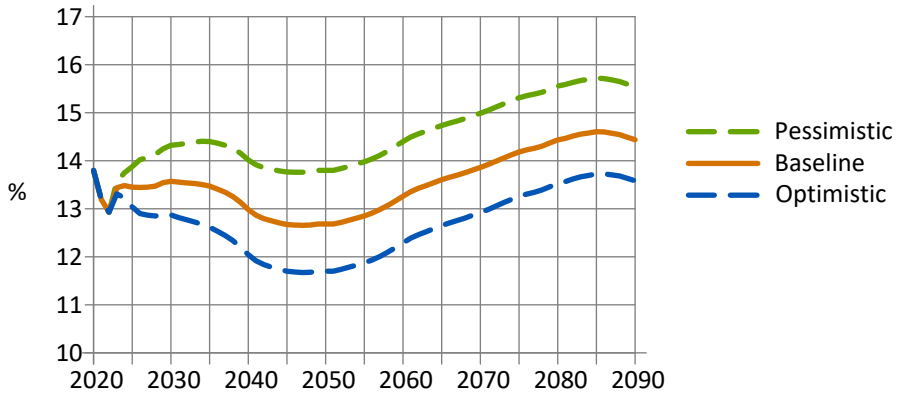


Figure 6.17.
Average pension relative to average earnings under different scenarios

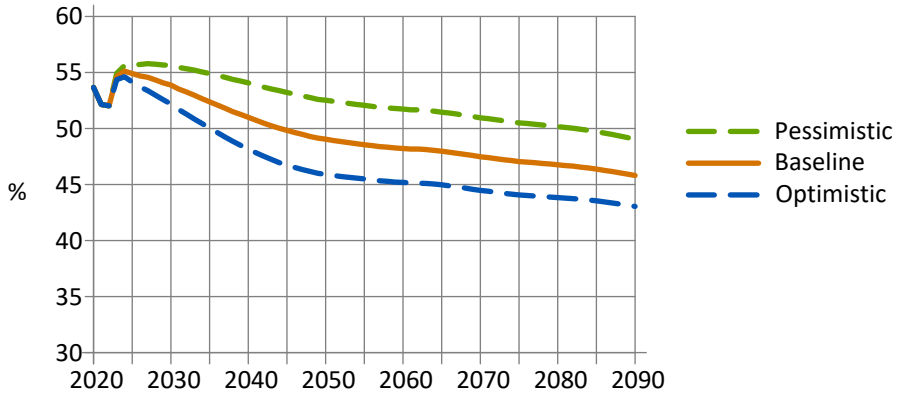


Figure 6.18.
TyEL contribution relative to TyEL wage sum under different scenarios

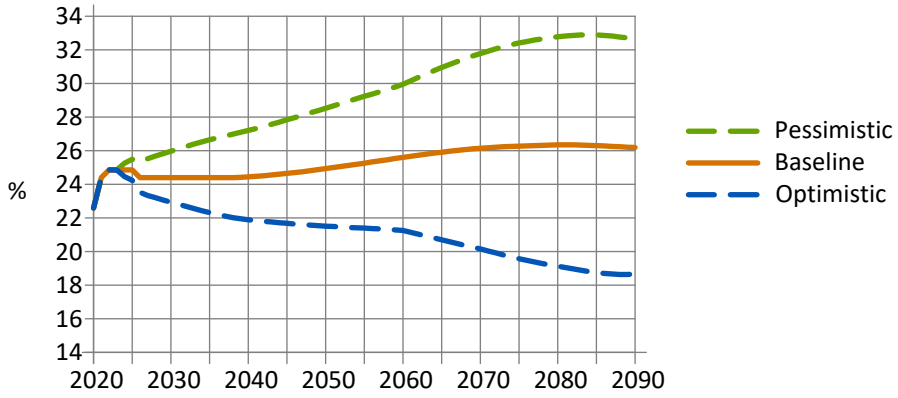


Table 6.13.
Sensitivity analysis, pessimistic and optimistic economic development (at 2021 prices)

6.13.1. Pension recipients (1,000)

	2021	2025	2030	2040	2050	2070	2090
Baseline	1,505	1,523	1,572	1,576	1,585	1,701	1,692
Pessimistic	-	0	0	2	3	2	2
Optimistic	-	0	-1	-2	-1	-2	-3

6.13.2. Employed (1,000)

	2021	2025	2030	2040	2050	2070	2090
Baseline	2,390	2,439	2,435	2,423	2,389	2,256	2,080
Pessimistic	-	-66	-66	-66	-65	-62	-57
Optimistic	-	66	66	66	65	62	57

6.13.3. Average pension, €/month and relative to average earnings

	2021	2025	2030	2040	2050	2070	2090
€/month							
Baseline	1,784	1,844	1,907	2,031	2,195	2,681	3,277
Pessimistic	-	-4	-21	-79	-175	-459	-836
Optimistic	-	4	22	83	193	571	1,167
% of average earnings							
Baseline	52.1	54.9	53.9	51.0	49.0	47.5	45.8
Pessimistic	-	0.8	1.8	3.1	3.5	3.5	3.3
Optimistic	-	-0.7	-1,7	-2.8	-3,1	-3.0	-2.7

6.13.4. Total pension expenditure

	2021	2025	2030	2040	2050	2070	2090
billion euros							
Baseline	33.4	35.0	37.3	40.0	43.5	57.0	69.3
Pessimistic	-	-0.1	-0.4	-1.5	-3.3	-9,6	-17.5
Optimistic	-	0.1	0.4	1.6	3.7	11.9	24.3
% of GDP							
Baseline	13.2	13.5	13.6	13.0	12.7	13.9	14.4
Pessimistic	-	0.4	0.7	1.0	1.1	1.1	1.1
Optimistic	-	-0.4	-0.7	-0.9	-1.0	-0.9	-0.9

6.13.5. Earnings-related pension expenditure, % of wage sum

	2021	2025	2030	2040	2050	2070	2090
TyEL							
Baseline	26.0	27.0	28.0	27.9	28.7	33.8	35.9
Pessimistic	-	1.0	1.7	2.4	2.7	3.0	3.0
Optimistic	-	-0.9	-1.6	-2,2	-2.4	-2.7	-2.8
JuEL municipal							
Baseline	30.3	32.1	32.8	31.8	31.6	35.3	37.4
Pessimistic	-	1.2	2.0	2.8	3.0	3.1	3.1
Optimistic	-	-1.1	-1.8	-2.5	-2.6	-2.8	-2.9

6.13.6. TyEL contribution and assets relative to TyEL wage sum (%)

	2021	2025	2030	2040	2050	2070	2090
Contribution							
Baseline	24.4	24.9	24.4	24.4	24.9	26.1	26.2
Pessimistic	-	0.6	1.6	2.8	3.6	5.6	6.4
Optimistic	-	-0.6	-1.5	-2.6	-3.4	-6.0	-7.5
Assets							
Baseline	252.1	243.1	242.7	258.3	291.9	348.6	365.0
Pessimistic	-	0.0	-7.4	-23.0	-37.9	-60.6	-59.5
Optimistic	-	0.0	7.6	25.0	43.8	77.9	81.9

7 Comparison with previous report

In this section, we compare the results of this report with the previous report *Statutory pensions – Long-term Projections 2019* (Tikanmäki et al. 2019).

7.1 Population projection and life expectancy coefficient

The main difference between the population projection of this report and of the previous one relates to the mortality rate. The assumptions regarding the total fertility rate and net immigration have not changed. In 2022, life expectancy is assumed to be 16 months lower than in the 2019 projection. However, the exceptionally high mortality rate is assumed to be temporary. In 2023, the difference in life expectancy is only eight months. The difference decreases throughout the projection period. In 2090, it is only around one month.

The old-age dependency ratio grows at a slightly slower pace in this projection than in the previous one. In 2085, for one hundred working-age people there is around one less person aged 65 or over than assumed in the 2019 projection. (Table 7.1).

Table 7.1.
Population forecasts in the 2022 and 2019 projections

	Realised	2022 projection			2019 projection		
	2021	2025	2045	2085	2025	2045	2085
Total fertility	1.46	1.45	1.45	1.45	1.45	1.45	1.45
Net migration (1,000)	22.9	15.0	15.0	15.0	15.0	15.0	15.0
Life expectancy at birth	81.8	82.7	86.3	90.7	83.4	86.8	90.8
Life expectancy at age 65	20.3	21.0	23.6	27.0	21.4	23.9	26.9
Population (1,000)							
Total	5,548	5,571	5,548	5,164	5,587	5,571	5,146
under 15-year-olds	852	809	729	596	812	724	586
15–64-year-olds	3,417	3,409	3,299	2,769	3,406	3,299	2,746
65 years and over	1,279	1,353	1,521	1,798	1,369	1,549	1,815
Old-age dependency ratio, %	37.4	39.7	46.1	64.9	40.2	46.9	66.1

In connection with the 2017 pension reform, the retirement age was linked to the rise in life expectancy so that the development of the mortality rate is compared to that in 2020–2024. During this period, life expectancy is at a clearly lower level than previously assumed, but in the future, it will grow at a more rapid pace. For this reason, the retirement age in the projection of this report will be seven months higher in 2085 than in the previous projection. This phenomenon is also discussed in Appendix 2. As a result of the lower life expectancy and the higher retirement age, the life expectancy coefficient is higher, that is, its cutting effect is smaller, than in the 2019 projection. The difference in the life expectancy coefficient compared to the previous report is at most 0.02 for those born in 1965. For cohorts born later, the difference is smaller. (Table 7.2).

Table 7.2.
Retirement age and life expectancy coefficient in the 2022 and 2019 projections, by year of birth

Year of birth	Retirement age		Life expectancy coefficient	
	2022 projection	2019 projection	2022 projection	2019 projection
1955	63 yrs 3 mos	63 yrs 3 mos	0.963	0.963
1960	64 yrs 6 mos	64 yrs 6 mos	0.947	0.942
1965	65 yrs 2 mos	65 yrs 2 mos	0.939	0.919
1970	65 yrs 10 mos	65 yrs 8 mos	0.927	0.909
1975	66 yrs 4 mos	66 yrs 2 mos	0.916	0.901
1980	66 yrs 10 mos	66 yrs 8 mos	0.908	0.894
1985	67 yrs 4 mos	67 yrs 1 mo.	0.900	0.886
1990	67 yrs 9 mos	67 yrs 5 mos	0.892	0.877
1995	68 yrs 2 mos	67 yrs 10 mos	0.884	0.872
2000	68 yrs 7 mos	68 yrs 2 mos	0.879	0.866

7.2 Retirement and employment

The expected effective retirement age depicts the level of retirement rates in different years in a similar way as life expectancy depicts mortality rates. In 2019–2021, the expected effective retirement age has risen at a more rapid pace than assumed in the 2019 projection. In 2021, the expected effective retirement age was 62.4 years; in the projection, it was assumed that this level would not be reached until 2025. Until 2050, the expected effective retirement age is around four months higher than in the previous projection, with the gap growing to 10 months towards the end of the century. The higher expected effective retirement age is mainly caused by the realised development of retirement rates and by the fact that the effect of the rising retirement age on the disability risk is assumed to be more moderate than in the previous projection. (Table 7.3).

The number of pension recipients is lower in this report's projection compared to that in the previous projection. The difference will grow to around 60,000 pension recipients in the 2030s and stabilize at that level. The reasons underlying the differences include the smaller number of older people, a higher old-age retirement age and lower retirement rates. (Table 7.3).

The employment rate is higher throughout the projection period than in the 2019 report. As of the beginning of 2021, Statistics Finland reformed the data content and data collection model of its Labour Force Survey. As a result of the reform, the level of the realised employment rate also changed. That is why the employment rate that is in line with the previous report has been adjusted and made comparable with the figures of the present projection.

In the long run, the employment rate will settle at 0.5 percentage points higher than the previous projection (Table 7.3). This is explained by, among other things, a higher retirement age. In addition, a more moderate assumption of the development of the disability risk of those who have turned 63 years increases employment. By 2085, the unemployment rate will rise in the new projection to 0.5 percentage points higher than in the 2019 projection.

By 2027, the difference in the number of employed persons will grow to 61,000 persons compared to the previous projection. The gap will narrow to 35,000 persons in the 2030s, after which it will start to grow steadily again. In 2085, the number of employed persons is 85,000, that is, four per cent, higher than in the 2019 projection. The difference is due both to the higher employment rate and the larger working-age population.

Table 7.3.
Employment, retirement and number of pension recipients in 2022 and 2019 projections

	Realised	2022 projection			2019 projection		
	2021	2025	2045	2085	2025	2045	2085
Expected effective retirement age, 25-year-olds	62.4	62.7	64.5	66.3	62.5	64.1	65.4
Pension recipients (1,000)	1,506	1,523	1,575	1,720	1,559	1,634	1,777
Employment rate (%)	72.3	74.1	73.4	73.3	72.4	72.4	72.8
Employed (1,000)	2,390	2,439	2,413	2,112	2,396	2,363	2,027
TyEL	1,548	1,596	1,608	1,407	1,605	1,620	1,392
Private sector	1,824	1,870	1,861	1,628	1,867	1,862	1,599
Public sector	669	674	656	574	645	616	526
Pension recipients/employed	0.63	0.62	0.65	0.81	0.65	0.69	0.88

7.3 Pension expenditure and average benefits

The statutory pension expenditure relative to GDP is higher until the 2070s than presented in the 2019 projections. This is mainly due to the lower real growth assumption of the earnings level. The ratio is lower than in the previous projection as of the 2070s. This is due to the lower retirement rates, the lower level of the sum of earned income relative to GDP and the reform of survivors' pensions. (Table 7.4 and Figure 7.1).

The earnings-related pension expenditure relative to the sum of earned income will exceed the level in the 2019 projection by 1.1 percentage points by 2045. After 2045, the growth in pension expenditure is curbed by slower growth in the number of pensioners relative to the number of working people. In 2085, the expenditure ratio is 0.2 percentage points higher than in the previous projection. (Table 7.4 and Figure 7.3).

As of 2025, the annual real growth in earnings level is slightly more than 0.3 percentage points slower than in the 2019 projection. As a result, the ratio between the average pension and the average earnings is higher than in the previous projection throughout the projection period. In addition, the higher life expectancy coefficient and the higher retirement age increase the ratio. The difference grows to more than two percentage points already in 2023 due to exceptionally high index increases. By 2045, the difference grows to 4.3 percentage points, after which it will gently decrease. (Table 7.4 and Figure 7.2).

Table 7.4.
Pension expenditure and average benefits in the 2022 and 2019 projections

7.4.1. Pension expenditure relative to GDP (%)

	Realised	2022 projection			2019 projection		
	2021	2025	2045	2085	2025	2045	2085
Total	13.2	13.5	12.7	14.6	13.3	12.4	14.8
Earnings-related pensions	12.0	12.4	11.7	13.9	12.3	11.5	14.1
Pensions paid by Kela	1.0	0.9	0.8	0.5	0.8	0.7	0.5
Special provision pensions*	0.2	0.2	0.2	0.2	0.2	0.2	0.2

* The 2021 pension expenditure of special pensions is an estimate.

7.4.2. Earnings-related pension expenditure relative to sum of earned income (%)

	Realised	2022 projection			2019 projection		
	2021	2025	2045	2085	2025	2045	2085
Total	31.5	32.8	31.3	37.3	32.5	30.3	37.1
TyEL	26.0	27.0	27.9	36.3	27.0	27.0	36.3
Private sector	27.5	28.6	28.8	36.2	28.2	27.7	36.3
Public sector	42.0	44.0	37.5	37.1	44.3	37.0	36.7

7.4.3. Average pension relative to average earnings (%)

	Realised	2022 projection			2019 projection		
	2021	2025	2045	2085	2025	2045	2085
Ratio	52.1	54.9	49.8	46.4	52.0	45.5	42.8

Figure 7.1.
Statutory pension expenditure relative to GDP 2010–2090

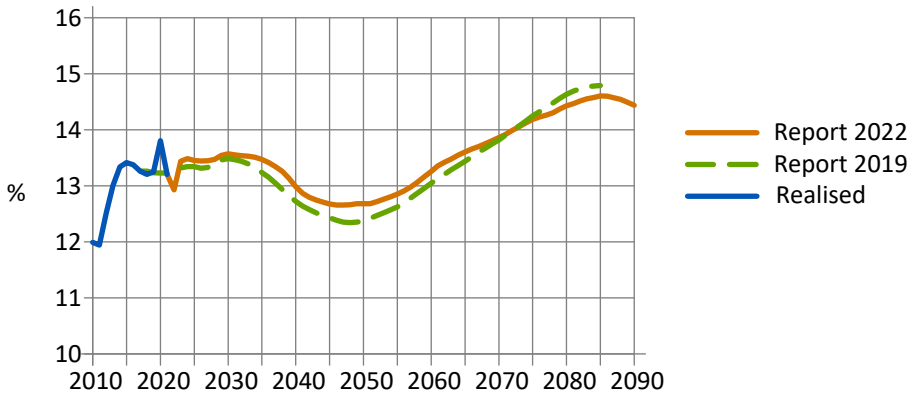


Figure 7.2.
Average pension relative to average earnings 2010–2090

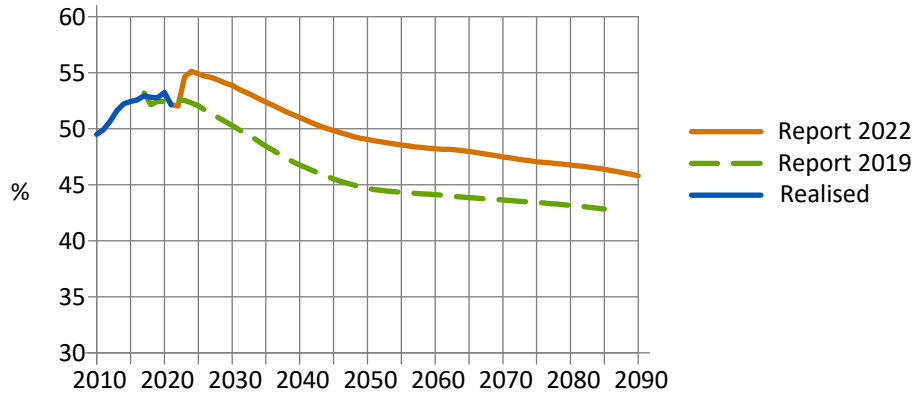
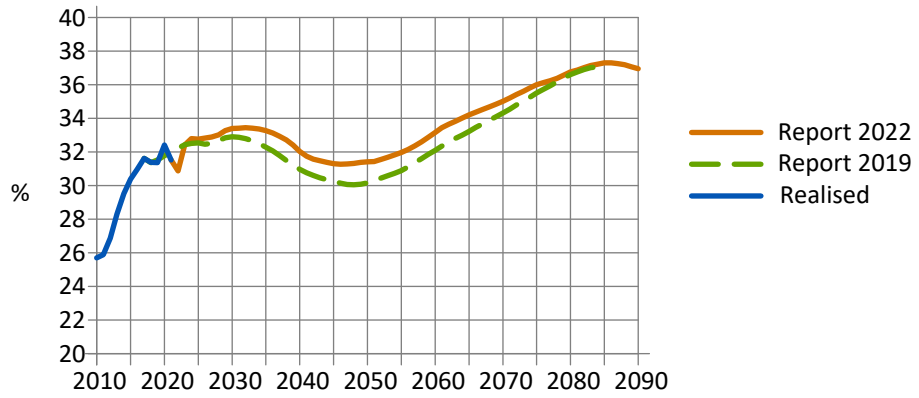


Figure 7.3.
Earnings-related pension expenditure relative to sum of earned income 2010–2090, all earnings-related pensions



7.4 Financing of TyEL pensions

In this report, the TyEL pension expenditure relative to the TyEL wage sum will be at a higher level throughout most of the projection period than projected in 2019. The ratio will exceed that in the previous report in 2026 due to the slower growth of the earnings level. However, the difference will start to decrease as of the 2060s due to the slower growth in the number of pensioners than projected in 2019. (Figure 7.4).

Since 2019, the real return of TyEL assets has been nearly four percentage points higher, on average, than projected. On the other hand, the estimated return based on the preliminary data for 2022 and the assumed return for 2029–2031 are lower than in the 2019 projection. The long-term real return assumption after 2031 is 3.5 per cent in both reports.

Because of the higher realised return, the TyEL assets relative to the TyEL wage sum are 43 percentage points higher at year-end 2021 than in the previous projection. In addition, the real pension expenditure is smaller than in the previous projection

due to the slower growth in earnings. These factors mean that there is more leeway in TyEL funding. There is pressure to raise the TyEL contribution in the long run, but considerably less so than in the 2019 projection. In the previous projection, the TyEL contribution rose to 30.1 per cent by 2085. In the present projection, it is 3.8 percentage points lower (26.3%). Despite the lower contribution level, the ratio of the TyEL assets to the TyEL wage sum is higher at the end of the projection period than in the previous projection. (Figures 7.5 and 7.6).

The ratio of assets to pension expenditure was 177 percentage points higher in 2021 than assessed in the 2019 projection. The difference varies throughout the projection period, but the assets exceed those in the previous projection by an amount that equals more than one year of pension expenditure in each year of the projection period. At most, the difference equals nearly the amount of two years of pension expenditure. (Figure 7.7).

Currently, the additional funding of old-age pensions is targeted to those who have turned 55. In the previous projection, the targeting was done as of 2025 to those who have turned 65. In the present projection, there is more leeway in funding. To stabilise the development of the contribution rate, the additional funding of old-age pensions is targeted at those who have turned 45 years in 2025–2059 and to those who have turned 65 years as of 2060.

Table 7.5.
TyEL expenditure, contributions and assets relative to wage sum, and assets relative to expenditure in the 2022 and 2019 projections (%)

	Realised	2022 projection			2019 projection		
	2021	2025	2045	2085	2025	2045	2085
TyEL expenditure	26.0	27.0	27.9	36.3	27.0	27.0	36.3
TyEL contribution	24.4	24.9	24.6	26.3	24.5	24.5	30.1
TyEL assets	252.1	243.1	273.2	365.5	205.8	221.9	308.6
Assets/expenditure	971.0	900.0	979.7	1,008.2	761.8	822.5	849.9

Figure 7.4.
TyEL expenditure relative to wage sum 2010–2090

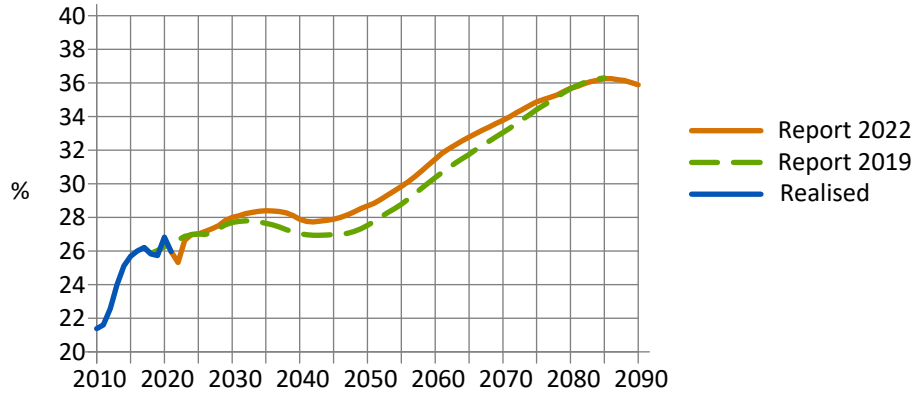


Figure 7.5.
TyEL contribution relative to wage sum 2010–2090

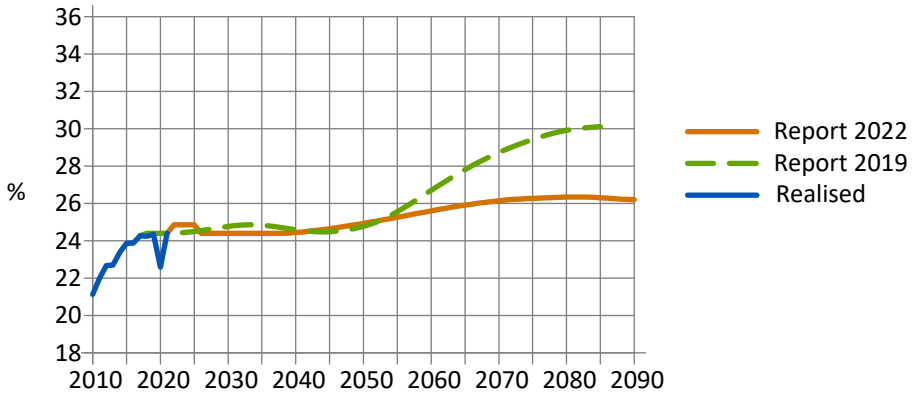


Figure 7.6.
TyEL assets relative to wage sum 2010–2090

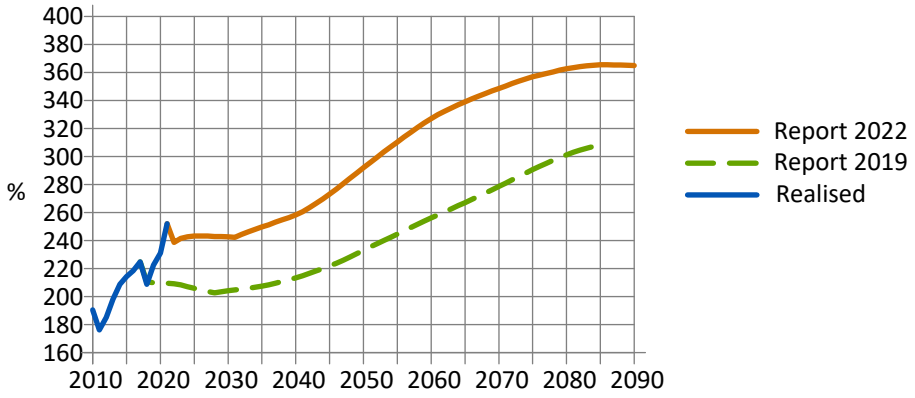
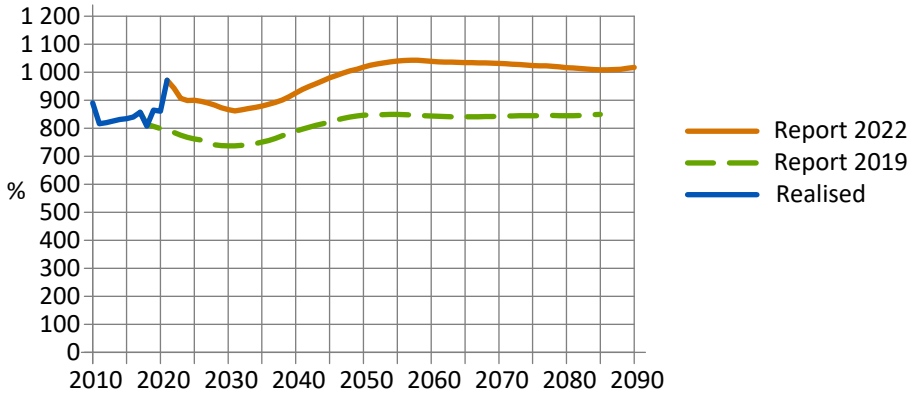


Figure 7.7.
TyEL assets relative to TyEL pension expenditure 2010–2090



7.5 Supplementary analyses of earnings-related pension financing

Sufficient constant contribution

According to the 2019 long-term projection, a sufficient constant contribution for the whole earnings-related pension scheme was 29.0 per cent. In the present projection, it is 27.8 per cent. The level of the sufficient constant contribution is reduced compared to the previous projection by, among other things, improved investment returns for 2019–2021, a lower number of pensioners, an improved employment rate and the reform of survivors' pensions. The slower earnings growth assumption has a minor increasing effect on the constant contribution.

The sufficient constant contribution rates of TYEL and JuEL municipal pensions are also lower in the present than in the previous projection. In the 2019 projection, the sufficient constant TyEL contribution was 26.7 per cent. In the present projection, it is 25.3 per cent. The constant contribution for JuEL municipal pensions was 27.6 per cent in the 2019 projection and 26.2 per cent in the present projection.

The change in the scheme-specific constant contributions is largely explained by the same factors as those in the change in the constant contribution projected for all earnings-related pensions. The difference to the previous projection is slightly larger in the constant contributions under TyEL and JuEL municipal pensions than in the constant contribution across sectors because these schemes have more pension assets for which the return has been better than previously assumed.

Internal rate of return, TyEL

In the 2019 long-term projection, the TyEL internal rate of return of the younger generations settled at approximately 2.1 per cent. In the present projection, it is at 1.8 per cent. The lower return of the present projection is mainly a result of the lower real growth in the earnings level. In addition, the reform of the survivors' pensions reduces the internal return received by women born in 1975 or later.

In addition, the pension expenditure data used in assessing the internal rate of return has been improved as of data year 2005. This increases the internal rate of return of people born in the early 1950s or earlier by around 0.1 percentage points compared to the 2019 projection.

References

Arinen, P. & Suhonen, A. (2022) Institutionaalisten sijoittajien pitkän aikavälin tuotto-odotukset (Institutional investors' long-term return expectations, English summary). Finnish Centre for Pensions, Reports 04/2022.

Burniaux, J.-M. & Romain, D. & Jaumotte, F. (2004) Coping with Ageing: A Dynamic Approach to Quantify the Impact of Alternative Policy Options on Future Labour Supply in OECD Countries. OECD Economics Department Working Papers 371, OECD Publishing.

Pension legislation. Finlex, http://www.finlex.fi. Referred to on 15 September 2022.

The European Central Bank (2021) The Governing Council of the European Central Bank's (ECB) new monetary policy strategy. https://www.ecb.europa.eu/press/pr/date/2021/html/ecb.pr210708~dc78cc4b0d.en.html Referred to on 16 September 2022.

European Commission (2020) The 2021 Ageing Report: Underlying Assumptions and Projection Methodologies.

Guillemette, Y. & Turner, D. (2021) The long game: Fiscal outlooks to 2060 underline need for structural reform. OECD Economic Policy Papers 29, OECD Publishing. https://doi.org/10.1787/a112307e-en. Referred to on 20 April 2022.

International Actuarial Association (2013) International Standard of Actuarial Practice 2: Financial Analysis of Social Security Programs.

Kela (2015), Kelan hoitama sosiaaliturva 2014–2080. Kelan aktuaarijulkaisuja 11, 2015.

Kela (2021) Kelan tilastollinen vuosikirja 2020.

Kautto, M. and Risku, I. (eds.) (2015) Laskelmia vuoden 2017 työeläkeuudistuksen vaikutuksista (Projections on the effects of the 2017 earnings-related pension reform, English summary). Finnish Centre for Pensions, Reports 02/2015.

Kesälä, M. (2017) Eläketurvakeskuksen pitkän aikavälin laskelmat jälkikäteen arvioituna (Finnish Centre for Pensions' long-term projections: how they compare with actual outcomes, English summary). Finnish Centre for Pensions, Reports 05/2017.

Keva (2022) Toimintakertomus 2021. https://www.keva.fi/tama-on-keva/tulostiedot/. Referred to on 15 September 2022.

Kokkinen, A. & Obstbaum, M. & Mäki-Fränti, P. (2021) Bank of Finland's Long-Run Forecast Framework with Human Capital. Bank of Finland Economics Review 10/2021.

Koskinen, L. (2019) Arviointi Eläketurvakeskuksen vuoden 2019 pitkän aikavälin ennustelaskelmaraportista. https://www.etk.fi/wp-content/uploads/2020/03/PTS-2019-Arvio-Koskinen.pdf. Referred to on 15 September 2022.

Kujanpää, J. & Hietaniemi, M. (2021) Työeläkkeen laskentaopas 2021. Finnish Centre for Pensions, Handbooks 01/2021.

Lilja, V. (2017) Referenssikuolevuuden K2016 stokastinen mallintaminen vahinkovakuutusyhtiössä. Suppea SHV-työ. The Actuarial Society of Finland.

Mäkinen, H. (2018) Työeläkkeiden kustannustenjako. Finnish Centre for Pensions, Handbooks 02/2018.

Mäki-Fränti, P. & Kokkinen, A. & Obstbaum, M. (2021) Suomen uuden pitkän aikavälin ennusteen mukaan kasvu näyttää entistä vaisummalta (Finland's new long-term forecast suggests GDP growth will be more subdued). Euro & Talous 5/2021.

Nisén, J. & Hellstrand, J. & Martikainen, P. & Myrskylä, M. (2020) Hedelmällisyys ja siihen vaikuttavat tekijät Suomessa lähivuosikymmeninä (Fertility and its determinants in Finland in the coming decades, English summary). Yhteiskuntapolitiikka 85:4.

Nopola, T. (2019) Skenaariolaskelmia muuttoliikkeen vaikutuksista eläkejärjestelmän kestävyyteen (The impact of migration on pension system sustainability: scenario calculations, English summary). Finnish Centre for Pensions, Reports 09/2019.

Nopola, T. & Tikanmäki, H. (2020) Syntyvyysskenaarioiden vaikutukset työeläkkeiden rahoitukseen (Effects of birth rate scenarios on the financing of earnigns-related pensions, English summary). Finnish Centre for Pensions, Reports 01/2020.

Nopola, T. (2021) Kuolevuuden kehityksen vaikutuksia eläkejärjestelmään (How mortality affects the pension system, English summary). Finnish Centre for Pensions, Reports 02/2021.

Reipas, K. & Sankala, M. (2015) Laskelmia vuoden 2017 työeläkeuudistuksen vaikutuksista – Hallituksen esitykseen perustuvat arviot (Projections on the effects of the 2017 earnings-related pension reform – projections based on the government bill, English summary). Finnish Centre for Pensions, Reports 05/2015.

Risku, I. (2015) Yksityisalojen palkansaajien työeläkkeet syntymävuoden ja sukupuolen mukaan (Private sector wage-earners' earnings-related pensions by birth cohort and gender, English summary). Finnish Centre for Pensions, Reports 09/2015.

Ritola, S. & Tuominen, S. (2022) Total pension in Finland 2022. How are earnings-related pensions, national pensions and taxation determined? Finnish Centre for Pensions, Reports 02/2022.

Sankala, M. & Reipas, K. & Kaliva, K. (2018) Sijoitusriskien vaikutus TyEL:n rahoitukseen (Impact of investment risks on earnings-related pension financing under the Employees Pensions Act, English summary). Finnish Centre for Pensions, Reports 05/2018.

Bank of Finland (2018) Unemployment rate in Finland close to structural level. Bank of Finland Bulletin 03/2018. https://www.bofbulletin.fi/en/2018/3/unemployment-rate-in-finland-close-to-structural-level/. Referred to on 14 April 2022.

Tarvainen, T. (2017) Ansiotulojen ennustaminen stokastisessa mikrosimulointimallissa. University of Jyväskylä, Master's Thesis.

TELA (2022) Eläkevarojen sijoittaminen. The Finnish Pension Alliance TELA. https://www.tela.fi/elakevarojen-sijoittaminen/. Referred to on 20 April 2022.

Tikanmäki, H. & Lappo, S. & Merilä, V. & Nopola, T. & Reipas, K. & Sankala, M. (2019) Statutory pensions in Finland: long-term projections 2019. Finnish Centre for Pensions, Reports 07/2019.

Tikanmäki, H. & Lappo, S. (2020) ELSI: The Finnish pension microsimulation model. Finnish Centre for Pensions, Reports 08/2020.

Tilastokeskus (2021) Väestöennuste 2021–2070. https://www.stat.fi/til/vaenn/2021/vaenn_2021_2021-09-30_tie_001_fi.html. Referred to on 4 October 2021.

Statistics Finland (2022) Iäkkäimpien kuolleisuus noussut selvästi. Tiedote. https://www.stat.fi/uutinen/iakkaimpien-kuolleisuus-noussut-selvasti. Referred to on 16 September 2022.

Villani, M. (2009) Steady-State Priors for Vector Autoregressions. Journal of Applied Econometrics 24:4.

Appendices

Appendix 1. Development of pensions paid by Kela under different assumptions

In the baseline projection, the pensions paid by Kela (the national and the guarantee pension) follow the consumer price index until 2027. As of 2028, annual discretionary increases will be made to pensions paid by Kela. They amount to half of the real growth in the earnings level. In Table A1.1, the development of pension expenditure and average benefits is presented for two alternative indexation rules in addition to the one used in the baseline projection. In the first one, no discretionary increases are made to pensions paid by Kela. In other words, throughout the projection period, their amounts follow only the development of consumer prices. In the second one, discretionary increases are made to pensions paid by Kela as of 2028. The increases equal the full real growth in the earnings level.

The growth in earnings affects the level of earnings-related pensions in many ways. Pensions accrue based on earnings, in addition to which changes in the earnings level affect the wage coefficient and the earnings-related pension index. Under current law, Kela pensions are in no way linked to the wage development whereas the earnings-related pension is deducted from the national pension and the guarantee pension. In other words, when earnings-related pensions grow, Kela pensions are reduced.

The importance of Kela pensions will diminish over time if the standard of living increases and Kela pensions are indexed only to consumer prices. Without additional discretionary increases, Kela pensions would gradually become very meagre compared to the general standard of living. Correspondingly, the ratio of national and guarantee pension expenditure to GDP would continue to shrink. The development would be similar but slower if Kela pensions were to follow an equally weighted average of price and wage changes, whereas the ratio of Kela pensions to GDP would grow in the long run with discretionary increases in line with the earnings level. (Table A1.1).

Table A.1.1.
Pension expenditure and pension benefit levels under different index rules for Kela pensions

A.1.1.1. Kela pension expenditure relative to GDP (%)

	2021	2025	2030	2040	2050	2070	2090
No discretionary increases	1.0	0.9	0.8	0.7	0.6	0.3	0.2
Baseline	1.0	0.9	0.8	0.8	0.7	0.6	0.5
Discretionary increases to the amount of the real growth of earnings	1.0	0.9	0.8	0.9	1.0	1.2	1.3

A.1.1.2. Total pension expenditure relative to GDP (%)

	2021	2025	2030	2040	2050	2070	2090
No discretionary increases	13.2	13.5	13.5	12.9	12.5	13.6	14.2
Baseline	13.2	13.5	13.6	13.0	12.7	13.9	14.4
Discretionary increases to the amount of the real growth of earnings	13.2	13.5	13.6	13.1	12.9	14.4	15.3

A.1.1.3. Average pension relative to average earnings (%)

	2021	2025	2030	2040	2050	2070	2090
No discretionary increases	52.1	54.9	53.8	50.6	48.3	46.6	45.0
Baseline	52.1	54.9	53.9	51.0	49.0	47.5	45.8
Discretionary increases to the amount of the real growth of earnings	52.1	54.9	54.0	51.5	50.0	49.4	48.5

A.1.1.4. Full guarantee pension relative to average earnings (%)

	2021	2025	2030	2040	2050	2070	2090
No discretionary increases	24.5	25.3	24.0	21.4	19.0	15.1	11.9
Baseline	24.5	25.3	24.4	23.0	21.8	19.4	17.2
Discretionary increases to the amount of the real growth of earnings	24.5	25.3	24.9	24.9	24.9	24.9	24.9

A.1.1.5. Full national pension of a single pensioner relative to average earnings (%)

	2021	2025	2030	2040	2050	2070	2090
No discretionary increases	19.4	20.1	19.1	17.0	15.1	12.0	9.4
Baseline	19.4	20.1	19.4	18.3	17.3	15.4	13.7
Discretionary increases to the amount of the real growth of earnings	19.4	20.1	19.8	19.7	19.8	19.8	19.8

Appendix 2. Alternative mortality projection

In this appendix we present a pension projection which is based on Statistics Finland's population projection of 2021. This alternative projection is compared to the baseline projection of this report. At the same time, we examine the effects of the mortality rates during the corona pandemic on the automatic stabilising mechanisms, that is, on the age limits and the life expectancy coefficient that are linked to life expectancy.

In the report's baseline projection, we have added the preliminary mortality rates for 2021 and an estimate for mortality in 2022 to the population projection of Statistics Finland. The mortality rates of future years are assessed by applying age- and gender-specific rates by which mortality decreases from the mortality rates of the starting level. The starting level for 2020 is the average mortality rate for the years 2018–2022. The rate by which mortality decreases is the same as the one used in Statistics Finland's population projection for 2021. Under these assumptions, mortality will return in 2023 to be close to the trend it had in the 2021 population projection, but the life expectancy will permanently be around three months lower.

The update of the population projection has been made because mortality in 2021 and early 2022 has been clearly higher than in Statistics Finland's projection. Underlying the high mortality are at least the indirect and direct effects of the corona pandemic, but it is possible that there are under underlying causes, as well.

Table A.2.1.
Life expectancy at birth, years

	2021	2025	2030	2040	2050	2070	2090
Baseline	81.8	82.7	83.7	85.5	87.1	89.8	91.0
Population projection 2021	82.2	83.0	83.9	85.7	87.3	90.0	91.1

Higher mortality in 2021 and 2022 affects pensions and their financing in several different ways. First, a rising mortality rate directly reduces pension expenditure since pensions end earlier on average. Second, higher mortality raises the monthly pensions for those age cohorts whose life expectancy coefficient is determined based on these mortality rates.

The third and most long-lasting effect relates to the coming into force of the 2017 pension reform. For those born in 1965 or later, the retirement age is linked to changes in life expectancy. At the same time, the life expectancy coefficient is mitigated to take the higher retirement ages into account. When calculating the retirement age, the reference level of life expectancy is its level in the years 2020–2024. If high mortality is a temporary phenomenon, the timing of this reference level means that future retirement ages will be higher than previously projected. Correspondingly, the life expectancy coefficient will be less cutting. The effect of the phenomenon on pension benefits and the financial standing of the pension scheme is a complex issue and depends, first and foremost, on how retirement rates develop in the future. If mortality were to remain high on a permanent basis, there would be no such phenomenon. In the baseline projection of this report, high mortality is, for the most part, temporary.

The retirement ages according to the 2021 population projection are, in the long term, around two months lower than the age limits in the baseline projection and the target retirement ages 0–1 months higher. Lower retirement ages correspond to a more cutting life expectancy coefficient. The differences in the stabilising mechanisms of the population projections are due, in particular, to the differences in the mortality rates of the reference years (2020–2024). (Table A2.2).

All-in-all, the effect on pension expenditure and pension contributions caused by updates of the population projection is rather limited. The population projection of 2021 would result in a slightly higher TyEL contribution level in the early decades of the projection period than in the baseline projection, but the effect is reversed as of the early 2060s. (Table A2.4.)

The automatic mechanisms that are based on realised mortality can cause unusual generational effects if mortality develops unevenly. This is because a cohort's life expectancy coefficient and age limits are determined based on the mortality rates of older age cohorts. The mechanism uses average values over a period of five years, which is supposed to reduce the significance of the variation.

The age cohorts that turn 62 in the next few years benefit from the temporary rise in mortality by getting a less cutting life expectancy coefficient. The development of mortality in the coming years is currently associated with an unusually high level of uncertainty, so it is possible that the adjustment mechanisms treat different birth cohorts unevenly.

Table A.2.2.
Retirement age and life expectancy coefficient under different population projections

Year of birth	Retirement age		Life expectancy coefficient	
	Baseline	Population projection 2021	Baseline	Population projection 2021
1965	65 yrs 2 mos	65 yrs 2 mos	0.939	0.928
1975	66 yrs 4 mos	66 yrs 3 mos	0.916	0.910
1985	67 yrs 4 mos	67 yrs 2 mos	0.900	0.892
1995	68 yrs 2 mos	68 yrs	0.884	0.877
2005	68 yrs 11 mos	68 yrs 9 mos	0.872	0.865

Table A.2.3.
Sufficient constant contributions under different population projections (%)

	TyEL	JuEL municipal	All earnings-related pensions
Baseline	25.3	26.2	27.8
Population projection 2021	0.1	0.0	0.1

Table A.2.4.
Results of pension projections under different population projections (at 2021 prices)

A.2.4.1. Pension recipients (1,000)

	2021	2025	2030	2040	2050	2070	2090
Baseline	1,505	1,523	1,572	1,576	1,585	1,701	1,692
Population projection 2021	-	8	10	16	21	12	12

A.2.4.2. Employed (1,000)

	2021	2025	2030	2040	2050	2070	2090
Baseline	2,390	2,439	2,435	2,423	2,389	2,256	2,080
Population projection 2021	-	-2	-2	-4	-6	-2	-2

A.2.4.3. Average pension, €/month and relative to average earnings

	2021	2025	2030	2040	2050	2070	2090
€/month							
Baseline	1,784	1,844	1,907	2,031	2,195	2,681	3,277
Population projection 2021	-	-2	-5	-11	-18	-26	-27
% of average earnings							
Baseline	52.1	54.9	53.9	51.0	49.0	47.5	45.8
Population projection 2021	-	0.0	-0.1	-0.2	-0.4	-0.5	-0.4

A.2.4.4. Total pension expenditure

	2021	2025	2030	2040	2050	2070	2090
billion euros							
Baseline	33.4	35.0	37.3	40.0	43.5	57.0	69.3
Population projection 2021	-	0.1	0.1	0.2	0.1	-0.1	-0.1
% of GDP							
Baseline	13.2	13.5	13.6	13.0	12.7	13.9	14.4
Population projection 2021	-	0.1	0.1	0.1	0.1	0.0	0.0

A.2.4.5. Earnings-related pension expenditure, % of wage sum

	2021	2025	2030	2040	2050	2070	2090
TyEL							
Baseline	26.0	27.0	28.0	27.9	28.7	33.8	35.9
Population projection 2021	-	0.1	0.1	0.2	0.1	-0.1	0.0
JuEL municipal							
Baseline	30.3	32.1	32.8	31.8	31.6	35.3	37.4
Population projection 2021	-	0.2	0.2	0.2	0.1	-0.1	-0.1

A.2.4.6. TyEL contribution and assets relative to TyEL wage sum (%)

	2021	2025	2030	2040	2050	2070	2090
Contribution							
Baseline	24.4	24.9	24.4	24.4	24.9	26.1	26.2
Population projection 2021	-	0.1	0.1	0.1	0.1	-0.1	0.0
Assets							
Baseline	252.1	243.1	242.7	258.3	291.9	348.6	365.0
Population projection 2021	-	0.2	0.1	0.2	-0.1	-1.1	-0.9

Figure A.2.1.
Statutory pension expenditure relative to GDP under different population projections

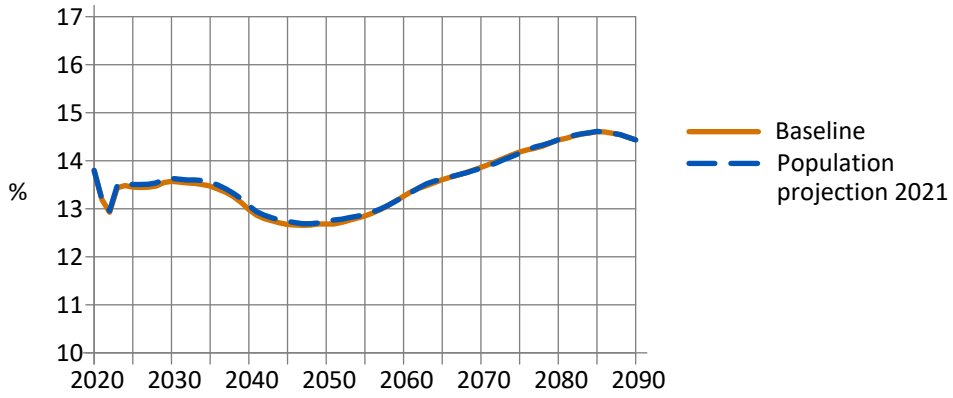


Figure A.2.2.
Average pension relative to average earnings under different population projections

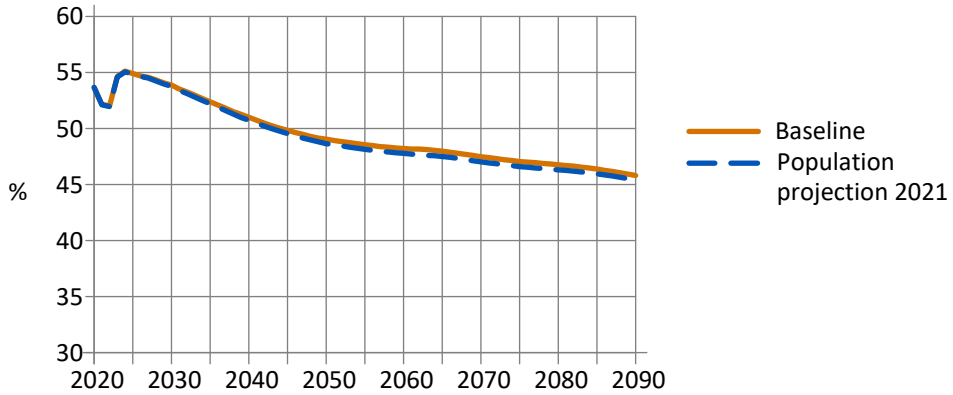
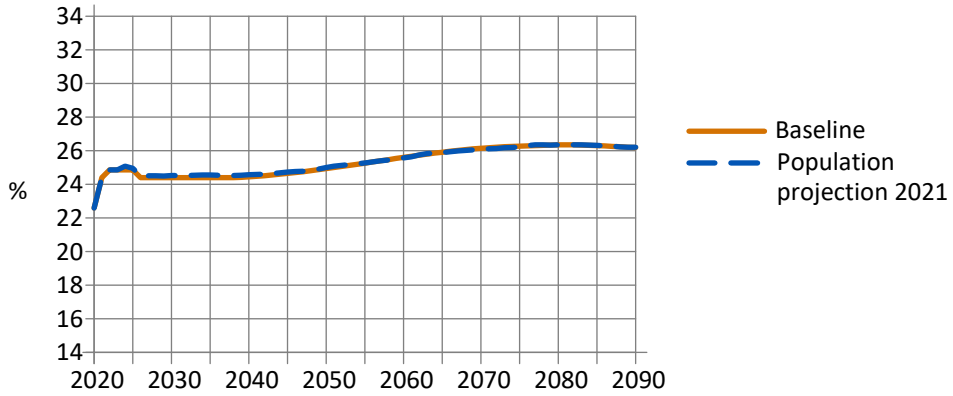


Figure A.2.3.
TyEL contribution relative to TyEL wage sum under different population projections



Appendix 3. Life expectancy by age and gender

Period life expectancy is calculated using mortality rates taken from a single calendar year. It expresses the life expectancy at a certain age under the assumption that mortality remains unchanged. When calculating the period life expectancy, only the mortality rates of the year under review are used.

In the population projection of this report, mortality decreases throughout the projection period. Period life expectancy underestimates the actual expected life spans of different cohorts. A more accurate estimate of the expected life span of each cohort is provided by cohort life expectancy, which is calculated using the projected mortality rates for each cohort.

Table A.3.1.
Period life expectancy in 2021–2090 by age and gender (years)

	2021	2025	2030	2040	2050	2060	2070	2080	2090
Life expectancy at birth	81.8	82.7	83.7	85.5	87.1	88.6	89.8	90.4	91.0
Men	79.1	80.2	81.3	83.4	85.3	87.0	88.4	89.1	89.7
Women	84.5	85.2	86.0	87.5	88.9	90.1	91.3	91.8	92.3
Life expectancy at age 25	57.3	58.2	59.1	60.8	62.4	63.8	65.0	65.6	66.1
Men	54.8	55.8	56.9	58.8	60.6	62.2	63.7	64.3	64.9
Women	59.9	60.6	61.4	62.8	64.1	65.3	66.4	66.9	67.4
Life expectancy at age 65	20.3	21.0	21.7	23.0	24.2	25.3	26.3	26.8	27.2
Men	18.5	19.3	20.0	21.5	22.8	24.0	25.1	25.6	26.1
Women	22.0	22.6	23.2	24.4	25.6	26.6	27.6	28.0	28.4

Table A.3.2.
Cohort life expectancy in 2021–2090 by age and gender (years)

	2021	2025	2030	2040	2050	2060	2070	2080	2090
Life expectancy at birth	90.9	91.2	91.5						
Men	89.5	89.8	90.2						
Women	92.4	92.6	92.9						
Life expectancy at age 25	64.5	64.9	65.3	66.0	66.6				
Men	62.8	63.3	63.8	64.6	65.3				
Women	66.3	66.6	66.9	67.5	68.0				
Life expectancy at age 65	22.4	23.0	23.6	24.9	25.9	26.6	27.1	27.5	27.9
Men	20.6	21.2	22.0	23.3	24.5	25.3	25.9	26.4	26.8
Women	24.1	24.6	25.2	26.4	27.3	27.9	28.4	28.8	29.1

Appendix 4. Population projection by age and gender

Table A.4.1.
Population projection for 2021–2090 by age and gender (1,000)

	2021	2025	2030	2040	2050	2060	2070	2080	2090
Men, (1,000)									
0–4	124	127	124	122	113	106	103	99	94
5–9	150	130	131	126	122	112	108	105	99
10–14	161	156	132	130	128	120	112	109	105
15–19	155	163	159	136	131	128	118	114	110
20–24	157	157	167	140	138	135	127	120	117
25–29	180	168	166	172	150	145	141	131	127
30–34	187	189	175	182	157	154	151	143	136
35–39	189	188	192	177	182	162	156	153	143
40–44	180	190	189	181	187	163	161	158	150
45–49	167	179	189	193	179	184	164	159	155
50–54	170	161	177	187	179	186	163	161	158
55–59	183	171	158	184	189	176	182	163	158
60–64	174	177	166	170	180	174	182	160	158
65–69	170	165	167	147	173	180	169	175	158
70–74	164	155	152	148	155	168	165	173	154
75–79	110	143	136	142	130	157	166	159	166
80–84	71	81	115	115	119	132	148	148	157
85–89	36	41	54	81	92	92	118	130	127
90–94	13	15	19	39	45	53	65	78	80
95–	2	3	4	7	13	17	20	27	32
Women, (1,000)									
0–4	119	122	119	116	108	101	99	94	89
5–9	144	124	125	120	117	107	103	100	95
10–14	154	149	127	125	122	114	107	104	100
15–19	148	155	151	130	125	122	112	108	105
20–24	148	149	158	132	130	127	120	113	110
25–29	169	156	155	160	140	135	131	122	118
30–34	175	176	161	168	144	142	139	132	125
35–39	176	175	178	163	167	148	143	140	130
40–44	170	178	177	166	172	150	147	144	137
45–49	159	170	178	181	166	170	151	146	143
50–54	167	156	170	177	166	173	151	149	146
55–59	183	171	155	177	179	165	169	151	147
60–64	181	181	168	167	174	164	171	150	147
65–69	184	177	176	149	171	174	161	165	148
70–74	185	176	169	158	158	166	158	165	145
75–79	135	173	164	160	138	160	165	154	159
80–84	102	111	152	143	139	143	153	147	155
85–89	64	70	84	117	122	112	135	143	135
90–94	33	33	39	72	77	81	91	103	102
95–	9	11	12	19	32	38	41	53	59

Appendix 5. Earnings per age and gender in 2021

Age, gender and earnings-related pension scheme specific average earnings as in Table A5.1 have been used in the LTP model. The earnings of the self-employed refers to their insured confirmed income.

Table A.5.1.
Average earnings by age and gender in 2021 (€/month)

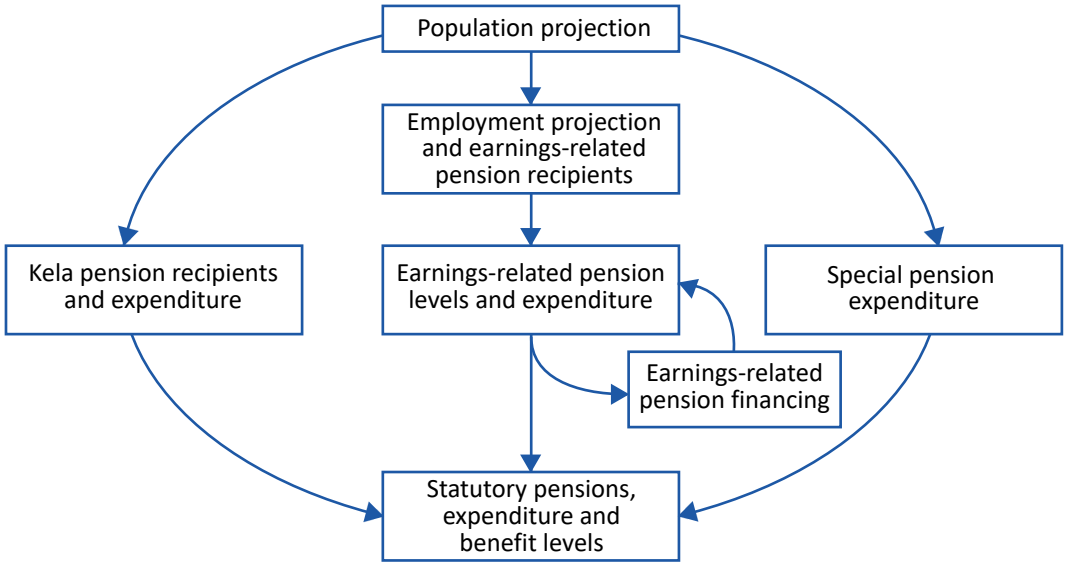
	TyEL	YEL	MYEL	JuEL State	JuEL municipal
Men					
18–19	1,090	1,003	725	1,082	1,557
20–24	2,153	1,102	1,367	2,633	2,168
25–29	3,005	1,260	1,847	3,380	2,970
30–34	3,670	1,453	1,944	3,903	3,428
35–39	4,288	1,688	1,949	4,318	3,763
40–44	4,717	1,896	1,987	4,658	4,042
45–49	4,795	2,034	2,034	4,824	4,083
50–54	4,757	2,162	2,023	4,944	4,052
55–59	4,702	2,225	1,983	4,961	4,109
60–64	4,667	2,199	1,968	4,908	4,067
65–67	4,588	2,162	1,935	4,828	4,000
18–67	4,011	1,925	1,968	4,552	3,763
Women					
18–19	848	755	699	983	1,821
20–24	1,580	981	1,249	2,127	2,412
25–29	2,222	1,120	1,705	2,687	2,684
30–34	2,584	1,256	1,792	3,021	2,686
35–39	3,031	1,415	1,761	3,368	2,957
40–44	3,433	1,587	1,762	3,795	3,271
45–49	3,569	1,717	1,747	4,111	3,308
50–54	3,582	1,871	1,701	4,170	3,285
55–59	3,472	2,016	1,655	4,200	3,297
60–64	3,449	1,980	1,641	4,152	3,263
65–67	3,391	1,947	1,613	4,088	3,211
18–67	2,868	1,663	1,709	3,875	3,082

Appendix 6. LTP model description

The results concerning employment, pension expenditure, financing and average pensions have been calculated using the long-term projection (LTP) model of the Finnish Centre for Pensions. The model simulates the Finnish pension scheme and can be used to make projections for planning and forecasting purposes. As a rule, pension acts and other regulations governing the scheme remain unchanged throughout the projection period.

The model consists of several interconnected modules (Figure A6.1).

Figure A.6.1.
Modules of the LTP model



The employment projection is mainly based on the cohort component method developed by the OECD (Burniaux et al 2004). However, the model we have used is more detailed than the original in accounting for flows into and out of the labour force. The benefit with OECD's model is that it can be used without age-specific labour force entry and exit rates. However, in Finland, this information can be estimated through the registers of the earnings-related pension scheme, making the projection less sensitive regarding the source data. In the original OECD model, the temporal trends of the source data continue exaggeratedly into the future.

The employment projection consists of two parts. First, the age-specific labour force participation rates are estimated. Second, an assessment of the age-specific development of unemployment is made. A combination of these two factors yields an employment projection by age for men and women. Participation rates have been estimated by projecting the latest observations on labour force participation into the future according to entry and exit rates that have been estimated based on register data. In the projection, the population is divided into three states: those belonging to the workforce, retirees outside the workforce and non-retirees outside the workforce. The flows between these states are directed with the help of transition probabilities, the assumptions regarding which have been outlined in Chapter 3.

The development of the unemployment rate is based on the notion of equilibrium unemployment. When equilibrium unemployment prevails, employees' wage demands and companies' pricing decisions that take into account market conditions and production costs are compatible with a stable rate of inflation. The level of equilibrium unemployment is determined by structural factors such as labour market institutions and policies, taxes that influence the purchasing power of wages, and how the commodity markets function.

In this report, the equilibrium unemployment rate has been assumed to be 7.9 per cent. Abandoning the additional days of the unemployment allowance is assumed to reduce the unemployment rate, while the rising retirement age is assessed to increase it. In addition, in the 2020s we have assumed an unemployment rate that is, cyclically, lower than the present level.

In the earnings-related pension expenditure module, the earnings-related pension expenditure is calculated separately for each pension scheme. In the private sector, this means that each pension act is treated separately. The expenditure under the Public Sector Pensions Act (JuEL), which came into force in 2017, is calculated separately by financing act for state employees, municipal employees[18] and other insured employees. Each year, pensions are paid to pensioners, insured employees accrue future pensions, and persons move between different states (for example, employed, unemployed, pensioner) according to given probabilities. The central states of the model are:

- active: employed, not retired;
- unemployed: receiving an earnings-related unemployment benefit, a basic daily allowance or a labour market subsidy;
- inactive: not in work insured by the act under review, not retired and not receiving an earnings-related unemployment benefit, but has accrued pension under said scheme before;
- retirement states: receiving an old-age pension, a full disability pension, a partial disability pension, a part-time pension, a partial old-age pension, or a years-of-service pension; and
- other: persons covered by Finnish social insurance who are not covered by the earnings-related pension scheme.

The states of receiving a partial disability pension or a partial old-age pension are further divided into two states each based on whether the individual is employed or not while receiving a pension.

Employed persons are those who are active or who receive a part-time pension, as well as those partial disability pension and partial old-age pension recipients who are employed. They accrue a pension for their earnings, and a pension contribution is levied based on these earnings. The unemployed are divided into two states. The first unemployed state includes those receiving a normal earnings-related unemployment allowance, those on a basic daily allowance and those receiving a labour market

18 To be specific, the employees of Keva's member organisations.

subsidy. Those entitled to additional days of the earnings-related unemployment allowance have their own state.[19] The inactive state includes persons who transfer from work covered by the pension scheme under review to work covered by some other scheme or who exit the labour force. Thus, the inactive have accrued a pension under the reviewed pension scheme but are no longer in employment covered by that scheme and are not drawing a pension.

New employed persons are transferred annually to the active state based on the population and employment projections. Also, some people in each state die over the course of each year, and a part of these deaths result in the granting of survivors' pensions to family members.

Within the model's states, people are grouped according to age and gender. Within each state, a technique that uses average values is applied. For example, all 50-year-old men insured under TyEL are treated as being identical to each other. A modelling technique that uses average values for each state is easier to apply in practice, but it produces less information than an individual-level projection would. For example, the projection does not provide information on pensions per education level or the size distribution of pensions. These are produced with the ELSI microsimulation model (Appendix 7).

The chosen technique does not prevent taking into account the known selection biases inherent in the transfers between the various states. The following phenomena have been taken into consideration in the model:

- The accrued pension and salary for projected pensionable service for those transferring to a disability pension are typically lower than for those continuing in gainful employment.
- The mortality rate of persons drawing a disability pension is higher than for the population on average, while the mortality rate of non-disabled persons is correspondingly lower.
- Among old-age pensioners, controlling for age and gender, a high pension is associated with low mortality.
- Pension accruals for those dying under the age of 63 are lower than for the insured on average.

The TyEL financing model is used to calculate the development of the TyEL contribution rate, technical provisions and assets. It contains a detailed description of the legislation and the actuarial principles pertaining to TyEL financing. The financing module is linked to the TyEL expenditure projection: TyEL expenditure and wage sum affect the contribution rate as well as the way in which technical provisions are generated and dissolved. On the other hand, the level of the TyEL contribution affects the growth in earnings, which is reflected in the size of accrued pensions.

19 The state is in use only during the early years of the projection since those born in 1965 or later do not have the right to additional days of the unemployment allowance.

In the model, the contribution income is composed of a pooled component, a funded component and a residual component which includes, among other things, operating costs. The pooled component is used to finance pensions through the PAYG system. The funded contribution income is accumulated into technical provisions for the pension providers. Part of the technical provision is dissolved annually to finance the funded component of pensions in payment. The larger the funded part of a pension in payment, the smaller is the required pooled component.

The average earnings-related pensions are calculated once the pension expenditure of all pension schemes has been assessed. The number of earnings-related pension recipients is calculated in the same way as the number of pensions in the pension expenditure projections for individual pension schemes. However, the results cover all persons subject to earnings-related pension insurance, which means that for every pension (received in one's own right) in payment, there is one pension recipient. The average pension is estimated based on the total pension expenditure and the number of pension recipients.

In the module of Kela pensions, the number of national and guarantee pension recipients and the average size of these pensions is calculated.

The number and size of national and guarantee pensions starting parallel to earnings-related pensions are estimated per age and gender based on starting earnings-related pensions. It is assumed that the size distribution for starting earnings-related pensions will follow the current distribution, but the beginning and end points of the distribution have been adjusted to be compatible with the values of the number and level of national and guarantee pensions that come from the ELSI model.

The number of persons receiving only a national pension has been deduced based on the population projection and the number of persons who have accrued pension. This projection is also based on assessments of future starting national pensions received from the ELSI model.

Kela pensions react to changes in employment rates and the indexing of Kela pensions in the same way as in the ELSI model.

The module on the expenditure of special pensions is constructed based on the population projection and is rougher than the other modules. The starting point for the projection is the current expenditure for special pensions, grouped by age and gender. For those of active age (18-62 years), the special pensions will grow at the same rate as general wages. For those who are 63 and above, the special pensions are tied to the earnings-related pension index.

The total pension expenditure and the average total pension are calculated as the joint result of different modules. In this report, the average pension numbers are calculated for persons living in Finland who receive a pension in their own right, other than a part-time pension or a partial old-age pension.

The projection model requires the following data to describe the starting year, specified by pension scheme as well as by the age and gender of the insured:

- population distribution over different schemes and different states within the schemes,
- wages of the insured and other earnings for which pension accrues,
- amount of accrued pension,
- technical provision and the amount of pension assets,
- the size of pensions in payment, and
- transition probabilities between different states, particularly retirement rates.

The figures that depict the starting point of the projection are from the following sources:

- the statistical database of the Finnish Centre for Pensions,
- the pension register of the Finnish Centre for Pensions,
- the joint earnings and accrual register of the earnings-related pension scheme,
- the joint registers of the Social Insurance Institution of Finland (Kela) and the Finnish Centre for Pensions,
- the PAYG data relating to earnings-related pensions of the Finnish Centre for Pensions,
- the register of the Finnish Centre for Pensions on the supervision of the insurance obligation of the self-employed, and
- the Financial Supervisory Authority.

Appendix 7. Description of the ELSI microsimulation model

ELSI is a microsimulation model that is used to simulate the development of Finnish statutory pensions by modelling people's life spans on an individual level. That way, we get more detailed assessments of pension distributions and pensions paid by Kela than offered by the LTP modelling of average attributes of population groups.

The ELSI model simulates the socially insured adult population of Finland and such adults who have accrued earnings-related pension under the Finnish earnings-related pension scheme. The source data has been compiled from administrative registers and covers the entire population of interest. The source data includes around 4.8 million persons.

The ELSI model consists of modules which are run consecutively. Figure A7.1 illustrates the structure of the model.

The population model simulates new individuals entering the population, changes in educational levels and transitions between population states. These transitions include, among other things, death, retirement and labour market dynamics. The probability to transition to a particular population state is defined by the individual's age, gender, educational level and present population state.

The earnings module simulates the wages received by persons and periods of social security for which pension accrues. The model used for simulating earnings is based on the one estimated in the Master's thesis Tarvainen 2017.

In the earnings-related pension module, the earnings-related pension accruals are formed based on the data simulated in the earnings module. When individuals transition to retirement in the simulation, their earnings-related pension is calculated based on their simulated working life and accruals. The model does not consider the differences between the earnings-related pension acts. As a rule, insofar as there are differences between the acts, the calculations are done based on TyEL.

Based on the simulated earnings-related pension, a national and a guarantee pension is calculated for the individual in the national pension module. When calculating the national pension, factors such as the time a person has resided in Finland and whether the person lives alone or with a spouse, are taken into account. Earnings-related survivors' pensions and foreign pensions are modelled crudely to take into account their reducing effect on the pension expenditure of Kela pensions when calculating national and guarantee pensions.

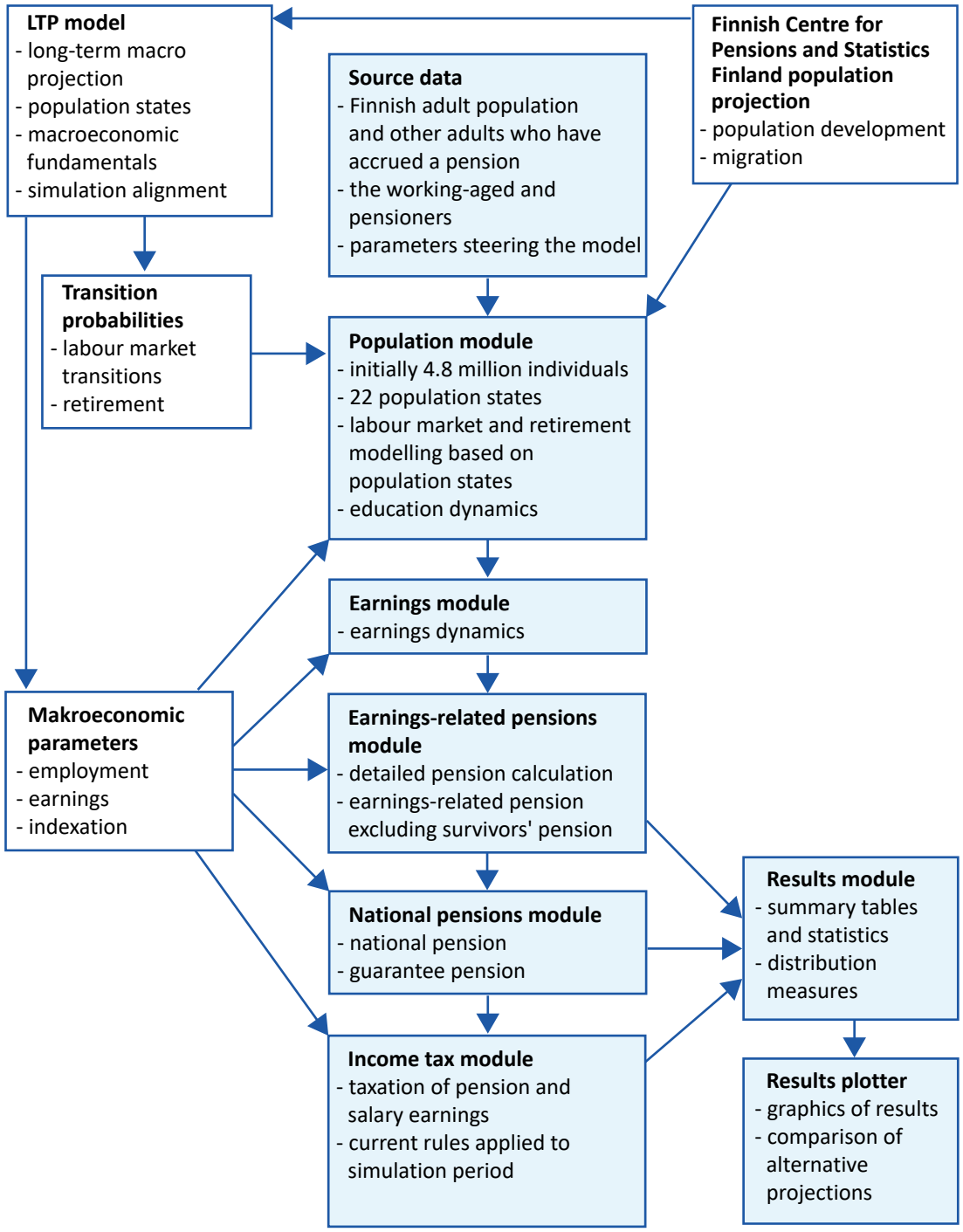
Income tax and net earnings are calculated in the income tax module. After the simulation phases, statistics for various distributions can be collected for different population groups. We never present results on an individual level or for very small groups.

In key respects, the ELSI model has been calibrated to be compatible with the results of the LTP model. For example, the same population projection and the same macro-level assumptions are used in the ELSI model as in the LTP model. In the population module, the transition probabilities between population states are based on the corresponding probabilities in the LTP model. The earnings module has also been calibrated to be compatible with the results of the LTP model. Correspondingly, the Kela pension

expenditure simulated with the ELSI model has been used in the development of Kela pension calculations in the LTP model.

For a more detailed description of the ELSI model, consult Tikanmäki & Lappo (2020). The results on the median pensions and pension distributions in sections 4.4 and 4.5 have been produced with the ELSI model.

Figure A.7.1.
Structure of the ELSI model



Appendix 8. Selection of sensitivity analyses

In the external evaluation of the 2019 report, it was argued that, to facilitate comparison between the sensitivity analyses, they should be selected so that they are equally likely (Koskinen 2019). In this report, we have aimed to select the sensitivity analysis scenarios for each individual factor so that half of the long-term variation would be between the low and high scenarios. This does not mean that, in individual years, there is necessarily a 50 per cent probability that the observations will fall between the low and high scenarios. For example, the annual fluctuation in investment returns is very large compared to the average long-term fluctuation.

The mortality scenarios have been constructed around the mortality development in the baseline scenario by applying the Lee-Miller model to the realised mortality rates for 1986–2020 in line with Lilja (2017). The model has been constructed so that, for each projected year, the life expectancy ranges between the low and the high scenarios with a 50-per-cent probability.

Nisén et al. (2020) present two scenarios of the future development of fertility. The writers of the article find scenario A to be more probable. It assumes that part of the already observed decline in birth rates is due to women having children at an increasingly higher age. This trend is assumed to continue but slow down. In the secondary scenario B, the decline in birth rates is not assumed to be due to the trend of deferring having children, and the fertility rate is assumed to no longer continue to decline. However, the selection of fertility scenarios in this report are based on scenario B of the report of Nisén et al. (2020) since its median alterative is closer to Statistics Finland's 2021 population projection than scenario A. In the sensitivity analyses of our report, the total fertility rate is 1.3 in the low fertility rate scenario and 1.6 in the high fertility rate scenario. These roughly correspond to the 80-per-cent range in the year 2040 in scenario B mentioned above. In the long run, they can be thought to roughly correspond to a 50-per-cent range. This interpretation partly deviates from the pension projections presented by Nopola and Tikanmäki (2020).

The fluctuation in employment, growth in earnings and return on pension assets has been modelled by applying a mean-adjusted Bayesian vector autoregression model (Villani 2009) to the realised data. The model has been used to simulate 60 years of the following time series:

- Index of wage and salary earnings (Statistics Finland),
- Consumer price index (Statistics Finland),
- Prices of dwellings in housing companies (Statistics Finland),
- 3 months Euribor rate,
- five-year government bond of Germany,
- Barclays Hedge Fund Index (Barclays),
- Investment grade corporate bond index,
- Aggregated stock market index (OMXGI, STOXX600, TOPIX, RUSSELL), and
- Employment rate (Statistics Finland).

With the model, the range of the growth in earnings over a period of 60 years is +/- 0.5 percentage points compared to the baseline assumption. The range of the 10-year moving average of the employment rate is +/- 2 percentage points. The range of investment returns with the investment allocation in Chapter 3 is +/- 1.2 percentage points compared to the baseline assumption.

03
2023

Finnish Centre for Pensions,
Reports

Statutory pensions in Finland – Long-term Projections 2022

The report presents the Finnish Centre for Pensions' long-term projection regarding the development of statutory pensions from 2022 to 2090. The main focus of the report is on projections of earnings-related pensions. The report examines the development of pension expenditure and the pension benefit level, as well as the financing of private sector earnings-related pensions. The main results of the financing projection are the development of contributions and assets under the Employees Pension Act and an assessment of the financial equilibrium of the earnings-related pension scheme.

Finnish Centre for Pensions, Reports

The Finnish Centre for Pensions, an expert on earnings-related pensions, is a statutory body that develops pension provision and produces joint services for all parties to the scheme. In the Reports series, we publish reviews, surveys and projections that serve the assessment and development of the pension provision.

Finnish Centre for Pensions
ELÄKETURVAKESKUS