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TO THE READER

One of the statutory tasks of the Finnish Centre for Pensions is to project the development of pensions and their financing. The Finnish statutory pensions include the earnings-related pensions, the national pension, the guarantee pension, as well as special pensions for military accidents, motor liability insurance as well as workers compensation insurance. This report presents the Finnish Centre for Pensions' long-term projections of statutory pensions for the period 2019–2085.

This report is based on a report originally published in Finnish in March 2019. After publication, an error was found in the projections of the original report and a correction was published in Finnish in May 2019 (Reipas 2019). All results presented in this English version include the corrections.

The previous similar report was published in 2016 (in Finnish; English version published in early 2017). Compared to the report published in 2016, the pension scheme has changed very little as the 2017 pension reform was taken into account already in that report. The most substantial changes in the assumptions concern the new population forecast and the updated assumptions on employment and investment returns. The calculation in Appendix 3 on the value of accrued pension rights has been extended to a funding balance analysis based on an open group analysis. Chapter 4 now also includes an analysis of the financial status of the pension scheme under the Employees Pensions Act at the end of the projection period.

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 produced the pension projections using the LTP model. Heikki Tikanmäki and Sampo Lappo produced the projections using the ELSI microsimulation model. Kaarlo Reipas produced the employment projections, while Ville Merilä and Hannu Sihvonen collected and edited the register data used in the projections. Ville Merilä also produced the short-term economic forecasts. Tuija Nopola produced the population forecast that underlies the projections. Heikki Tikanmäki coordinated the writing of the report, which was translated into English by Lena Koski. Merja Raunis and Heidi Nyman prepared the report for publication.

The authors of the report thank Mikko Kautto, Ismo Risku, Jaakko Aho and Risto Vaittinen from the Finnish Centre for Pensions for their valuable advice and comments at different stages of the work. Many of our 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 Jorma Kinnunen (Mela), Pertti Lassila (Keva), Risto Louhi (Keva), Mika Maliranta (Etla and University of Jyväskylä), Pertti Pykälä (Kela), Markus Rapo (Statistics Finland), Reima Rytsölä (Varma), Antti Suhonen (Aalto University) and the Actuarial Society of Finland. The responsibility for the contents of the report remains with the authors.

Helsinki, October 2019

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

SUMMARY

In this report, we present the Finnish Centre for Pensions' 2019 long-term projections of the development of statutory pension expenditure and the benefit level. 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 2019–2085.

The projections follow Statistics Finland's population forecast from 2018, which we have extended to 2085. According to the forecast, the population will continue to grow until the mid-2030s, after which it will start to shrink. At year-end 2017, the population in Finland was 5.51 million. It is projected to shrink to 5.1 million by 2085. 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 during the projection period.

The old-age dependency ratio (the ratio of persons aged 65 and over to the 15–64-year-olds) will continue to grow until 2085. In 2017, the old-age dependency ratio was 34.2 per cent. It is projected to rise to 66.1 per cent by 2085. The weakening of this ratio in the near future is a consequence of the current age structure in Finland. However, a steadily rising life expectancy combined with a low birth rate would mean that the old-age dependency ratio would weaken throughout the projection period. In 2017, life expectancy at birth was 81.5 years. It is projected to rise to nearly 91 years by 2085.

The employment rate in 2018 was 71.7 per cent. According to the employment projection, it is expected to rise to 73.4 per cent in 2025. After that, the employment rate will be slightly over 73 per cent, varying slightly based on the age-structure of the working-age population. The growth in the employment rate follows mainly from an increasing labour force participation rate of the older age groups. The employment rate of the elderly will rise partly as a result of the expected postponing of retirement mainly due to the 2017 pension reform. In 2018, the expected effective retirement age was 61.3 years. It is projected to rise to 62.5 years in 2025 and 65 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 2019, the life expectancy coefficient for the 62-year-olds is 0.95722. In 2030, it is expected to be 0.91, and 0.85 in 2085. The retirement age will also be linked to the development of the expected life expectancy as of those born in 1965. The retirement age for those born in 1980 is 66 years and 8 months. It will exceed 68 years for those born in 2000.

In 2017, the total statutory pension expenditure was 13.4 per cent relative to the GDP. The ratio will remain more-or-less unchanged up to 2030. At its smallest, the ratio will be slightly over 12 per cent at mid-century, after which it will start to grow again. At its highest, the pension expenditure will be around 15 per cent of GDP at the end of the projection period. In 2017, the earnings-related pension expenditure for the whole economy was 31.6 per cent relative to the sum of earned income. The expenditure ratio will grow until 2030, at which time it will be around 33 per cent. After that, the ratio will decrease,

standing at approximately 30 per cent of the sum of earned income in 2050. From then on, the expenditure ratio relative to the sum of earned income will grow to 37 per cent by the end of the projection period. The increase in the expenditure ratio is caused, in particular, by a shrinking working-age population.

In 2017, the average monthly pension was 1,656 euros. The purchasing power of the average pension is projected to grow continuously, reaching over 3,500 euros in 2085 (at 2017 prices). In the next few years, the average pensions will grow in step with the general growth in earnings. The pension level relative to the average earnings will begin to decrease in the early 2020s. The main reason for the decrease is the life expectancy coefficient. The employee's pension contribution and the adjustments made to the public sector pension benefits in the 1990s also play a role in this development. The discretionary increases made to the pensions paid by the Social Insurance Institution of Finland (Kela) will have a pivotal impact on the level of these pensions. According to the assumptions of this projection, the increases to the pensions paid by Kela will exceed inflation but lag behind earnings.

During the projection period, there will be no significant changes to pension distributions within gender groups. However, the gender gap in pensions will decrease. Pensions for people of different educational levels will develop more-or-less at the same rate throughout the projection period. The group with a basic-level education, whose pensions will develop at a below-average rate, form the exception. In the future, the group with 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 contribution under the Employees Pensions Act (TyEL contribution) is projected to rise from 24.3 per cent in 2017 to around 25 per cent at the end of the 2020s. The contribution will begin to rise rapidly in the 2050s, mainly due to the low birth rates. The TyEL contribution rate will reach 30 per cent by 2085. At the end of the projection period, the contribution will be at a sustainable level. By the end of the century, also the assets under the Employees Pensions Act (TyEL assets) will grow relative to the wage sum. Relative to the pension expenditure, however, the TyEL assets will remain stable.

A constant TyEL contribution rate of 26.7 per cent would be sufficient to finance expenditures long term. In 2017, the contribution rate was 24.3 per cent of the TyEL wage sum. Similarly, a sufficient constant contribution rate for municipal pensions would be 27.6 per cent relative to the corresponding wage sum. In 2017, that rate was 28.5 per cent. The contribution level sufficient to finance the total pension expenditure under all earnings-related pension schemes relative to the economy's total wage sum would be 29.0 per cent. The collected comparable contribution income was 29.2 per cent in 2017.

We have examined the sensitivity to changes in the main assumptions in our report.

Changes in mortality would affect the development of retirement ages. These changes would also affect the benefit levels due to the life expectancy coefficient. However, these adaptation mechanisms would not remove all the effects of the rising life expectancy on expenditure. First, they do not affect the pensions 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 does not affect, in full, the effective retirement age. This phenomenon

would be accentuated if the retirement age rises quickly because of a rapid increase in life expectancy.

The birth rate affects the financing of the pension system with a delay of about 20 years, when the new-born reach working age. In the low birth rate projection, the expected total fertility rate is 1.2. At the end of the projection period, the pension expenditure relative to GDP would grow by 2.4 percentage points compared to the baseline projection. The effect on the TyEL contribution at the end of the projection period would be roughly 4 percentage points. In the high birth rate projection, the expected total fertility rate is 1.7, which was the baseline assumption in 2016. With this assumption, the share of the statutory expenditure of GDP would be below the current level in the long run. At the end of the projection period, the TyEL contribution would be about 3 percentage points below the baseline projection.

The incidence rate of disability pensions has a great impact on the statutory pension expenditure. In the high incidence rate projection, the incidence rate of disability pensions decreases at a slower pace than in the baseline projection, settling at 19 per cent above the baseline projection at the end of the projection period. In the high incidence rate projection, the expected effective retirement age for 2025 is 62.3 years, which is about one month below the set target of 62.4 years. In the low incidence rate projection, the target is exceeded by 0.3 years. In the long run, a high incidence rate would increase the TyEL contribution rate by 0.8 percentage points, while a low incidence rate would decrease the TyEL contribution by 0.8 percentage points compared to the baseline projection.

In the long run, an increase in the earnings growth by half a percentage point would decrease the pension expenditure relative to GDP by approximately one percentage point compared to the baseline projection. The purchasing power of pensions would grow significantly, even though the pensions would decrease by more than three percentage points relative to the average earnings. In the long run, the TyEL contribution rate would be approximately 0.7 percentage points below that of the baseline projection. The effects of a slow growth rate would be the opposite.

The employment rate affects the pension expenditure relative to the wage sum 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 be lower than those in the baseline projection. In the latter part of this century, a constant deviation from the baseline projection would not show in the pension expenditure relative to the wage sum or the 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 value of pension assets and, in the long run, lead to a lower TyEL contribution rate. A one-percentage-point increase in investment returns would reduce the contribution rate by slightly less than one percentage point in 2030 and by more than four percentage points towards the end of the century.

An optimistic economic scenario combines high employment rates with fast earnings growth and high investment returns. High employment rates and a fast earnings growth reduce the pension expenditure relative to GDP. In the long run, this ratio will remain slightly over one percentage point below the baseline projection. In addition, high investment returns will lower the contribution rate. The TyEL contribution will be several percentage points below the baseline projection. In the optimistic scenario, the average pension will be

considerably higher than in the baseline projection. However, in the optimistic economic scenario, pensions relative to average earnings will stay below that of the baseline projection. This is due to the fast earnings growth.

The pessimistic economic scenario combines low employment rates with slow earnings growth and low investment returns. In the long run, the ratio of pension expenditure to GDP will be 1.4 percentage points higher than in the baseline projection. The TyEL contribution will be higher than in the baseline projection as of the early 2020s. At the end of the projection period, the TyEL contribution will be over 34 per cent. In the pessimistic economic scenario, the average pension will be lower but the ratio of pensions relative to average earnings will be higher than in the baseline projection.

TIIVISTELMÄ

Raportissa esitetään Eläketurvakeskuksen vuoden 2019 pitkän aikavälin laskelmat lakisääteisten eläkemenojen ja etuustason kehityksestä. Työeläkejärjestelmien osalta raportti sisältää myös rahoituslaskelmia, joiden keskeisimpiä tuloksia ovat TyEL-maksun ja -varojen kehitys vuosille 2019–2085.

Laskelmissa käytetään Tilastokeskuksen väestöennustetta vuodelta 2018, jota on jatkettu Eläketurvakeskuksessa vuoteen 2085 saakka. Ennusteen mukaan Suomen väestö kasvaa 2030-luvun puoliväliin saakka, jonka jälkeen se kääntyy laskuun. Vuoden 2017 lopussa väestön määrä oli 5,51 miljoonaa, ja sen arvioidaan olevan 5,1 miljoonaa vuonna 2085. Väestön vähenemisestä huolimatta 65 vuotta täyttäneiden määrä kasvaa vuoteen 2080 asti. Sen sijaan työikäisten ja lasten määrä vähenee laskentajakson aikana.

Vanhushuoltosuhteen (65 vuotta täyttäneet suhteessa 15–64-vuotiaisiin) kasvu jatkuu vuoteen 2085 asti. Vuonna 2017 vanhushuoltosuhde oli 34,2 prosenttia ja sen arvioidaan olevan 66,1 prosenttia vuonna 2085. Vanhushuoltosuhteen heikkeneminen lähitulevaisuudessa johtuu Suomen nykyisestä ikärakenteesta. Eliniän jatkuva pidentyminen sekä matala syntyvyys kuitenkin aiheuttavat sen, että vanhushuoltosuhde heikkenee koko ennustejakson ajan. Vuonna 2017 vastasyntyneen elinajanodote oli 81,5 vuotta. Ennusteen mukaan se nousee vuoteen 2085 mennessä lähes 91 vuoteen.

Työllisyysaste vuonna 2018 oli 71,7 prosenttia. Työllisyysennusteen mukaan työllisyysaste nousee siten, että vuonna 2025 se on 73,4 prosenttia. Tämän jälkeen työllisyysaste pysyy runsaassa 73 prosentissa vaihdellen hieman työikäisten ikärakenteen mukaan. Työllisyysasteen nousu on seurausta lähinnä työvoimaosuuden kasvusta erityisesti vanhemmissa ikäryhmissä. Ikääntyneiden työllisyyttä kasvattaa osaltaan se, että eläkkeelle siirtymisen odotetaan myöhentyvän muun muassa vuoden 2017 työeläkeuudistuksen seurauksena. Vuonna 2018 eläkkeellesiirtymisiän odote oli 61,3 vuotta. Laskelman mukaan se on 62,5 vuotta vuonna 2025 ja kasvaa runsaaseen 65 vuoteen laskentajakson lopulla.

Vanhuuseläkkeen suuruus sopeutetaan eläkeikäisten elinajanodotteen muutokseen elinaikakertoimen avulla. Elinaikakertoimen arvo lasketaan jokaiselle syntymävuosiluokalle erikseen. Vuonna 2019 elinaikakerroin oli 62 vuotta täyttäville 0,95722. Vuonna 2030 se on 0,91 ja vuonna 2085 se on 0,85. Myös alin vanhuuseläkeikä kytketään elinajanodotteen kehitykseen vuonna 1965 syntyneistä alkaen. Alin vanhuuseläkeikä on 66 vuotta 8 kuukautta vuonna 1980 syntyneille ja vuonna 2000 syntyneille se on noin 68 vuotta.

Lakisääteiset kokonaiseläkemenot olivat 13,4 prosenttia bruttokansantuotteesta vuonna 2017. Eläkemeno suhteessa BKT:een pysyy kutakuinkin nykyisellä tasolla vuoteen 2030 asti. Osuus on pienimmillään vuosisadan puolivälissä runsaassa 12 prosentissa, jonka jälkeen se kääntyy jälleen kasvuun. Korkeimmillaan osuus on laskentajakson lopussa, jolloin eläkemenot nousevat noin 15 prosenttiin bruttokansantuotteesta. Koko talouden työeläkemeno suhteessa talouden työtulosummaan oli 31,6 prosenttia vuonna 2017. Työeläkemenon suhde työtulosummaan kasvaa noin vuoteen 2030 saakka, jolloin se on noin 33 prosenttia. Tämän jälkeen suhde alenee, ja vuonna 2050 työeläkemeno on noin 30 prosenttia työtulosummasta. Tämän jälkeen työeläkemeno suhteessa työtulosummaan kasvaa saa-

vuttaen 37 prosentin tason laskentajakson lopulla. Työeläkemenon kasvu suhteessa työtulosummaan on seurausta erityisesti työikäisen väestön supistumisesta.

Vuonna 2017 keskieläke oli 1 656 euroa kuukaudessa. Eläkkeiden ostovoima kasvaa jatkuvasti ja vuonna 2085 keskimääräinen eläke on yli 3 500 euroa vuoden 2017 hintatasossa. Keskieläkkeet kehittyvät lähivuosina samaa tahtia yleisen ansiotason kasvun takia. Keskiansioihin suhteutettu eläketaso kääntyy laskuun vuoden 2020-luvun alkupuolella. Tärkein syy alenemiselle on elinaikakerroin, joka sopeuttaa etuustason vastaamaan muutoksia elinajanodotteessa. Myös työntekijän eläkemaksu ja julkisen sektorin eläke-etuihin 1990-luvun aikana tehdyt muutokset vaikuttavat tähän kehitykseen. Kelan eläkkeiden tasoon vaikuttaa ratkaisevasti näihin eläkkeisiin tehtävät harkinnanvaraiset muutokset. Tässä laskelmassa käytettävän oletuksen mukaan Kelan eläkkeiden korotukset ovat inflaatiota suurempia mutta jäävät jälkeen ansiotason kasvusta.

Eri sukupuolten omaeläkejakaumissa ei tapahdu merkittäviä muutoksia laskentajakson aikana, mutta sukupuolten väliset eläke-erot pienenevät. Eri koulutustasojen eläkkeet kehittyvät suurin piirtein samaa tahtia koko laskentajakson ajan. Poikkeuksena ovat perusasteen koulutuksen suorittaneet, joiden eläkkeet kehittyvät muita ryhmiä hitaammin. Tulevaisuudessa peruskoulutettujen ryhmään valikoituu keskimäärin enemmän lyhyen työuran tekeviä henkilöitä sekä vain osan työurastaan Suomessa tehneitä maahanmuuttajia.

Laskelman mukaan TyEL-maksu nousee 24,3 prosentista vuonna 2017 noin 25 prosenttiin 2020-luvun lopulla. Maksutaso alkaa nousta voimakkaasti vuosisadan puolivälissä erityisesti matalan syntyvyyden takia. TyEL-maksu saavuttaa 30 prosentin tason vuoteen 2085 mennessä. Laskelman lopussa maksutaso on kestävällä tasolla. Vuosisadan loppupuolella myös TyELvarat kasvavat suhteessa palkkasummaan. Sen sijaan eläkemenoon suhteutettuna TyELvarat pysyvät vakaina.

Pitkän aikavälin rahoitustarpeen huomioiva TyEL-maksun riittävä vakiotaso olisi 26,7 prosenttia. Vuonna 2017 TyEL-maksu oli 24,3 prosenttia TyEL:n palkkasummasta. Vastaavasti JuEL:n kunnallisten eläkkeiden eläkemaksun riittävä vakiotaso olisi 27,6 prosenttia suhteessa kuntasektorin palkkasummaan. Vuonna 2017 JuEL:n kunnallisten eläkkeiden maksutulo oli 28,5 prosenttia suhteessa vastaavaan palkkasummaan. Kaikkien työeläkelakien eläkemenojen rahoittamiseen riittävä maksutaso suhteessa koko talouden työtulosummaan olisi 29,0 prosenttia. Vuonna 2017 peritty vertailukelpoinen maksutulo oli 29,2 prosenttia.

Raportissa tutkitaan tulosten herkkyyttä keskeisimpien oletusten suhteen.

Kuolevuuden kehitys vaikuttaa eläkeikien kehitykseen sekä myös etuustasoon elinaikakertoimen vuoksi. Nämä sopeutusmekanismit eivät kuitenkaan poista eliniän kasvun menovaikutuksia täysimääräisesti. Ensinnäkään ne eivät vaikuta jo eläkkeellä olevien eläketasoon, eikä elinaikakerrointa sovelleta Kelan eläkkeisiin. Eläkeiän nousu ei myöskään täysimääräisesti vaikuta todelliseen eläkkeellesiirtymisikään. Tämä ilmiö korostuu, jos eläkeikä nousee nopeasti nopean eliniän kasvun myötä.

Syntyvyys vaikuttaa eläkejärjestelmän rahoitukseen noin kahdenkymmenen vuoden viiveellä syntyvien lasten vartuttua työikäisiksi. Matalan syntyvyyden vaihtoehdossa oletus kokonaishedelmällisyysluvusta on 1,2. Laskentajakson lopussa eläkemenot suhteessa BKT:seen kasvavat 2,4 prosenttiyksiköllä verrattuna peruslaskelmaan. Vaikutus TyEL-maksuun laskentajakson lopussa on noin neljä prosenttiyksikköä. Korkean syntyvyyden

skenaariossa kokonaishedelmällisyysluku on 1,7, mikä oli edellisen laskelman perusoletus. Tällä oletuksella lakisääteisten eläkemenojen osuus bruttokansantuotteesta jäisi pitkällä aikavälillä nykytason alapuolelle. TyEL-maksu olisi laskentajakson lopussa noin kolme prosenttiyksikköä peruslaskelmaa matalampi.

Työkyvyttömyyseläkkeiden alkavuudella on suuri merkitys lakisääteiseen eläkemenoon. Korkean alkavuuden vaihtoehdossa työkyvyttömyyseläkealkavuus alenee peruslaskelmaa hitaammin ja asettuu laskentajakson lopussa 19 prosenttia peruslaskelmaa korkeammalle tasolle. Korkean alkavuuden laskelmassa eläkkeellesiirtymisiän odote vuodelle 2025 on 62,3 vuotta, mikä alittaa asetetun 62,4 vuoden tavoitteen noin kuukaudella. Matalan alkavuuden skenaariossa tavoite ylitetään 0,3 vuodella. Pitkällä aikavälillä korkea alkavuus kasvattaa TyEL-maksua 0,7 prosenttiyksikköä ja matala alkavuus alentaa sitä 0,8 prosenttiyksikköä.

Ansiotason kasvuvauhdin nousu puolella prosenttiyksiköllä peruslaskelmaan verrattuna alentaisi eläkemenojen suhdetta bruttokansantuotteeseen noin prosenttiyksikön verrattuna perusvaihtoehtoon pitkällä aikavälillä. Eläkkeiden ostovoima kasvaisi oleellisesti, mutta eläkkeiden suhde keskiansioihin alenisi pitkällä aikavälillä yli kolme prosenttiyksikköä peruslaskelmaa matalammaksi. TyEL-maksu alenisi pitkällä aikavälillä noin 0,7 prosenttiyksikköä verrattuna peruslaskelmaan. Hitaan kasvuvauhdin vaikutukset olisivat päinvastaiset.

Työllisyys vaikuttaa työeläkemenoon työtulosummaan suhteutettuna lyhyellä ja keskipitkällä aikavälillä. Jos työllisyys jää peruslaskelman urasta, myös työeläkkeitä karttuu peruslaskelmaa vähemmän. Vuosisadan loppupuolella työllisyyden tasainen poikkeama perusurasta ei näy erona työtulosummaan suhteutetussa työeläkemenossa tai TyEL-maksussa.

Eläkevarojen tuotto vaikuttaa maksutasoon ja eläkevarojen määrään. Sijoitustuottojen nousu kasvattaisi aluksi eläkevarojen määrää ja pidemmällä aikavälillä alentaisi TyEL-maksun tasoa. Prosenttiyksikön nousu sijoitustuotoissa alentaisi TyEL-maksua vuonna 2030 vajaan prosenttiyksikön ja vuosisadan loppupuolella vaikutus olisi yli neljä prosenttiyksikköä.

Optimistisessa talousskenaariossa on yhdistetty korkea työllisyys, nopea ansiotason kasvu ja korkeat sijoitustuotot. Korkea työllisyys ja nopea ansiotason kasvu alentavat eläkemenoa suhteessa bruttokansantuotteeseen. Tämä suhde jää pitkällä aikavälillä runsaan prosenttiyksikön matalammaksi kuin perusvaihtoehdossa. Edellä mainittujen tekijöiden lisäksi maksutasoa alentavat korkeat sijoitustuotot. TyEL-maksu jää useita prosenttiyksikköjä perusvaihtoehtoa matalammaksi. Keskimääräinen eläke on optimistisessa skenaariossa oleellisesti perusvaihtoehtoa korkeampi. Kuitenkin eläkkeet suhteessa talouden keskiansioon jäävät optimistisessa vaihtoehdossa perusvaihtoehtoa matalammaksi. Tämä johtuu nopeasta ansiotason kasvusta.

Pessimistisessä talousskenaariossa on yhdistetty matala työllisyys, hidas ansiotason kasvu ja matalat sijoitustuotot. Eläkemeno suhteessa bruttokansantuotteeseen muodostuu pitkällä aikavälillä 1,4 prosenttiyksikköä korkeammaksi kuin perusvaihtoehdossa. TyEL-maksu on perusvaihtoehtoa korkeampi 2020-luvun alkupuolelta alkaen. Laskentajakson lopussa TyEL-maksu saavuttaa yli 34 prosentin tason. Keskimääräinen eläke on pessimistisessä skenaariossa perusvaihtoehtoa matalampi. Eläkkeiden taso suhteessa talouden keskiansioon muodostuu kuitenkin perusvaihtoehtoa korkeammaksi.

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

Other pension acts

LUTUL	Act on Farmers' Early Retirement Aid
REL	Front Veterans' Pensions Act
SOLITA	Pensions based on Workers' Compensation Act (TyTAL), Motor Liability Insurance Act (LVL) and different military injuries acts.

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 incidence rate

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

earned income

Includes wages and salaries, as well as the income insured by the self-employed.

expected effective retirement age

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

old-age retirement rate

Number of (new) old-age retirees during a calendar year divided by the number of persons eligible for old-age pension.

(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.

retirement rate

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

termination rate

Number of terminating pensions during a calendar year divided by the number of pensions in payment.

wage sum

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

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1 Introduction

This report presents the Finnish Centre for Pensions' long-term projection of the development of statutory pensions for the period 2019–2085. For a while now, the Finnish Centre for Pensions has published reports on the long-term development of statutory pensions.[1] The previous similar report was published in the autumn of 2016 (in Finnish; in 2017 in English) (Tikanmäki et al. 2017). The next long-term projections are planned to be published in 2022.

Statutory pensions under review are earnings-related pensions and Kela pensions (national and guarantee pensions), as well as special benefits based on the Military Injuries Act, the Compensation for Military Injuries Act, the Motor Liability Insurance Act and the Workers' Compensation Insurance Act (SOLITA pensions). Earnings-related pension insurance covers almost all earnings by both wage and salary earners and the self-employed. The earnings-related pension serves to ensure that the insured and their family will 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 permanent residents of Finland with a minimum income in old age or in the event of incapacity for work. SOLITA pensions provide benefits in certain special cases. In 2017, the statutory pension expenditure was 30 billion euros, of which 90 per cent were earnings-related pensions, 8 per cent Kela pensions and 2 per cent SOLITA 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, pension financing and pension benefits.

Compared to the report published in 2016, the pension scheme has changed very little as the 2017 pension reform was taken into account already in that report. The most important changes have been the deviations in the calculation of the national pension index in 2018–2019, as well as the discretionary increases to the guarantee pension made in 2018–2019. These affect the development of the pensions paid by Kela and, to a minor degree, the total pensions.

The Incomes Register (introduced at the beginning of 2019) affects the timing of the payment of TyEL contributions. In the future, most of the earnings-related pensions contributions will be disbursed to the pension provider during the month after the wages were paid. This change does not require a change to the projection models.

When making the projections, it has been necessary to decide which factors to take into account. The transfer of the labour force between the private and the public earnings-related pension acts due to the drafting of the health, social services and regional government reform that was under way at the time these projections were made has not been taken into account in this report. Similarly, the merging of the municipal pensions of JuEL into TyEL that is currently being considered has also been excluded from this report. As in the

1 Kesälä (2017) has compared the results of the previous reports with actual outcomes.

previous projections, the conditional raising of the lower limit for the right to additional days of the unemployment allowance agreed on in connection with the 2017 pension reform has been assumed to be realised.

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 20 November 2018 in which the future development of earnings, employment and expected 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 have been made at the Finnish Centre for Pensions.

In the 2016 report, the expected real return on investments was 3 per cent for the first ten years. Due to the current low interest rate, the expected real return on pension assets has been reduced to 2.5 per cent for the next decade. After that, the expected real return goes up to 3.5 per cent, which was the long-term expected real return rate of the previous report. The assumptions used in this report have been selected so that they make sense individually and form a consistent whole.

The transition probabilities between modelled population states and the starting point of the projections presented in this report are based on the register data available to the Finnish Centre for Pensions. This data is reliable and comprehensive, apart from some minor deficiencies. The trends observed in the register data on the transitions to disability and old-age pensions have been extended into a new age range. Data on starting partial old-age pensions is available for 2017–2018 but for starting years-of-service pensions only for 2018.

The starting point of the projections is the realised situation at year-end 2017. The economic development, that is, the investment returns, employment rates, growth in earnings and index development, has been taken into account up to the end of 2018. In addition, the development in pension contingencies in 2018 has been taken into account insofar as it deviated considerably from the situation in 2017. The data for 2018 is partly based on preliminary estimates. The calculations have been made based on the data available at the end of January 2019.

The TyEL financing projections adhere to current funding regulations. In reality, the TyEL contribution is determined each year as part of the TyEL calculation criteria. A central limitation as regards the TyEL contribution is that the provision for pooled claims intended for the jointly financed pensions must always exceed a set minimum limit. Changes are made to the TyEL calculation criteria during the projection period regarding the allocation of the increase of funded pensions and the mortality factor. The timing of the TyEL contribution is left at the discretion of the projection maker due to the funding regulations. The projections aim for an even development of the contribution and a sensitivity to changes in pension expenditure.

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

The appendices include supplementing projections and offer more details on the modelling framework and the assumptions used. Appendix 1 includes alternative assumptions of the

indexing of the national and guarantee pensions. Appendix 2 presents an assessment of the constant contribution levels sufficient to finance expenditures indefinitely. Appendix 3 includes estimates of the capital values of accrued pension rights. This review has been expanded to a funding balance analysis based on an open group analysis, which includes not only the accrued pension rights bus also the pension rights that will accrue in the future and the future pension contributions. Appendix 4 presents a projection of the generational return of the TyEL scheme.

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. The Finnish Centre for Pensions requested the Actuarial Society of Finland to select one or two persons to review the content of this report. Professor Lasse Koskinen (Tampere University) was appointed for the task. His evaluation (in Finnish) was published online at www.etk.fi. A corresponding review was made and published also of the 2016 report.

2 Statutory pension benefits and pension financing

The earnings-related pension system consists of several pension acts. Together, they cover the different sectors of the economy. 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 under one of the pension acts. The acts do not apply to small-scale or temporary self-employment or self-employment while drawing an old-age pension. The sector of the employer or the type of the entrepreneurial activity determine which pension act is applied. The age at which the insurance obligation ends will rise gradually by two years from the current 68 to 70 years.

For the most part, the rules for determining pension benefits are uniform in all pension acts. Historically, there have been significant differences in these rules. At present, there are substantial differences between the pension acts 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[2]. The financing technique[3] of private sector earnings-related pensions is also described on the website.

2.1 Pension acts included in the report

The projections in this report are based on the Finnish earnings-related pension acts.

Private sector:

- Employees Pensions Act (TyEL),
- Seafarer's Pensions Act (MEL),
- Self-employed Persons' Pensions Act (YEL),
- Farmers' Pensions Act (MYEL),
- Act on Farmers' Early Retirement Aid (LUTUL),
- Farm Closure Act (LUEL), and
- Act on supplementary pensions under the Employees Pensions Act (TEL-L).

Public sector:

- Public Sector Pensions Act (JuEL), and
- the pension regulations for the employees of the Bank of Finland and the regional government of Åland.

2 https://www.etk.fi/en/the-pension-system/pension-security/earnings-related-pension-benefits/

3 https://www.etk.fi/en/the-pension-system/pension-financing-and-investments/financing-principals/financing-technique/

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). The public sector financial regulations were kept separate. The financing of pensions under JuEL are 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, and
- Act on the Social Insurance Institution of Finland.

Currently, the earnings-related pension schemes are no longer governed by one field-specific pension act, as was the case before the 2017 pension reform. To avoid confusion, and contrary to the terminology used in our previous reports, we do not refer to projections that are specific to a pension act when public sector pensions are included in the review. Instead, we talk about projections that are specific to a pension scheme. Pension schemes refer to the aforementioned 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])[4]. The pensions of the employees of the Evangelical-Lutheran Church and Kela are handled 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).

The projections also include the Act on compensation for Pension Accrual from State Funds for Periods of Childcare (of children 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.

For the most important pension schemes (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 expenditure. 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 concern both expenditure and financing. The financing rules of public sector pensions are not as detailed as those of the private sector. That is why the financing of public sector pensions is covered only in the projections of the constant contribution rates in Appendix 2 and in the open group analysis in Appendix 3.

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,

4 Strictly speaking, JuEL municipal pensions refer in this report to the pension system of Keva's member corporations. They include the municipalities, the federations of municipalities, Keva itself and the Municipal Guarantee Board. Under certain conditions, some associations of the municipal sector, foundations, universities of applied sciences and corporations owned by the municipalities may be member corporations of Keva.

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

The so-called *Lex Lindström*, an act on pension assistance, has not been taken into account in the projections, as the benefit paid under this act is not an actual pension. The pension assistance expenditure is low and it ends within a few years without a separate decision.

The so-called SOLITA pensions consist of pensions or life annuities paid based on the following acts:

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

The SOLITA pensions have been included in this projection only in general terms. The projections include also the pension expenditure of the predecessors of the aforementioned acts.

2.2 Benefit types and levels

2.2.1 Earnings-related pensions

In the following, we present a broad outline of the currently valid determination rules of earnings-related pensions. The benefits in various acts are fairly uniform. Historically speaking, there have been significant differences in these rules in the public sector, some of which are still being transitioned out of. For example, the retirement age of some public sector employees is still lower than for those in the private sector. In addition, in the public sector, the eligibility for disability pension is based on a definition of vocational disability. Soldiers and other state special groups 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 a pension and cannot insure their work. Pension accrues at a rate of 1.5 per cent of the annual gross earnings for insured persons of all ages. During a transition period until 2025, pension will accrue at a rate of 1.7 per cent of the earnings for persons aged between 53 and 62 years.

According to the earnings-related pension acts, pension accrues during periods of the following social benefits: the earnings-related unemployment allowance, the parenthood allowance, the sickness allowance, 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.

Regardless of age, the pension accrual rate for social benefits is 1.5 per cent per year. The earnings used in the accrual of pensions are calculated from the earnings that the actual benefit is based on. For the parental allowance, the basis for the pension is 117 per cent of the earnings. For earnings-related unemployment benefits, the percentage is 75, and 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 child care 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 742 euros per month (at 2019 prices). This amount is tied to the wage coefficient.

Age limits

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 of a pensioner will remain stable. However, the retirement age can rise by no more than two months per age cohort.

The target retirement age is defined for each age cohort. By deferring retirement until the target retirement age, the pension increase for late retirement will offset the effects of the life expectancy coefficient. When determining the target retirement age, possible new pension rights earned during the period that retirement is deferred are not taken into account.

The insurance obligation ends at age 68 for those born in 1957 and earlier. For those born between 1958 and 1961, the age limit 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.

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 wages weigh 80 per cent and changes in consumer prices weigh 20 per cent. Pensions in payment are adjusted using an earnings-related pension index, in which changes in wages 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.

Benefits

Earnings-related benefits are the disability, old-age, partial old-age, years-of-service and survivors' pensions. No new part-time pensions are granted, but some previously granted pensions of this type are still in payment.

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 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 of the annual earnings. 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 later 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. The old-age pension of a person who gets 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 aged 61 or above can draw partial old-age pension. Persons born in 1964 can draw the pension 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 insured can draw either 25 or 50 per cent of the accrued old-age pension as a partial 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 from when the pension is taken to the month that the insured reaches their retirement age. 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 after the retirement age.

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. The total amount of the surviving spouse's 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 survivors' pension is of the same amount as the deceased person's pension. If the surviving spouse is the only beneficiary, the survivors' pension amounts 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.

Life expectancy coefficient

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

2.2.2 National and guarantee pension

The national pension and the guarantee pension secure an income for pensioners with a small or non-existing earnings-related pension. For the most part, the types of pension benefits and the entitlement criteria in the national pension scheme are identical to those in the earnings-related pension scheme. 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. In 2019, the full national pension is 629 euros per month for a single person. For a married or cohabiting person, it is 558 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 56 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 also reduces 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 in a country that Finland has a social security agreement with.

The guarantee pension raises the level of the smallest pensions to a minimum pension level. In 2019, this minimum level is 785 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.

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 the 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 the Parliament, the national and guarantee pensions have undergone occasional discretionary increases. The national pension was increased at the beginning of 2008 and the guarantee pension at the beginning of 2019. The national pension index itself was cut or frozen both in 2015 and in 2017–2019, due to which the index development has lagged behind that of the consumer price index.

2.2.3 SOLITA pensions

Based on the Motor Liability Insurance Act (LVL), a disability pension is paid if a permanent injury has led to a loss of earnings. Based on the Workers' Compensation Act (TyTAL), 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. Military injuries and service-related illnesses are compensated based on the Act on Compensation for Military Accidents and Service-related Illnesses. 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, SOLITA benefits are primary in relation to the earnings-related pension. They also reduce Kela pensions.

2.3 Pension financing

Since their inception, pension acts governing private sector employees have applied a financing technique that uses partial funding. A given part of the annual pension accrual is pre-funded while the rest of the pension is financed with annual contribution income through the pay-as-you-go (PAYG) system. In recent years, approximately one fifth of the private sector pension expenditure has been financed with pre-funded pension assets.

State and municipal earnings-related pensions were financed according to the PAYG principle until the end of the 1980s. In 1988, the Local Government Pensions Institution (now Keva) began funding pensions in order to curb the increase of the pension contribution rate. The State Pension Fund was established in 1989 to accommodate future state pension expenditure. Funding began in the following year.

Since the inception of the pension schemes for the self-employed and farmers, their pension expenditure has been financed according to the PAYG principle. The State contributes to the financing of these pension schemes.

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

The Employment Fund pays a contribution to the earnings-related pension scheme each year. The contribution is used to finance the pension expenditure of earnings-related pensions that accrue for periods of unemployment, adult education and job alternation leaves. This contribution is called the TVR contribution.[5]

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 for 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 and return on shares, the funded components of old-age pensions are increased. In addition, the contributions of 53–62-year-old employees are used to increase the funded components until 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.

5 The Employment Fund launched its operations at the beginning of 2019 when the Unemployment Insurance Fund (TVR) and the Education Fund merged. The TVR contribution is an established term. The acronym TVR refers to the Unemployment Insurance Fund which used to pay the contribution.

Increases to funded pensions can be targeted in varying amounts to different age groups in order 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 2019, the contribution rate was 20.0 per cent of the wage sum. The employer's share of the contribution is 12.8 per cent and the average employee contribution is 7.2 per cent. The employee's share of the contribution is determined according to TyEL. The State contributes nearly one third of the pension expenditure for sailors.

2.3.2 YEL and MYEL

The pension expenditure and administration 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 YEL contribution rate corresponds roughly to the average TyEL contribution rate. The average MYEL contribution rate equals approximately half of the TyEL contribution rate.

In 2017, the State paid approximately 15 per cent of the YEL expenditure and nearly 80 per cent of the MYEL expenditure. The large role of the State regarding MYEL financing is due to an unfavourable age structure 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. The projections are based on current pension laws and other regulations. Exceptions to this principle are described in the report. Future changes to laws that were known at the time of making the projections have been taken into account. Some of the regulations of the 2017 pension reform will come into force in the 2020s. There are no other significant and approved changes to law that have not already come into force.

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 neutral assumptions that are neither underestimates nor overestimates. In particular, we have not used margins when selecting the assumptions. When available, we have turned to international literature and expert estimates when selecting the assumptions.

3.1 Population

The population projection in the baseline scenario follows Statistics Finland's population projection from 2018 (Statistics Finland 2018a), which covers the period up to 2070. To be exact, the population projection in this report adheres to the assumptions of the projection of Statistics Finland, but it has been recalculated at the Finnish Centre for Pensions. Thanks to the recalculation, it has been possible to extend the population projection beyond 2070 and to make sensitivity analyses of factors relating to the population. This report's population figures differ slightly from those of Statistics Finland's population projection.

The starting year for the population projection is 2017. The main assumptions made in the forecast are as follows:

1. the total fertility rate is 1.45,
2. net migration is 15,000 persons per year, and
3. the decrease in mortality rates observed in 1987–2017 will continue in 2018–2070.

The population projection has been extended beyond 2070 according to the assumptions above, apart from the decrease in the mortality rate, the rate of which is reduced to half after 2070. The basis for this reduction is that, when compared to other population projections, the increase in life expectancy by 2070 is high in the population projection by Statistics Finland. For example, the projected life expectancies in 2070 in a report by the Working Group on Ageing Populations and Sustainability (AWG) (European Union 2017) are lower than what is presented in this report in all member states, including Finland.

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 63 will rise from

19.8 years in 2017 to 27.5 years in 2085. For women, the rise is from 23.5 years to over 30 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. Cohort-specific life expectancies are calculated using the mortality rates available for each birth year cohort. In 2017, the cohort life expectancy for men at age 63 was 22.0 years and for women 25.9 years. (Appendix 5).

The old-age dependency ratio (the ratio of persons aged 65 and over to 15–64-year-olds) will rise from 34.2 per cent in 2017 to more than 43 per cent by 2030. In 2085, the old-age dependency ratio will be over 66 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.

The share of the population that has reached retirement age will grow slower than the share of the population that has turned 65 years because the retirement ages will rise during the projection period. In 2017, a total of 1,325,000 persons were of pensionable age, that is 63 years. In 2030, those born in 1965 will have reached their retirement age, which is 65 years and 2 months. At that time, a total of 1,454,000 persons will be of pensionable age. In 2085, at the end of the projection period, those born in 2016 will be able to retire (at 69 years). At that time, a total of 1,566,000 persons will have reached their retirement age. (Table 3.1.)

Table 3.1.
Population projection for the years 2017–2085

3.1.1 Life expectancy at age 63

	2017	2020	2025	2030	2045	2065	2085
Total	21.7	22.3	23.1	23.8	25.6	27.7	28.8
Men	19.8	20.4	21.2	22.0	24.0	26.3	27.5
Women	23.5	24.1	24.7	25.4	27.2	29.1	30.1

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

	2017	2020	2025	2030	2045	2065	2085
Total	5,513	5,544	5,587	5,613	5,571	5,410	5,146
0–14-year-olds	890	867	812	760	724	636	586
15–64-year-olds	3,443	3,419	3,406	3,387	3,299	3,039	2,746
65 years and over	1,179	1,258	1,369	1,466	1,549	1,736	1,815
Old-age dependency ratio, %	34.2	36.8	40.2	43.3	46.9	57.1	66.1

3.1.3 Number of persons who have reached their retirement age (1,000)

	2017	2020	2025	2030	2045	2065	2085
Number of persons who have reached their retirement age	1,325	1,349	1,387	1,454	1,448	1,535	1,566

3.2 Employment and pension incidence rates

The method used to project employment rates is described in Appendix 8. The assumed long-term unemployment rate used in the employment projection is 7.9 per cent. This assumption is in line with the assumptions of the structural unemployment rate of Finland made by various parties (Bank of Finland 2018). In the long run, the rising retirement age will raise the average age of the labour force, which may raise the unemployment rate. In this projection, however, the rising retirement age raises the share of people who are outside the labour force but not retired in the age groups in which retirement on an old-age pension becomes impossible due to the rising retirement age. The disability retirement rates are also high in these age groups. In the projections, the age limit for the right to additional days of unemployment allowance will not rise above 62 years. The resulting increase in the duration of the right to additional days of unemployment allowance causes the number of elderly unemployed to grow, but this factor is already accounted for in the assumption used for the level of structural unemployment.

Changes in the retirement rates reduce the probability for an exit from the labour force. 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 probabilities have been estimated based on register data for 2014–2017. 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 2017. As of 2018, the retirement rates are assumed to be affected by the trends described below. In particular, the 2017 pension reform will affect the retirement rates.

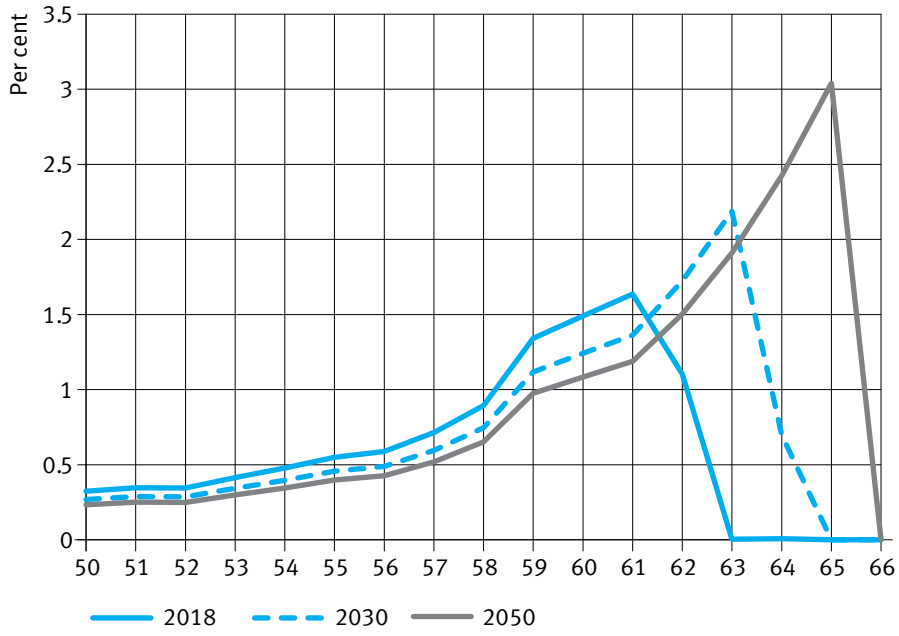
The future development of the disability incidence rate is based on a past trend for the period 1996–2018[6]. During that period, the age-adjusted disability incidence rate decreased, on average, by 2.0 per cent per year. In this report, the past trend is extrapolated to continue, but the rate of decrease has been slowed down by 5 per cent per year. Without the slowdown, the disability incidence rate would finally end up at an implausibly low level. Compared to the 2018 rate, the disability incidence rate will decrease by 11 per cent by 2025 and by 31 per cent by 2065. The reason for the observed decrease in the incidence rate can be ascribed to changes in work tasks, a rising educational level of the workforce and a general improvement in the health of the population. The age-adjusted disability incidence rate will be higher until the end of the 2020s compared to our 2016 long-term projection. After that, it will decrease and be lower than in the previous projection.

As a result of the 2017 pension reform, retirement ages will rise. It is therefore necessary to extrapolate the disability incidence rate for new age groups, which under the previous pension laws would have been entitled to an old-age pension. In previous years, the disability incidence rate has been the higher the older the workers are. This trend has been

6 The disability incidence rate for 2018 is based on the monthly statistics of the Finnish Centre for Pensions. Compared to 2017, the disability incidence rate rose by 7 per cent in 2018.

extrapolated to continue every time the retirement age rises. These choices are explained in more detail in Kautto and Risku (2015). The disability incidence rates for over 50-year-olds is presented in Figure 3.1. The disability incidence rate described here 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 a year after the onset of disability.

Figure 3.1.
Age-specific disability incidence rates of insured working persons over the age of 50 at various cross-sectional years



As retirement ages rise, people who have not reached the retirement age are prevented from retiring on an old-age pension. The old-age pension incidence rates are raised for persons older than that. The lower retirement ages of the public sector, the supplementary pensions under TEL-L and MEL form an exception. For the most part, these lower retirement ages will cease in the 2040s at the latest. All working persons have been assumed to retire on an old-age pension by the time they have reached the age at which their insurance obligation ends.

The partial old-age pension incidence rates are based on observations from 2017 and 2018.

The first years-of-service pensions started in 2018 when the maximum duration for the pension was three months. So far, the years-of-service pension has not been very popular. The assumption is that 2.5 per cent of the men and 2.0 per cent of the women of each working-age group that has reached the required age limit will retire on a years-of-service pension. If calculated by birth year cohort, this means that approximately every tenth working person who meets the requirement of a 38-year-long working life and who is working when

reaching the required age limit will retire on a years-of-service pension. In the 2030s, this will correspond to approximately two per cent of the entire age cohort. As the age limits rise, the share will go down since a smaller part of the age cohort will be working when reaching the age limit for the years-of-service pension. The impact of the incidence rates of the years-of-service pension on the results of this report is minor (Kautto & Risku 2015).

3.3 Growth in earnings level and inflation

The long-term growth in real earnings is assumed to be 1.5 per cent and inflation 1.7 per cent per year. Both assumptions are the same as in the long-term projection of 2016. The assumptions concerning the growth in earnings-level and inflation for the early years of the projection period (2019–2023) are based on the economic forecast drawn up at the Finnish Centre for Pensions in January 2019. In 2019–2021, the average annual real growth in earnings will be 1.0 per cent. After that, it is assumed to reach its long-term growth rate. Inflation is 1.5 per cent in 2019 and 1.6 per cent in 2020. After that, it is assumed to be at the long-term level. The long-term inflation assumption is compatible with the inflation target of the European Central Bank (ECB; 2019), which is slightly below 2 per cent over the medium term. The assumption of a growth rate of 1.5 per cent in real earnings is compatible with estimates of the growth rate of the potential output in Finland[7]. The assumption is close to the observed long-term growth rate. (Table 3.2.)

For simplicity, we assume in the projections that the changes in earnings-related pension contributions do not affect the gross wages of workers. As long as the contribution level does not change considerably, the effect of this assumption is minor.

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 quantities. 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, 1978–2017

Length of period	Years	Growth rate*, %
40 years	1978–2017	1.61
20 years	1978–1997	1.79
	1998–2017	1.43
10 years	1978–1987	1.81
	1988–1997	1.77
	1998–2007	1.97
	2008–2017	0.90

* geometric mean

Source: Own calculation, Statistics Finland (consumer price index and index of wage and salary earnings).

7 The estimated current growth rate of potential output in Finland is 1–1.6 per cent (Mäki-Fränti & Obstbaum 2018; OECD 2018; Ministry of Finance 2018).

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. The real rate of return for pension assets has been derived from the assumed returns of various asset types and their proportional allocations in the investment portfolio. This report includes a short-term (2019–2028) and a long-term (2029–2085) projection for investment returns since the current low interest rate environment 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.

It is impossible to reliably predict the short-term returns on shares. However, the historically high price of shares in relation to their return, a slow economic outlook, population ageing and high public debts in many countries support a more cautious assumption, according to which the return on shares is also likely to be only moderate in the near future.

Due to the exceptional nature of the current investment environment, the assumed real rate of return on pension assets in the baseline projection is projected to be 2.5 per cent in the next 10 years. However, there is no clear reason to think that the current market situation would become permanent. After a 10-year adjustment period, the investment returns are assumed to return to the long-term level used in the 2016 projection, that is, to an annual rate of 3.5 per cent.

In the current challenging investment environment, it is easy to imagine a trajectory in which even the assumption of a 2.5 per cent investment return over the next 10 years is too optimistic. As a rule, our assumption does not strive to be either pessimistic or optimistic. Instead, it aims to be such that a deviation in either direction is equally likely. In section 5.6 we present sensitivity analyses using both higher and lower assumed return rates.

The assumed rate of return for pension assets has been derived according to Tables 3.3 and 3.4. For comparison, the tables also include TyEL pension providers' realised investment allocations per 30 September 2018. This report bypasses a more extensive analysis of the uncertainty relating to the investment returns of pension assets. Instead, we have illustrated the impact of investment returns on the funding of TyEL pensions via sensitivity analyses. The uncertainty relating to the return on pension assets has been discussed in Sankala et al. (2018).

Table 3.3.
Assumed real return on pension assets by asset type, 2019–2028 (%)

	Realised allocation 30 Sept. 2018*	Assumed allocation	Assumed rate of return
Money market investments	4.2	5	0.0
Bonds and loans	30.7	33	0.5
Real estate	11.1	12	3.0
Shares and other investments	54.0	50	4.0
Total	100.0	100	2.5

* TyEL pension providers, source: The Finnish Pension Alliance TELA.

Table 3.4.
Assumed real return on pension assets by asset type, 2029–2085 (%)

	Realised allocation 30 Sept. 2018*	Assumed allocation	Assumed rate of return
Money market investments	4.2	5	0.5
Bonds and loans	30.7	33	1.5
Real estate	11.1	12	4.0
Shares and other investments	54.0	50	5.0
Total	100.0	100	3.5

* TyEL pension providers, source: The Finnish Pension Alliance TELA.

The proportion of investments in shares in the investment allocation used in the projections increases slightly relative to the historical mean (Kautto 2019: 106). The proportion of bonds and loans decreases correspondingly. In the long term, the change reflects, above all, the decision included in the 2017 pension reform to increase the rate of equity-linked buffer funds. The reform allows for a heavier weight on shares in TyEL investments. In the short term, also the low returns of fixed-income securities will affect the increase of the proportion of shares. The proportion of money market investments and real estate correspond rather well to the long-term mean. The proportion of these two investment instruments has remained fairly stable from one year to another. The central economic assumptions and data on realised returns have been compiled in Table 3.5. Comparable time series of statistics on investment returns start from the year 1997.

Table 3.5.
Return on assets, growth in earnings level and inflation, 1997–2085 (%)

		Growth in earnings level[e]		Return on pension assets	
Year	Inflation[d]	Nominal	Real	Nominal	Real[b]
1997–2017[a]	1.5	3.0	1.4	5.9	4.2
1998–2007[a]	1.6	3.6	2.0	7.1	5.4
2008–2017[a]	1.5	2.4	0.9	4.4	3.0
2011	3.4	2.7	-0.7	-3.0	-5.7
2012	2.8	3.2	0.3	8.4	5.9
2013	1.5	2.1	0.6	8.3	6.6
2014	1.0	1.5	0.4	6.8	6.3
2015	-0.2	1.4	1.7	5.0	5.2
2016	0.4	0.9	0.5	5.1	4.0
2017	0.7	0.2	-0.5	7.4	6.9
2018	1.1	1.8[c]	0.7[c]	-0.9[c]	-2.0[c]
2019–2028[a]	1.7	3.1	1.4	4.2	2.5
2029–2085[a]	1.7	3.2	1.5	5.3	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) estimate
d) change in the consumer price index annual mean value
e) change in the index of wage and salary earnings, annual mean value
Source: Own calculations, Statistics Finland and The Finnish Pension Alliance TELA.

Background to assumptions on investment returns

The assumptions on investment returns are based on various expert sources as well as our own calculations and simulations. For simplicity, we have used a return assumption that is at a constant level for the first ten years and at another constant level after that. In the short term, we used Vanguard (2018) as one of the central background materials for the investment return for the period 2019–2028. It includes a global market projection for one decade. With the investment allocation of the TyEL scheme, taking into account the hedging of the currency risk in fixed-income securities, this would result in an average annual real return of 2.5 per cent. Together with other expert evaluations, this formed an overall view of the future investment environment. We compared our own calculations to the sources' assessments by investment category and the overall return rate derived from these. We derived the final figures in Table 3.3 by analysing the results of independent calculations and by selecting the least biased value.

When making the assessments, we took into account the general economic outlook and the impacts of financial policy as well as we could. For example, the return assumption for bonds and loans is based on a view that the ECB will raise rates in 2020. The interest rate program is expected to be considerably more modest than that exercised in recent years by the US central bank, the Federal Reserve System (FED). This is because of its timing in an economic downturn and because of Europe's weaker economic outlook in general. The interest rates are assumed to rise evenly during 2020–2028 to a level of 2–3 per cent. The modified duration of bonds is assumed to be 2.0. This equals the average duration of the investments in bonds by Finnish earnings-related pension providers in 2017. The assumed starting level of the (coupon) rate (1.8%) is also based on the realised return in 2017 (TELA 2019).

Finally, we compared the real return assumption formed based on assessments per investment type (2.5%) with the corresponding return assumption generated though stochastic calculations (2.2%) (Sankala et al. 2018). Of these two options, the 2.5 per cent real return assumption better meets our view of the short-term assumption.

The return assumptions of social security funds in different countries have been compared by, for example, Brière et al. (2018). Western countries included in the comparison are Canada (excl. Quebec), Finland, Sweden, Switzerland and Quebec. The interest levels and pension system regulations are different in the various countries. Hence, there are differences, for example, in equity weights. Due to different circumstances, the return assumptions also vary. In Finland, Switzerland, Canada and Quebec, the used short-term return assumption is lower than the long-term return assumption. The equity weight in Sweden is very similar to that in Finland. The real return assumption used in Sweden is 3.3 per cent throughout the whole projection period.

In several other countries, the return assumptions and targets have been lowered in the last few years due to the low rates. This applies to, for example, the Norwegian pension fund (IPE 2017) and the largest Dutch pension insurer ABP (IPE 2019a). The Netherlands has also set up a committee to establish future discount rate assumptions (IPE 2019b).

3.5 Indexing of Kela pensions

As for the indexing of Kela pensions, we have deviated from current legislation. Under the act on the national pension index, Kela pensions are 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 was made in 2008. As of 2011, the guarantee pension has been paid to those with the smallest pensions. The national pension index has been cut or frozen in 2015, 2017, 2018 and 2019, while discretionary increases have been made to the guarantee pension in 2015, 2018 and 2019.

Overall, Kela pensions have exceeded the long-term increase in consumer prices but have lagged behind long-term earnings growth. The real value of the full national pension rose by approximately 8 per cent from 2000 to 2018. Real earnings grew by 28 per cent during the same period. Taking the guarantee pension into account, the real growth of the minimum pension was 33 per cent during the same period. This is slightly above the earnings growth. However, the increase to the guarantee pension affects only a small portion of those who receive Kela pensions.

In this report, we have assumed that discretionary increases will be made to Kela pensions in the future. In the long run, if Kela pensions were indexed only to changes in consumer prices, they would no longer meet their goal of securing a minimum income. In this report, the technical implementation of future increases in the level of Kela pensions is to tie these benefits to the increases in the earnings level and consumer prices on a fifty-fifty basis as of the year 2024. This choice roughly depicts the realised development of national pensions in the 2000s. In other words, real increases are made to Kela pensions, but the increases lag behind the general growth in earnings. The long-term assumption is the same as in Kela's actuarial report (Kela 2015). Until 2023, Kela pensions will follow the development of consumer prices under the current legislation.

Appendix 1 includes two alternative projections of the indexing of Kela pensions. In one of them, Kela pensions follow consumer prices throughout the projection period. In the other, they follow the earnings development as of the year 2024.

4 Baseline projection

The key results analysed in the baseline projection are the following:

1. pension expenditure and the number of pension recipients,
2. size and distribution of pensions, and
3. the financing of TyEL, YEL and MYEL pensions.

The statutory pension expenditure consists of expenditure from earnings-related pensions, pensions paid by Kela and SOLITA 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 schemes and benefit types. Each pension expenditure is presented in euros at the price level of the starting year and also in relation to its financing base. For earnings-related pensions, expenditures are compared to corresponding sums of earned income. The ultimate financing base of the entire statutory pension system is the national economy, so the statutory pension expenditure is presented in proportion to the gross domestic product (GDP). This presentation also serves international comparisons.

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

The financing projections for TyEL, YEL and MYEL pensions in section 4.6 depict their financing according to current laws and other regulations. Supplementary financing projections on earnings-related pensions can be found in the appendices of this report.

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 employment projection is a prerequisite for making the expenditure projection. It is based on the population projection, the estimated entry and exit rates that depict changing labour force participation, pension contingencies and the assumed employment 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 expected effective retirement age depicts retirement rates in different years in a similar way as life expectancy depicts mortality rates. One of the main aims of the 2017 pension reform was to raise the expected effective retirement age so that it is at least 62.4 years in 2025.

The data presented for 2017 and 2018 are partly a result of the projection and may differ slightly from their actual values as presented in statistics. The money amounts are in 2017 prices.

4.1 Employment, retirement and number of pension recipients

The employment projection has been made using the cohort component method. The method makes use of observed labour force participation rates for different age and gender groups, as well as entry and exit rates that depict changes in labour force participation. The cohort model has been renewed since the 2016 projection. A short description of the method can be found in Appendix 8.

The employment rate will rise from its 2017 level to 73 per cent in the early 2020s. After that the rise will slow down and the rate will settle at below 74 per cent throughout the rest of the projection period. The number of employed persons will grow by 103,000 in the period 2017–2023 and start decreasing in the late 2020s. During the projection period, the number of employed will decrease by 280,000 persons. This is due to the decreased number of working-age people. (Table 4.1.)

Since the unemployment rate will not change significantly during the projection period, the rise in the employment rate is essentially due to the growth of the labour force participation rate. This, in turn, is mainly due to the rising retirement age and decreases in age-specific retirement rates. The ageing demographic structure also raises the employment rate since age-specific employment rates are lower among younger age groups than in the working-age population as a whole.

In the medium term, the employment rate of this report is approximately one percentage point higher than in the projection used as the basis for the sustainability gap calculations of the Ministry of Finance, taking into account the population projection of 2018 (Economic Policy Council 2019: 76). In the long run, the employment rate is essentially the same.

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 schemes. However, this division has limited effects on the total pension expenditure since the pension benefits are, by and large, uniform under the different pension acts.

As a rule, the relative allocation of employed persons covered by different pension schemes is assumed to stay at 2017 levels. There are, however, two important exceptions.

First, the number of MYEL insured has decreased steadily, and this trend is assumed to continue. In 2017, there were 62,000 persons insured under MYEL. The number is assumed to decrease by 58 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 will increase. The assumption regarding the development of the number of persons insured under MYEL roughly follows estimates made by Mela.

Second, the number of state employees has decreased, and this trend will continue. 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 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 after 1980 under TyEL. Because of these regulations, the proportion of employees insured under the state pension scheme of JuEL will decrease while the proportions of employees insured under both the municipal

pension scheme of JuEL and TyEL will increase. The projected development of the number of persons transferring between schemes follows estimates made by Keva. However, the total number of persons insured under JuEL has not been matched up with Keva's estimate.

Many other factors may influence the allocation of workers under different pension schemes. The growth of the elderly population will increase the demand for services provided by the municipal sector. On the other hand, if municipal enterprises are privatised and municipal services outsourced, the number of municipal workers may decrease. Trends of this kind are difficult to anticipate and have not been included in the projection. At the moment, a possible merger of TyEL and the municipal pension scheme of JuEL is being considered (Ministry of Social Affairs and Health 2019). This reform has 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 the data used in this report are register data that depict the situation at the end of each calendar year. There are more employed persons and fewer unemployed persons in the survey data than in the register data.

Table 4.1.
Employment, 2017–2085

4.1.1 Number of employed (1,000)

	2017	2020	2025	2030	2045	2065	2085
TyEL	1,501	1,568	1,605	1,607	1,620	1,527	1,392
YEL	202	210	212	211	210	198	180
MYEL	61	55	45	37	26	25	23
JuEL (State)	131	125	110	99	78	73	66
JuEL (municipal)	478	499	510	513	513	482	439
Private sector	1,770	1,839	1,867	1,860	1,862	1,755	1,599
Public sector	634	649	645	637	616	578	526
Total	2,292	2,373	2,396	2,382	2,363	2,226	2,027

4.1.2 Employment and unemployment rates, %

	2017	2020	2025	2030	2045	2065	2085
Employment rate, 15–64-year-olds	69.6	72.6	73.4	73.1	73.4	73.7	73.8
Share of employed population	41.6	42.8	42.9	42.4	42.4	41.1	39.4
Unemployment rate	8.6	8.0	7.9	7.9	7.9	7.9	7.9

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. The estimate of the development of the retirement age in Table 4.2 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 1973, 67 years for those born in 1984, and 68 years for those born in 1997. (Table 4.2.)

The retirement age in the national pension system 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 system.

The estimate of the development of the life expectancy coefficient is based on population statistics for the years 2003 to 2017. From 2018 onward, it 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 at age 62. As of those born in 1965, the changes in the retirement age will be considered when calculating the life expectancy coefficient. Therefore, the life expectancy coefficient decreases at a slower rate from 2027 onwards. In 2017, the life expectancy coefficient for those who turned 62 that year was 0.96344. According to the population projection, mortality will decrease in such a way that the life expectancy coefficient for the 62-year-olds in, for example, 2025 will be 0.925 and in 2045 it will be 0.889. (Table 4.3.1.)

The target retirement age is the age at which the pension reducing effect of 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 of retirement rates for each year (Table 4.3.2). The calculation principle of the expected effective retirement age is depicted in Kannisto 2018, and the assumptions relating to pension contingencies used in the projection are described in Chapter 3. The expected effective retirement age for a 25-year-old was 61.3 years in 2018. The expected effective retirement age rises to 62.5 years by 2025 and to 65.4 years by 2085. The main cause for the rising effective retirement age is the rising retirement age. However, the expected effective retirement age grows distinctly slower 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 2017, 1.59 million people received a statutory pension. This figure includes, among others, pensioners who live abroad and those who receive only a survivors' pension. This report focuses on 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 2017, 1.47 million persons met this definition. (Table 4.3.3.)

The demographic development and retirement rates are the key factors determining the number of pension recipients. The number of pension recipients will grow strongly until 2030, when it will be 1.6 million. The growth will slow down in the 2030s when the baby boomers born after the wars die. By 2085, the number of pension recipients will be 1.8 million. (Table 4.3.3.)

The number of persons aged over 65 will grow from 1.2 million at year-end 2017 to nearly 1.8 million in 2085. That means that the number of elderly people will grow considerably faster than the number of pensioners. The difference is explained by the rising effective retirement age.

In 2017, there were 64 pension recipients per 100 employed persons. The decreasing number of employed persons and the growing number of pension recipients will lead to a pronounced growth of this ratio in the projection. The number of pension recipients per 100 employed persons will be 69 by 2045 and 88 by 2085.

Table 4.2.
Age limits of the earnings-related pension scheme for those born between 1955 and 2000

Year of birth	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 10 mos	69 yrs
1961	64 yrs 9 mos	66 yrs 3 mos	69 yrs
1962	65 yrs	66 yrs 7 mos	70 yrs
1963	65 yrs	66 yrs 9 mos	70 yrs
1964	65 yrs	66 yrs 10 mos	70 yrs
1965	65 yrs 2 mos	67 yrs	70 yrs
1966	65 yrs 3 mos	67 yrs 2 mos	70 yrs
1967	65 yrs 4 mos	67 yrs 4 mos	70 yrs
1968	65 yrs 6 mos	67 yrs 6 mos	70 yrs
1969	65 yrs 7 mos	67 yrs 8 mos	70 yrs
1970	65 yrs 8 mos	67 yrs 9 mos	70 yrs
1975	66 yrs 2 mos	68 yrs 6 mos	70 yrs
1980	66 yrs 8 mos	69 yrs 2 mos	70 yrs
1985	67 yrs 1 mo.	69 yrs 10 mos	70 yrs
1990	67 yrs 5 mos		70 yrs
1995	67 yrs 10 mos		70 yrs
2000	68 yrs 2 mos		70 yrs

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

Table 4.3.
Life expectancy coefficient, expected effective retirement age and number of pension recipients

4.3.1 Life expectancy coefficient at age 62, 2017–2085

	2017	2020	2025	2030	2045	2065	2085
Coefficient	0.963	0.952	0.925	0.914	0.889	0.863	0.849

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

	2017	2020	2025	2030	2045	2065	2085
Expected effective retirement age	61.2	61.6	62.5	62.8	64.1	65.1	65.4

4.3.3 Pension recipients and employed persons (1,000)

	2017	2020	2025	2030	2045	2065	2085
Employed	2,292	2,373	2,396	2,382	2,363	2,226	2,027
Pension recipients	1,466	1,510	1,559	1,622	1,634	1,732	1,777
Pension recipients/ employed	0.64	0.64	0.65	0.68	0.69	0.78	0.88

4.2 Total pension expenditure

The size of the labour force and the earnings level have a major effect on the pension expenditure in the long run. Earnings-related pensions accrue based on earnings, in addition to which the indexes of the earnings-related pension system follow prices and wages. The projected development of earnings (Table 4.4) is based on the employment projection and the assumption about earnings growth.

The projected development of gross domestic product (GDP) is based on the development of the sum of earned income. In 2017, the sum of earned income was 38 per cent relative to GDP. The projection assumes that the ratio will remain at 38 per cent also in the long run.

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 2017, the statutory pension expenditure amounted to 13.4 per cent of GDP. Until 2030, the number of pensioners will grow but the level of the average pension relative to average earnings will decrease slightly. The ratio of pension expenditure to GDP will remain close to its current level until 2030. After that, the growth in the number of pensioners will slow down, which will decrease the pension expenditure relative to GDP. The ratio will go down to 12.4 per cent by 2045. (Table 4.4 and Figure 4.1).

Around 2050, the decrease in the average pension relative to average earnings will slow down and the number of pension recipients will continue to grow. For these reasons, the ratio of pension expenditure to GDP will start to grow. This trend will continue into the latter half of the century. The pension amounts are reviewed in more detail in sections 4.4 and 4.5.

Earnings-related pensions account for 90 per cent of the statutory pension expenditure. During the projection period, this percentage will rise further. That is why 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, these pensions are indexed until 2023 to changes in consumer prices. As of 2024, the index increases of Kela pensions will take into account not only changes in prices but also half of the real growth in earnings. An indexing that is slower than the earnings growth will reduce the size of Kela pensions relative to 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 entire 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 in countries with which Finland has a social security agreement. 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 SOLITA pensions, the projection does not aim for elaborate details. Instead, these pensions are modeled with a simple estimate 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 SOLITA benefits develop in line with earnings. For those who have reached the retirement age, the SOLITA benefits follow the earnings-related pension index.

Table 4.4.
Total pension expenditure and number of pension recipients 2017–2085 (at 2017 prices)

4.4.1 GDP and earned income (€ billion)

	2017	2020	2025	2030	2045	2065	2085
GDP	223.8	238.9	257.6	276.0	342.0	433.0	530.6
Sum of earned income	85.9	91.2	97.7	104.9	129.9	164.5	201.6

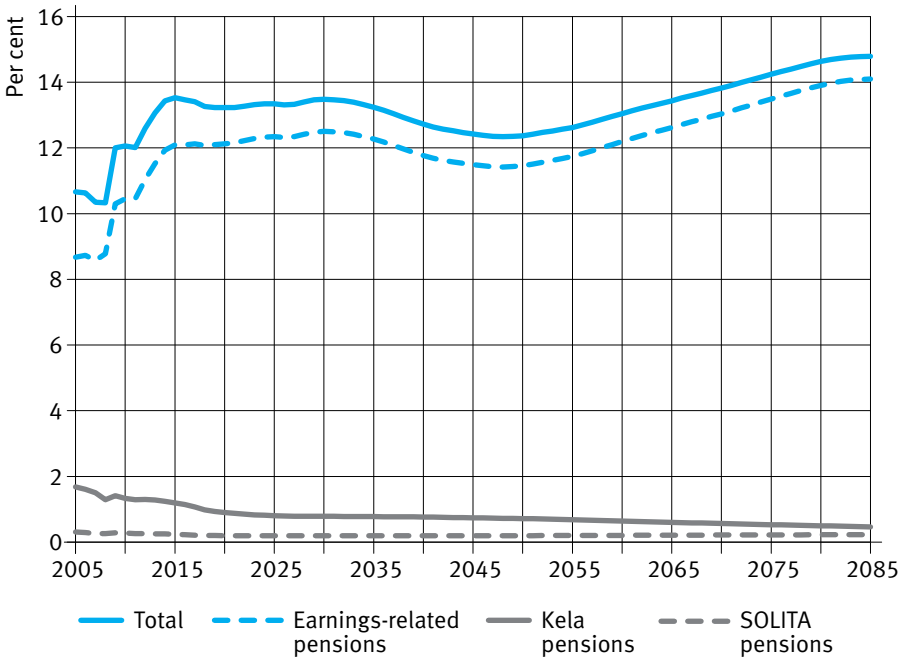
4.4.2 Pension expenditure (€ billion)

	2017	2020	2025	2030	2045	2065	2085
Total pension expenditure	30.0	31.6	34.4	37.2	42.5	58.2	78.5
Earnings-related pensions	27.2	29.0	31.8	34.5	39.3	54.7	74.8
Kela pensions	2.4	2.2	2.1	2.2	2.5	2.6	2.5
SOLITA pensions	0.5	0.5	0.5	0.5	0.7	0.9	1.2

4.4.3 Pension expenditure relative to GDP (%)

	2017	2020	2025	2030	2045	2065	2085
Total pension expenditure	13.4	13.2	13.3	13.5	12.4	13.4	14.8
Earnings-related pensions	12.1	12.1	12.3	12.5	11.5	12.6	14.1
Kela pensions	1.1	0.9	0.8	0.8	0.7	0.6	0.5
SOLITA pensions	0.2	0.2	0.2	0.2	0.2	0.2	0.2

Figure 4.1.
Statutory pension expenditure relative to GDP 2005–2085



4.3 Earnings-related pension expenditure

The development of the earnings-related pension expenditure relative to the economy's sum of earned income is mainly explained by the development of the old-age pension expenditure. The population will age rapidly between 2017 and 2035. At the same time, the earnings-related pension benefits will still be maturing. However, the rising retirement age and the decreasing average pension relative to average earnings will slow down the growth in old-age pension expenditure. The old-age pension expenditure relative to the sum of earned income will start decreasing after 2030. In the latter half of the century, the growing number of retirees combined with the smaller number of employed people will make the ratio grow again. (Table 4.5 and Figure 4.3.)

The disability pension expenditure relative to the sum of earned income has decreased throughout the 2000s. This trend is largely due to the decreasing number of people on a disability pension. The underlying reasons for this trend are, on the one hand, the lower incidence rate of disability pensions and, on the other hand, the fact that the baby boomers have reached their retirement age. However, the disability pension expenditure relative to the sum of earned income will start increasing as the rising retirement age results in a growing number of people retiring on a disability pension. In addition, the benefit level of disability pensions will improve as a result of the 2017 pension reform. In 2000, the disability pension expenditure amounted to 4.2 per cent of the sum of earned income. In 2017, the corresponding figure was 2.3 per cent. In 2018–2035, the expenditure will stay at around

2 per cent, after which it will rise. The disability pension expenditure is projected to rise to over 3 per cent of the sum of earned income by 2085.

The first partial old-age pensions were granted in 2017. 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 recipients will decrease. In addition, the life expectancy coefficient will reduce the level of new pensions relative to average earnings. For these reasons, the expenditure relative to the sum of earned income will slowly take a downward turn after 2025 and stay at 0.3 per cent throughout the projection period. Drawing partial old-age pension early will permanently reduce the part that is drawn early. For this reason, even a large number of partial old-age pensions drawn early will not significantly increase the earnings-related pension expenditure.

Years-of-service pensions have been granted since 2018. At the beginning, it was possible to draw the pension only three months before reaching retirement age. In 2018, 21 persons retired on a years-of-service pension. The annual number of recipients will grow to slightly over 2,000 by the end of the 2020s. As the minimum age for this pension benefit rises, the number of recipients will decrease. When the pensions have matured, the pension expenditure will be around 0.03 per cent of the sum of earned income in 2030 and will decrease to approximately 0.02 per cent during the projection period. The low expenditure is due to the assumptions about how many people will start receiving the pension and to the fact that years-of-service pensions are paid for a maximum period of two years.

The last part-time pensions started in January 2017. The expenditure of this pension benefit in 2017 was 0.1 per cent of the sum of earned income. In a few years, the part-time pension expenditure will cease altogether.

Most survivors' pensions are paid to the widows of men who had been receiving an old-age pension. As the number of persons receiving an old-age pension rises, the number of old-age pensions that will end will also grow. As a result, the number of starting surviving spouse's pensions will grow. However, mortality rates in the population projection develop in such a way that the range of ages at which people die will get narrower. This will reduce the average time spent in widowhood. Consequently, the annual number of survivors' pensions paid will be reduced. The size of the average survivors' pension in relation to average earnings will also decrease. During the projection period, the survivors' pension expenditure will decrease steadily from 2.0 per cent in 2017 to 1.2 per cent in 2085.

The expenditure for farmers' early retirement aid was approximately 0.1 per cent of the sum of earned income in 2017. As of 31 December 2018, the retirement aid is no longer granted. In a few years, the expenditure will cease altogether.

The expenditure ratios relative to the sum of earned income differ considerably from one pension scheme to another. In 2017, the expenditure ratio was the highest for State pensions under JuEL and MYEL pensions. and the lowest for YEL and TyEL pensions. 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 pension schemes. In the long run, however, the expenditure ratio for all pension schemes will converge towards a level of 36–37 per cent (Table 4.5). Many factors underlie the scheme-specific differences in pension

expenditure ratios. 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. This is why the expenditure ratios of these systems are high at the moment. The continued decrease in the number of workers insured will keep the expenditure ratio of JuEL (State) pensions high. The expenditure ratio of MYEL pensions will grow considerably above its current 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. This will further accentuate the differences in expenditure ratios between the pension schemes.

A younger and more male-dominant group of insured people leads to a lower expenditure ratio than an older and more female-dominant group of insured. Women's life expectancy is more than five years higher than men's (Appendix 5). The survivors' pension evens out some of the difference. 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 older workers.

The age and gender distributions of the insured differ greatly between pension schemes. 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, except for the schemes for the self-employed. By 2085, around one third of the differences in age structure is assumed to remain. The differences in gender distributions, on the other hand, are assumed to remain nearly unchanged.

For the most part, the accrual rates are the same for all pension schemes. However, there have been and continues to be 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 in particular 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. The VEKL pension scheme will have reached its 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 0.7 per cent of the economy's sum of earned income. Pension 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 paid mainly 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 sums of earned income during the year in which the pension is paid.

Table 4.5.

Earnings-related pension expenditure per pension scheme and pension benefit 2017–2085 (at 2017 prices)

4.5.1 Sum of earned income (€ billion)

	2017	2020	2025	2030	2045	2065	2085
TyEL	56.1	60.1	65.0	70.2	88.3	112	137.2
YEL	4.6	4.9	5.3	5.7	7.1	9.1	11.1
MYEL	1.3	1.2	1.0	0.9	0.8	1.0	1.3
JuEL (State)	5.9	5.8	5.4	5.3	5.2	6.5	7.9
JuEL (municipal)	16.8	18.0	19.7	21.4	26.7	33.8	41.4
Private sector	62.4	66.6	71.7	77.2	96.7	122.7	150.3
Public sector	23.6	24.6	26.1	27.7	33.2	41.9	51.3
Total	85.9	91.2	97.7	104.9	129.9	164.5	201.6

4.5.2 Earnings-related pension expenditure per pension scheme and sector (€ billion)

	2017	2020	2025	2030	2045	2065	2085
TyEL	14.7	15.8	17.5	19.4	23.8	35.6	49.8
YEL	1.2	1.3	1.5	1.7	2.1	3.0	4.0
MYEL	0.8	0.8	0.8	0.8	0.6	0.5	0.5
JuEL (State)	4.6	4.7	4.8	4.7	3.6	2.7	2.9
JuEL (municipal)	5.0	5.5	6.4	7.1	8.2	11.2	15.2
Private sector	17.2	18.3	20.2	22.3	26.8	39.2	54.5
Public sector	10.0	10.6	11.6	12.2	12.3	14.4	18.8
VEKL	0.0	0.0	0.0	0.0	0.2	1.0	1.5
Total	27.2	29.0	31.8	34.5	39.3	54.7	74.8
of which for unsalaried periods	0.1	0.2	0.3	0.5	1.2	2.5	3.4

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

	2017	2020	2025	2030	2045	2065	2085
TyEL	26.2	26.3	27.0	27.7	27.0	31.7	36.3
YEL	26.1	26.8	27.9	29.2	29.2	32.7	35.7
MYEL	62.2	68.0	78.2	88.3	80.4	46.5	37.5
JuEL (State)	78.5	81.6	88.3	89.3	70.6	41.9	36.1
JuEL (municipal)	29.8	30.9	32.3	33.0	30.6	33.0	36.8
Private sector	27.5	27.5	28.2	28.8	27.7	32.0	36.3
Public sector	42.3	43.2	44.3	44.1	37.0	34.4	36.7
VEKL*	0.0	0.0	0.0	0.0	0.2	0.6	0.7
Total	31.6	31.8	32.5	32.9	30.3	33.2	37.1
of which for unsalaried periods	0.2	0.2	0.3	0.5	0.9	1.5	1.7

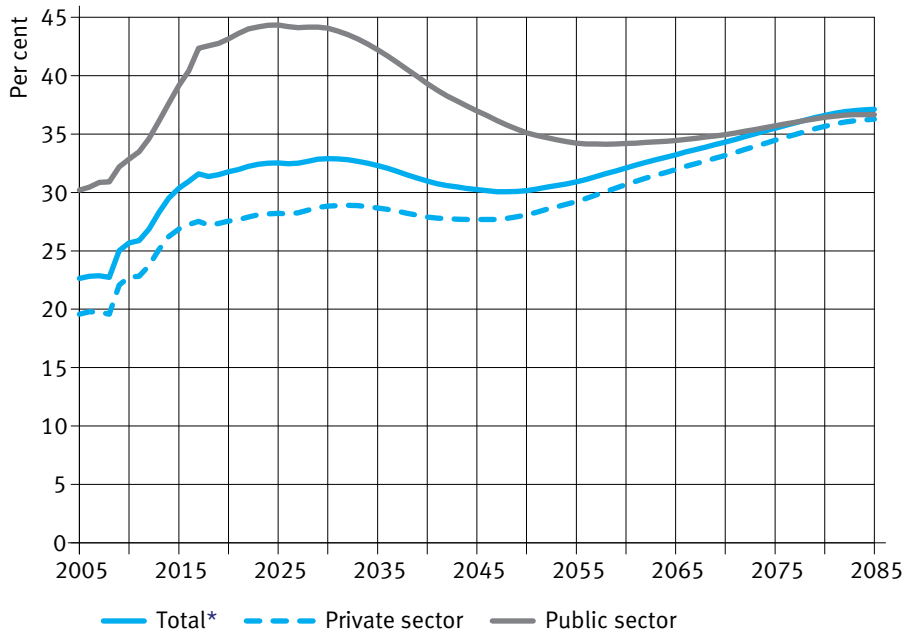
* relative to the sum of earned income of the overall economy.

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

	2017	2020	2025	2030	2045	2065	2085
Old-age pension*	27.1	27.5	28.2	28.7	26.1	28.8	32.3
Partial old-age pension	0.1	0.3	0.4	0.3	0.3	0.3	0.3
Disability pension	2.3	2.1	2.1	2.1	2.4	2.9	3.3
Years-of-service pension	-	0.0	0.0	0.0	0.0	0.0	0.0
Part-time pension	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Survivors' pension	2.0	1.8	1.8	1.7	1.5	1.1	1.2
Total	31.6	31.8	32.5	32.9	30.3	33.2	37.1

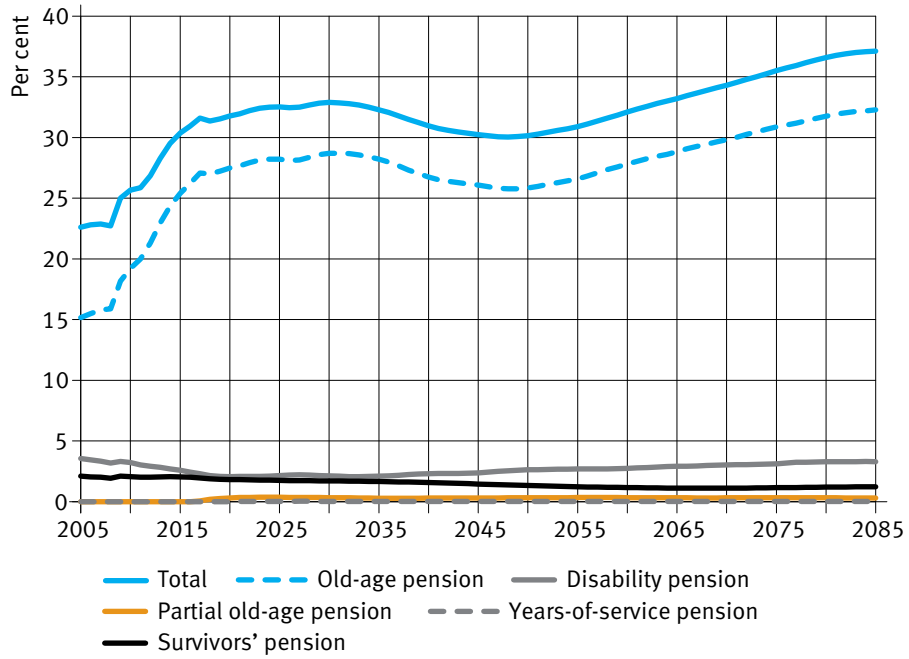
* The figures for old-age pension do not include partial old-age pension.

Figure 4.2.
Earnings-related pension expenditure relative to sum of earned income 2005–2085, by sector



* Includes VEKL expenditure.

Figure 4.3.
Earnings-related pension expenditure relative to sum of earned income 2005–2085, 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 taken into account. In addition to earnings-related pensions, national, guarantee and SOLITA pensions received in one's own right are included when calculating the average pension.

The purchasing power of the average monthly pension will grow from 1,656 euros to approximately 3,500 euros in the period 2017–2085 (Table 4.6). 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 between 2035 and 2050. 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 (made when calculating the pensions of wage earners), 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 2017, the average pension was 52.8 per cent of the average earnings of the insured.[8] As of 2025, pensions will grow slower than average earnings. By 2045, the ratio of the average pension to average earnings will decrease to 45.5 per cent, and by 2085 to 42.8 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 system 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 4.6 and Figure 4.4.)

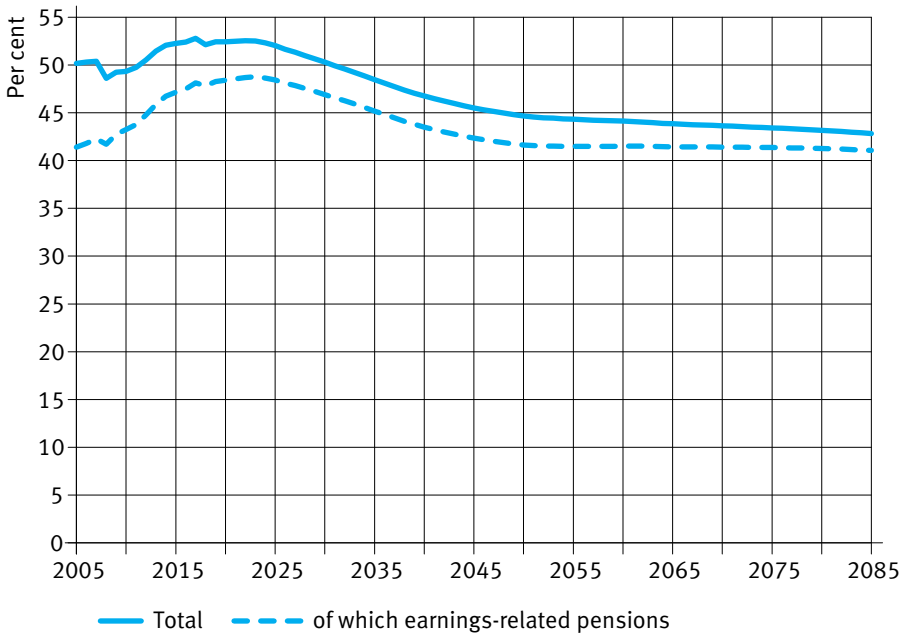
Table 4.6

Average pension and average earnings (at 2017 prices)

	2017	2020	2025	2030	2045	2065	2085
Average earnings, €/month	3,137	3,209	3,400	3,667	4,572	6,139	8,254
Average pension, €/month	1,656	1,683	1,770	1,844	2,081	2,692	3,535
of which earnings-related pension, €/month	1,510	1,553	1,647	1,720	1,937	2,544	3,389
% of average earnings	52.8	52.4	52.0	50.3	45.5	43.8	42.8

8 The gross pension is compared to gross earnings. Often in the literature on income distribution, comparisons are done 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

Figure 4.4.
Average pension relative to average earnings 2005–2085



The benefit level of statutory pensions can also be described by considering the median[9] 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 SOLITA pensions are not included in these figures since they are not included in the ELSI microsimulation model. However, survivor's pensions generated by a rough approximation have been considered as benefits that reduce the national and guarantee pensions. A description of the ELSI model is presented in Appendix 9. The educational levels are primary education, secondary education, post-secondary education or lower level tertiary education and higher academic education. Individuals are classified according to the highest degree they have attained.

By and large, the factors that affect median pensions are the same as those affecting average pensions. The real value of median pensions per educational level remains virtually unchanged until the 2050s. After that, it will start to grow. Relative to median earnings[10], median pensions will decline until the 2050s, after which they will develop according to the growth in earnings. The median pensions of the whole population develop faster than the median pension 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.

9 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.

10 Median earnings of the employed in the ELSI model.

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, the group of people with no more than a primary education includes a higher proportion of underprivileged people than in the past. In addition, the share of immigrants will increase in this group. The working lives of immigrants are shorter 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. Immigrants also have, on average, lower earnings than the original population.

The median pensions of those with a higher academic education will slightly decrease even in real terms by 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 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 higher education as they tended to have higher earnings towards the end of their working life. (Table 4.7 and Figures 4.5–4.8.)

The average pension in Table 4.6 includes the survivors' pension of those who receive a pension in their own right. The median figures in Table 4.7 do not include the survivors' pension. Some of the differences are also explained by the fact that different indicators are used. The medians are clearly lower than the averages also in actual pension distributions as presented in statistics.

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 the projection, the gender gaps in pensions would be smaller than what they are in this projection. The role of survivors' pensions will decrease during the simulation period.

Table 4.7.

Median values of pensions received in one's own right, by educational level and gender, as well as median earnings (at 2017 prices, €/month)

	2017	2020	2025	2030	2045	2065	2085
Men	1,598	1,626	1,691	1,745	1,926	2,432	3,177
primary education	1,325	1,331	1,349	1,327	1,192	1,347	1,657
secondary education	1,513	1,526	1,579	1,628	1,802	2,253	2,938
post-secondary education	2,325	2,289	2,270	2,246	2,312	2,811	3,669
higher academic education	3,463	3,418	3,391	3,350	3,491	4,384	5,786
Women	1,179	1,210	1,293	1,367	1,564	2,038	2,708
primary education	1,032	1,048	1,092	1,119	1,065	1,168	1,455
secondary education	1,174	1,182	1,216	1,247	1,334	1,629	2,083
post-secondary education	1,707	1,707	1,729	1,743	1,841	2,270	3,012
higher academic education	2,543	2,510	2,491	2,466	2,636	3,332	4,388
All	1,325	1,363	1,446	1,515	1,710	2,214	2,921
Median earnings	2,716	2,770	2,954	3,147	3,915	5,336	7,188

Figure 4.5.
Median of pensions received in one's own right, by educational level, men (at 2017 prices, €/month)

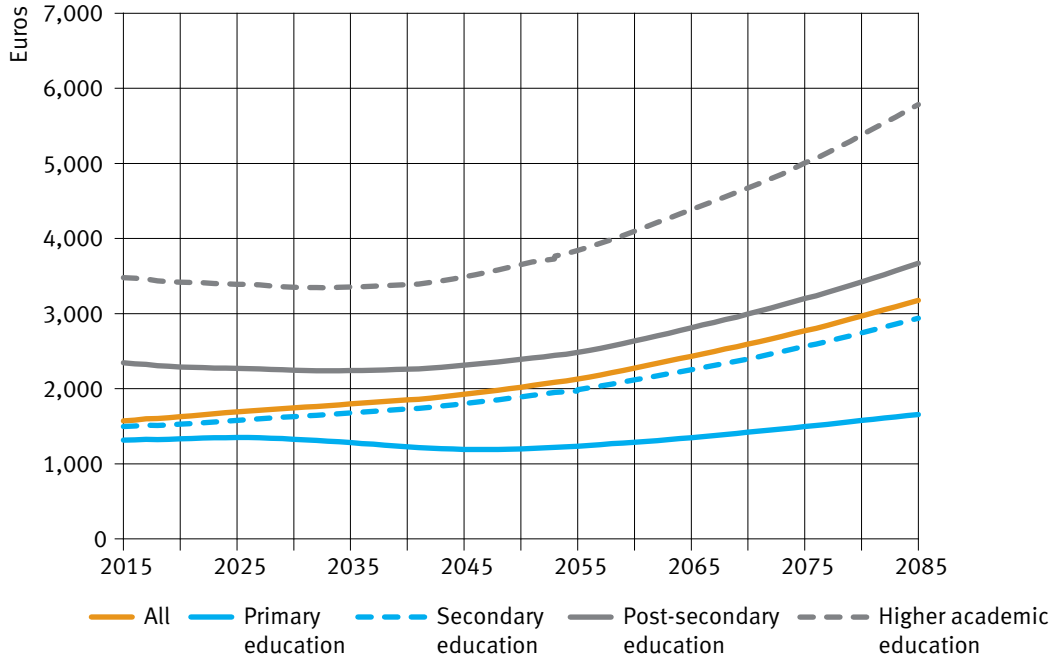


Figure 4.6.
Median pensions received in one's own right, by educational level, women (at 2017 prices, €/month)

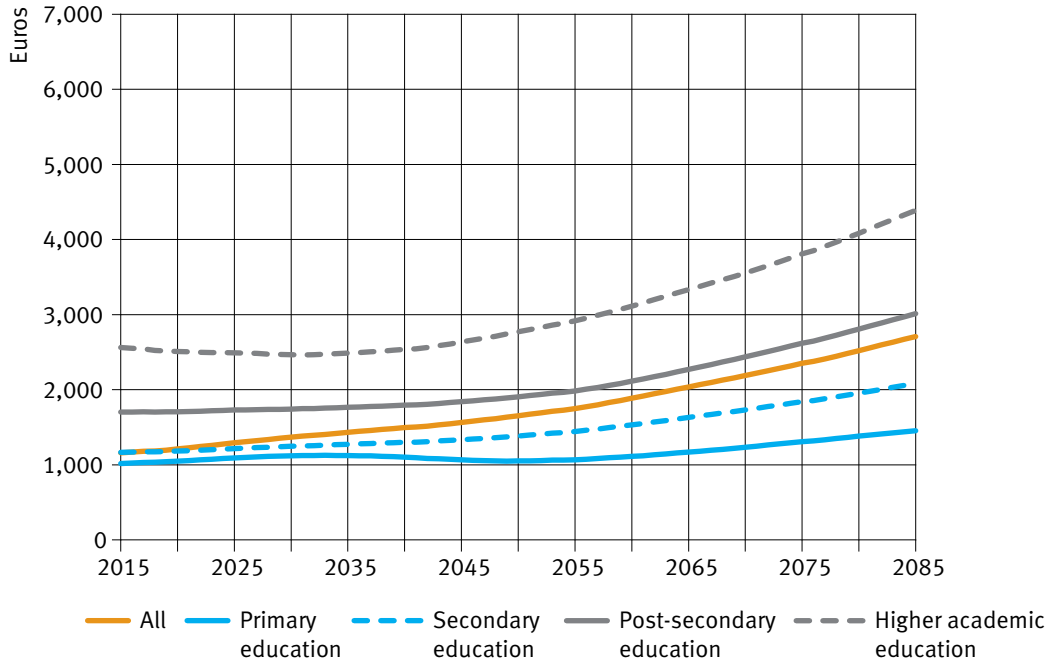


Figure 4.7.
Median pensions received in one's own right relative to median earnings, by educational level, men

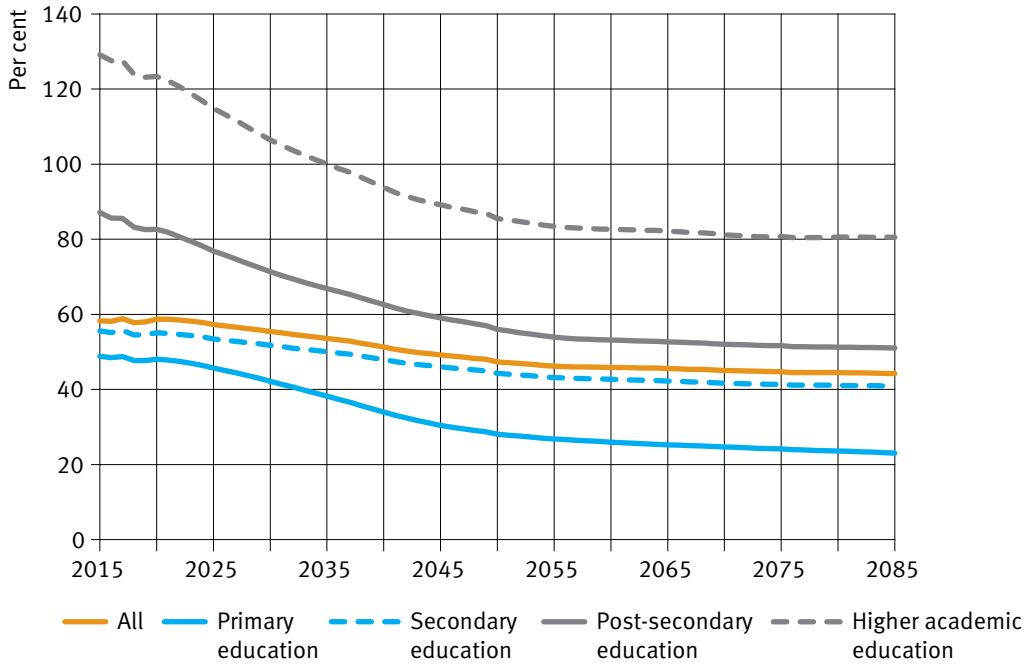
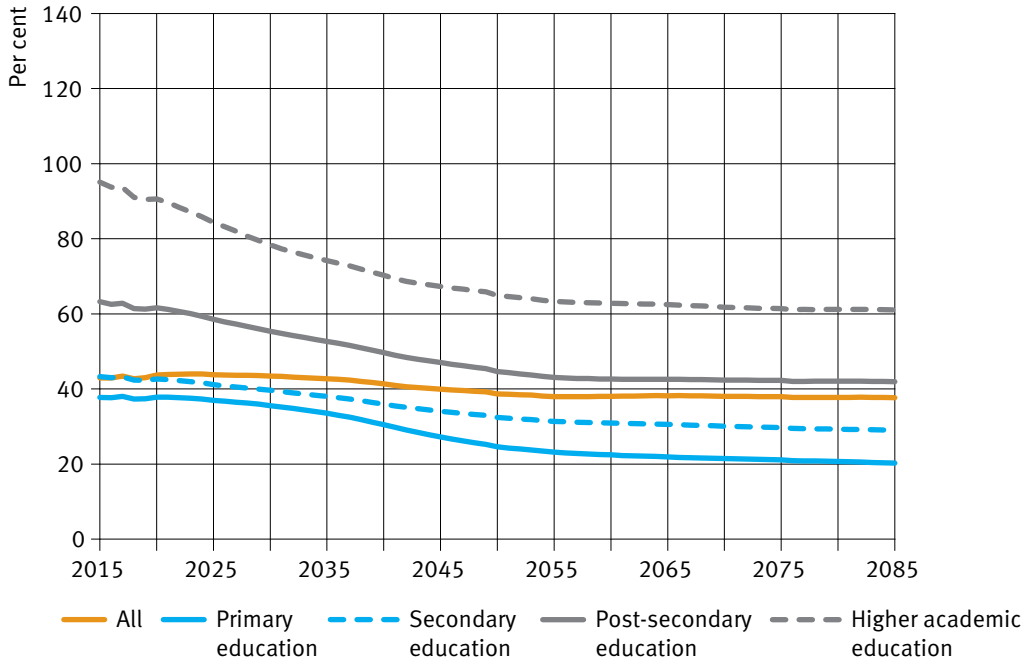


Figure 4.8.
Median pensions received in one's own right relative to median earnings, by educational level, women



4.5 Pension distributions

The distribution of pensions received in one's own right is examined by gender using percentiles. Pensions from the earnings-related, national and guarantee pension systems have been included. The distributions have been calculated using the ELSI microsimulation model. The percentiles are the 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 lowest (10th) percentile depicts the development of the level of the lowest pensions.

The distribution of pensions received in one's own right remains almost equally broad for both men and women throughout most of the projection period. The pension distribution of both genders narrows slightly in the middle of the simulation period, only to broaden again towards the end of it. These changes are, however, relatively minor.

The 10th percentile of the women's pension distribution is close to the amount of the guarantee pension throughout the projection period. For men it is slightly above it. The median of the women's pension distribution exceeds the maximum income limit of the national pension around 2030. 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 nation pension at any point of the projection period. More than one quarter of women's pensions are below the income limit of the national pension system throughout the projection period. For men, the 25th percentile exceeds the income limit of the national pension at the end of the projection period. Large pensions, as well as the median pensions of men, consist solely of earnings-related pensions throughout the projection period. (Table 4.8 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 national pensions is reduced during the projection period as the national pension index grows at a slower pace than earnings.

Table 4.8.
Distribution of pensions received in one's own right, by gender (at 2017 prices, €/month)

	2017	2020	2025	2030	2045	2065	2085
Men, 10%	806	797	815	841	933	1,171	1,455
Men, 25%	1,116	1,123	1,158	1,196	1,329	1,648	2,073
Men, median	1,598	1,626	1,691	1,745	1,926	2,432	3,177
Men, 75%	2,233	2,263	2,333	2,382	2,606	3,438	4,544
Men, 90%	3,053	3,086	3,165	3,219	3,538	4,909	6,541
Women, 10%	711	749	774	803	901	1,092	1,373
Women, 25%	866	896	967	1,030	1,183	1,480	1,875
Women, median	1,179	1,210	1,293	1,367	1,564	2,038	2,708
Women, 75%	1,603	1,658	1,759	1,839	2,101	2,882	3,850
Women, 90%	2,119	2,183	2,292	2,381	2,748	3,823	5,099

Figure 4.9.
Distribution of pensions received in one's own right, men (at 2017 prices, €/month)

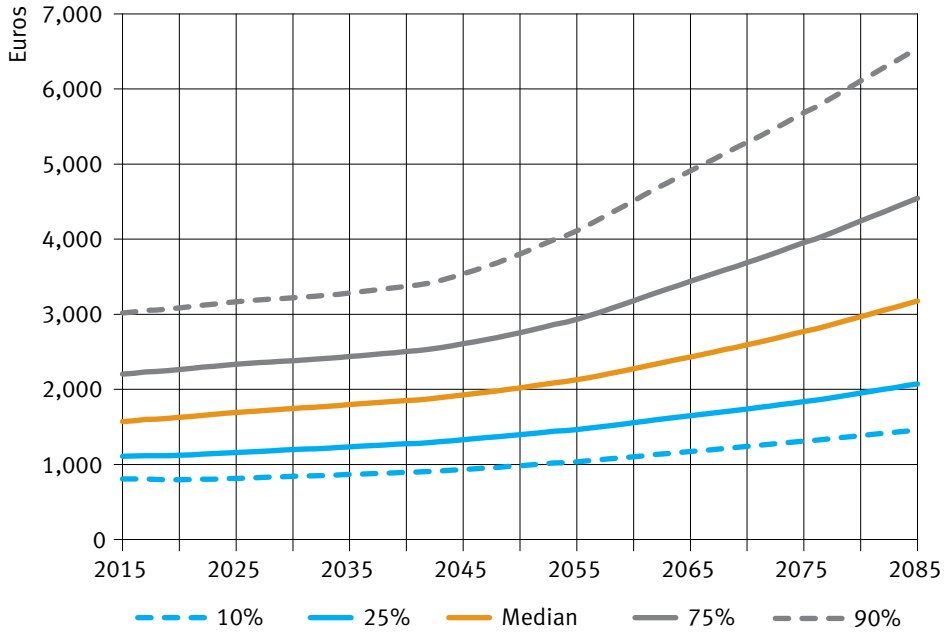
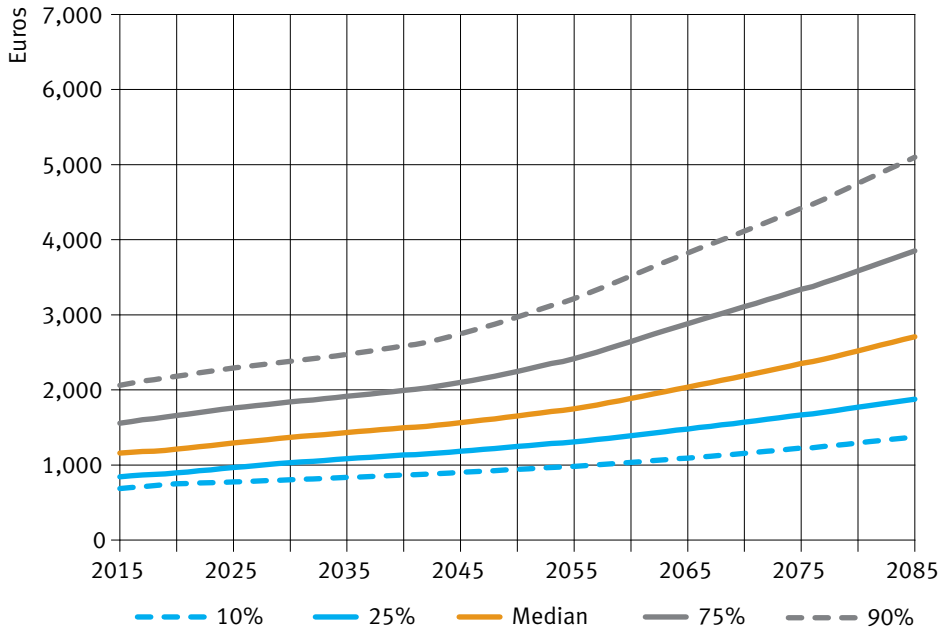


Figure 4.10.
Distribution of pensions received in one's own right, women (at 2017 prices, €/month)



4.6 Financing of private sector earnings-related pensions

4.6.1 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 from the founding of the scheme to the early 2010s, except for a few years during the depression of 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.

In the competitiveness pact agreed on in the spring of 2016, the central labour market organisations set the TyEL contribution rate until 2021. In this projection, it is 24.4 per cent of the wage sum until 2021, as agreed in the competitiveness pact.

In 2017, the employee's basic contribution was 6.15 per cent of their wage. Those aged 53–62 years paid a higher contribution of 7.65 per cent. In connection with the competitiveness pact, the central labour market organisations agreed that the employee's earnings-related pension contribution will rise by a total of 1.2 percentage points during the period 2017–2020. The employer's contribution will decrease correspondingly. 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 4.10 and Figure 4.11).

The TyEL financing projection starts at the end of 2017. In practice, the development in 2018 is fairly well known. At year-end 2018, the TyEL assets exceeded the technical reserves by 26 per cent, and the surplus of the asset reserve used to buffer jointly financed pension expenses was slightly more than 11 per cent of the wage sum.

The growing pension expenditure and investment returns that are lower than the historical average will weaken the financial standing of TyEL in the coming decade. The contribution rate will have to be increased from the early 2020s onwards, so that the provision for pooled claims used to buffer jointly financed pension expenses will not fall below its lower limit. The contribution rate will increase to slightly below 25 per cent of the wage sum towards the end of the 2020s, after which it will be slightly lowered again.

In the latter half of the century, the TyEL contribution must be increased steeply as the TyEL pension expenditure will grow due to changes in demography. 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. The TyEL contribution will be 30.1 per cent of the wage sum (Table 4.10 and Figure 4.11).

The TyEL contribution can be divided into the pooled component, the funded component and operating costs. The pooled component is used to cover jointly financed pension expenditure, while the funded component is transferred to pension funds to await the payment of the accrued funded pension. The funded component will grow evenly 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 as of the 2030s until the pooled component will start to grow in the latter half of the century as the pension

expenditure level begins to react in earnest to changes in demography. In these projections, it is assumed that the amount of operating expenses relative to the TyEL wage sum remains stable throughout the projection period.

The amount of the TyEL assets[11] relative to the wage sum will decrease until the end of the 2020s, after which assets relative to the wage sum will start to grow steadily (Table 4.10 and Figure 4.12). The decrease in the assets until the latter half of the 2020s is explained by low investment returns and the fact that the provision for pooled claims is dismantled to curb the pressure to raise the contribution. The assets relative to the pension expenditure decrease until the 2030s, after which they grow again and even out to the current level when approaching the 2050s (Figure 4.13).

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

The technical provisions from old-age pensions that are the responsibilities of the pension providers grow as life expectancy grows. The share of funded old-age pensions relative to the total old-age pension expenditure grows 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. This means that disability pension liabilities grow as retirement ages rise since disability pensions are paid for a longer period of time, the pensions are slightly higher due to the projected pension component, 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, transitions to old-age pension 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 to the provision for pooled claims. We made this change in order to prevent developments in mortality from systematically producing a surplus or a deficit towards the end of the projection period.

If the mortality assumption was kept unchanged, the transitions to old-age pension would result in a slight deficit in the first half of the century, a surplus in mid-century and a significant surplus after the mid-2060s. We have assumed changes to the mortality assumption so that the effects of the transitions to old-age pension would not distort the results, and so that the projection would better depict reality, where the mortality assumption

11 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 capital base. Presenting them in proportion to pension expenditure depicts the amount of assets relative to their purpose of use. For more information, see Kautto 2019: 72–73.

is adjusted from time to time to correspond to observed mortality rates. The selection made increases the need to raise the TyEL contribution by more than 0.1 percentage points in the 2030s and decreases the need to raise the contribution after the mid-2040s. The surplus of the transitions to old-age pension will peak at the end of the projection period, when the required contribution level would be 0.5 percentage points higher if the surplus had not been transferred to the provision for pooled claims.

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 until the year 2024. After that, the increases will be targeted at those aged 65 and over. The targeting is changed in the mid-2020s to even out the pressure to raise the contribution caused by the low investment returns during the early years of the projection period. If the increases were targeted in line with current practices throughout the projection period, the TyEL contribution rate would have to be increased by an additional 0.4 percentage points by the end of the 2030s. Correspondingly, that would lead to a lower pressure to raise the contribution as of the 2060s. Without changing the targeting, TyEL assets would accumulate about 9 per cent more by 2085 than in the baseline projection.

4.6.2 Financial standing under TyEL in 2085

The TyEL pension expenditure relative to the wage sum will grow in the latter half of the projection period until 2085. If the projection was extended further, the pension expenditure relative to the wage sum would decrease slightly after that due to changes in demography.

According to the projection, the TyEL contribution will be 30.1 per cent of the wage sum in 2085. As of 2085, a sufficient constant TyEL contribution rate is 29.8. per cent. There is no significant 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 Appendix 2.

The TyEL funding rate will grow during the projection period from the starting level of 30.6 per cent to 38.1 per cent by 2085 (Table 4.10). There is no significant pressure to change the TyEL contribution after 2085, 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 and disability pension liabilities as described earlier. The funding rate at the beginning of the projection period is diminished by the assumption that the discount rate for the next ten years is lower than in the long term. The calculation of the funding rate is depicted in more detail in Appendix 3.

Table 4.9.

TyEL financing in 2017–2085 (€ million, at 2017 prices)

4.9.1 Contribution income and wage sum

	2017	2020	2025	2030	2045	2065	2085
Wage sum	56,123	60,140	64,955	70,157	88,334	111,995	137,203
Contribution income	13,638	14,674	15,912	17,379	21,628	31,145	41,309
Employer	10,010	10,184	11,040	12,127	15,142	21,060	27,378
Employee, basic contribution	2,730	3,393	3,720	5,252	6,486	10,085	13,932
Employee, raised contribution	898	1,098	1,152	-	-	-	-
Funded component*	2,434	2,608	2,919	3,262	4,816	6,923	9,184

4.9.2 Pension expenditure

	2017	2020	2025	2030	2045	2065	2085
Old-age pension	12,392	13,404	14,874	16,573	20,193	30,531	42,959
Partial old-age pension	40	179	240	232	272	378	424
Disability pension	1,251	1,193	1,353	1,470	2,068	3,248	4,473
Years-of-service pension	-	4	14	19	15	22	25
Survivors' pension	992	1,007	1,066	1,142	1,284	1,378	1,930
Part-time pension	30	2	-	-	-	-	-
Total	14,704	15,789	17,548	19,436	23,831	35,557	49,811
of which funded*	3,062	3,598	4,127	4,844	6,927	10,226	14,667

4.9.3 Assets and cash flows

	2017	2020	2025	2030	2045	2065	2085
Assets per 1 Jan.	118,659	122,492	130,060	138,251	188,423	288,391	410,198
Contribution income, TyEL	13,638	14,674	15,912	17,379	21,628	31,145	41,309
Contribution income, TVR**	565	441	449	491	634	936	1253
Return on investments	8,706	5,051	5,488	7,227	9,866	15,084	21,413
Expenditure, TyEL	-14,704	-15,789	-17,548	-19,436	-23,831	-35,557	-49,811
Expenditure, other***	-320	-283	-261	-234	-141	-98	-117
Operating costs	-392	-385	-416	-449	-565	-717	-878
Assets per 31 Dec.	126,152	126,201	133,686	143,229	196,014	299,184	423,367

4.9.4 Assets, technical provision and solvency capital per 31 Dec.

	2017	2020	2025	2030	2045	2065	2085
Technical provision from old-age pensions	78,717	85,862	93,739	100,380	133,507	200,467	289,045
Total technical provisions	96,614	101,950	109,816	116,148	152,326	230,842	323,899
Solvency capital	29,538	24,251	23,870	27,081	43,688	68,342	99,468
Assets	126,152	126,201	133,686	143,229	196,014	299,184	423,367

* 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.

** TVR = Employment Fund

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

Table 4.10.

TyEL financing, 2017–2085. Wage sum (€ million, at 2017 prices); other contribution income relative to wage sum (%)

4.10.1 Contribution income and wage sum

	2017	2020	2025	2030	2045	2065	2085
Wage sum	56,123	60,140	64,955	70,157	88,334	111,995	137,203
Contribution income	24.3	24.4	24.5	24.8	24.5	27.8	30.1
Employer	17.8	16.9	17.0	17.3	17.1	18.8	20.0
Employee, basic contribution	6.2	7.2	7.2	7.5	7.3	9.0	10.2
Employee, raised contribution	7.7	8.7	8.7	-	-	-	-
Funded component*	4.3	4.3	4.5	4.6	5.5	6.2	6.7

4.10.2 Pension expenditure

	2017	2020	2025	2030	2045	2065	2085
Old-age pension	22.1	22.3	22.9	23.6	22.9	27.3	31.3
Partial old-age pension	0.1	0.3	0.4	0.3	0.3	0.3	0.3
Disability pension	2.2	2.0	2.1	2.1	2.3	2.9	3.3
Years-of-service pension	-	0.0	0.0	0.0	0.0	0.0	0.0
Survivors' pension	1.8	1.7	1.6	1.6	1.5	1.2	1.4
Part-time pension	0.1	0.0	-	-	-	-	-
Total	26.2	26.3	27.0	27.7	27.0	31.7	36.3
of which funded*	5.5	6.0	6.4	6.9	7.8	9.1	10.7

4.10.3 Assets and cash flows

	2017	2020	2025	2030	2045	2065	2085
Assets per 1 Jan.	211.4	203.7	200.2	197.1	213.3	257.5	299.0
Contribution income, TyEL	24.3	24.4	24.5	24.8	24.5	27.8	30.1
Contribution income, TVR**	1.0	0.7	0.7	0.7	0.7	0.8	0.9
Return on investments	15.5	8.4	8.4	10.3	11.2	13.5	15.6
Expenditure, TyEL	-26.2	-26.3	-27.0	-27.7	-27.0	-31.7	-36.3
Expenditure, other***	-0.6	-0.5	-0.4	-0.3	-0.2	-0.1	-0.1
Operating costs	-0.7	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
Assets per 31 Dec.	224.8	209.8	205.8	204.2	221.9	267.1	308.6

4.10.4 Assets, technical provision, solvency capital and funding rate per 31 Dec.

	2017	2020	2025	2030	2045	2065	2085
Technical provision from old-age pensions	140.3	142.8	144.3	143.1	151.1	179.0	210.7
Total technical provisions	172.1	169.5	169.1	165.6	172.4	206.1	236.1
Solvency capital	52.6	40.3	36.7	38.6	49.5	61.0	72.5
Assets	224.8	209.8	205.8	204.2	221.9	267.1	308.6
Funding rate	30.6	30.7	30.6	30.8	32.2	34.6	38.1

* 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.

TVR = Employment Fund

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

Figure 4.11.
TyEL expenditure and contribution income relative to wage sum in 2005–2085

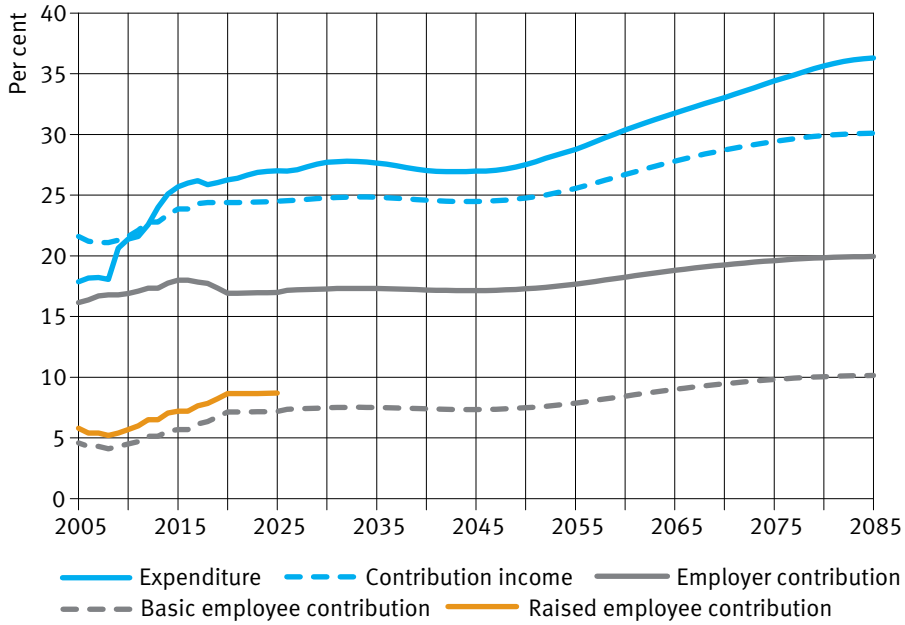


Figure 4.12.
TyEL assets and technical provision relative to wage sum in 2005–2085

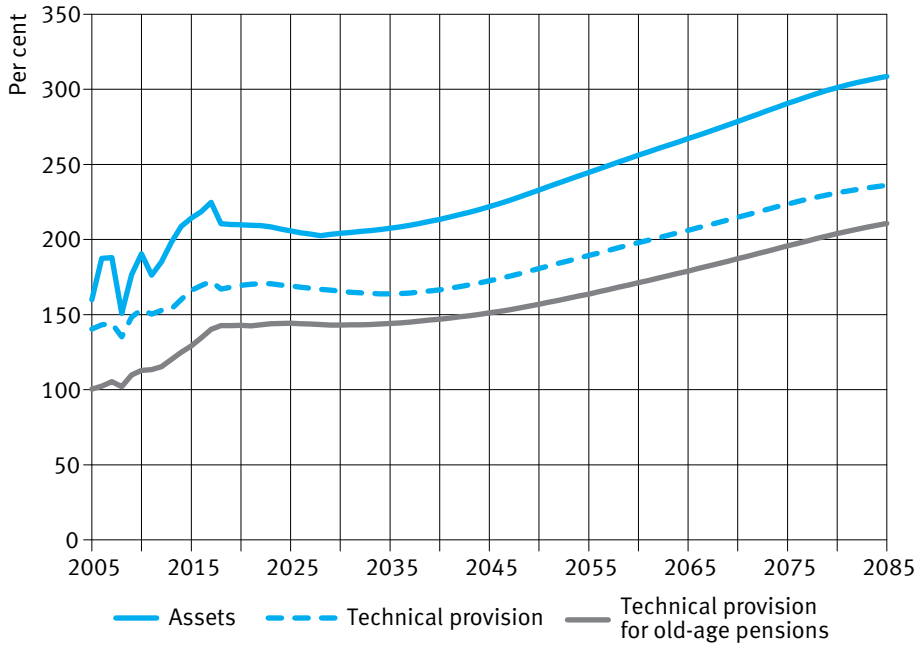
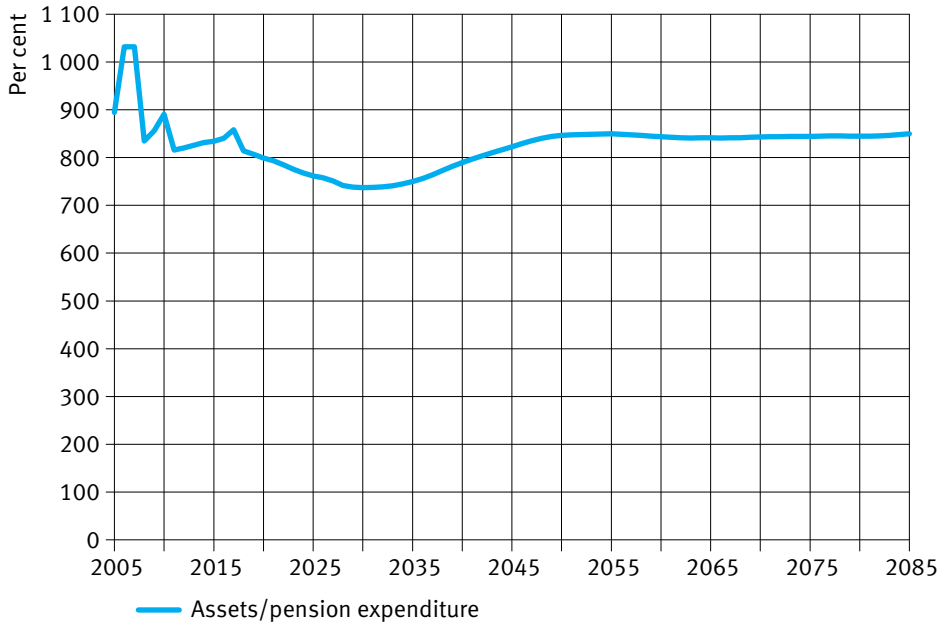


Figure 4.13.
TyEL assets relative to TyEL pension expenditure 2005–2085



4.6.3 Financing of pension expenditure under YEL and MYEL

YEL and MYEL pensions are financed from the PAYG system, and the State pays the share of the expenditure that the contribution income does not cover.

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. The administrative costs of YEL are based on the number of self-employed persons and persons receiving a pension under YEL. Previously, the administrative costs were adjusted with the wage coefficient. After a review in 2016 relating to the administrative costs, they have only been adjusted in accordance with inflation. In the long run, this would mean a significantly reduced share of administrative costs. In the projection, the administrative costs are adjusted annually with an index in which changes in earnings and consumer prices weigh 50 per cent each. The same assumption has been applied to the administrative costs under MYEL. In the 2016 report, the assumption was that the administrative costs under YEL and MYEL would be adjusted annually with the wage coefficient.

In 2017, the YEL contribution income amounted to 23.2 per cent of the insured sum of earned income. The State financed approximately 16 per cent of the YEL expenditure. The State's share will grow until the 2030s, at which time the State's share of the expenses will be around 25 per cent. Since the YEL contribution rate follows the TyEL contribution rate, the State's share will grow strongly in the coming decades as pension expenditure grows. A large part of the growing TyEL expenses in the near decades can be financed with assets released from the funds. Since YEL contributions are not funded, the corresponding part of YEL pensions will be financed by the State. In the long run, the State's share of the YEL

expenses will decrease slightly as the TyEL contribution rate rises and the administrative costs go down. (Table 4.11 and Figure 4.14.)

In 2017, 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 size of farms grows, the average MYEL contribution will grow slightly in relation to the TyEL contribution. The State financed nearly 80 per cent of the MYEL expenditure in 2017. The State's share will grow slightly until the mid-2030s, after which it will begin to decrease. However, the State will still finance nearly 50 per cent of the MYEL expenditure in 2085. The most significant reason for the high level of State financing is the unfavourable ratio of active farmers to MYEL pension recipients. Also, the low contribution rate raises the State's share. (Table 4.11 and Figure 4.15.)

Table 4.11.
YEL and MYEL financing 2017–2085

4.11.1 YEL cash flows (€ million, at 2017 prices and % of the sum of earned income)

€ million	2017	2020	2025	2030	2045	2065	2085
Sum of earned income	4,645	4,915	5,333	5,731	7,137	9,057	11,111
Pension contribution	1,076	1,143	1,246	1,353	1,666	2,400	3,187
State's share	190	241	314	398	508	661	888
Pension expenditure	-1,212	-1,317	-1,486	-1,673	-2,085	-2,959	-3,962
Operating costs	-63	-67	-73	-78	-89	-102	-113
% of the sum of earned income	**2017**	**2020**	**2025**	**2030**	**2045**	**2065**	**2085**
Pension contribution	23.2	23.3	23.4	23.6	23.3	26.5	28.7
State's share	4.1	4.9	5.9	6.9	7.1	7.3	8.0
Pension expenditure	-26.1	-26.8	-27.9	-29.2	-29.2	-32.7	-35.7
Operating costs	-1.4	-1.4	-1.4	-1.4	-1.2	-1.1	-1.0

4.11.2 MYEL cash flows (€ million, at 2017 prices and % of the sum of earned income)

€ million	2017	2020	2025	2030	2045	2065	2085
Sum of earned income	1,304	1,195	1,041	918	808	1,022	1,254
Pension contribution	180	167	149	135	123	185	247
State's share	658	662	680	689	537	298	234
Pension expenditure	-811	-813	-814	-811	-650	-475	-471
Operating costs	-18	-16	-15	-13	-10	-9	-10
% of the sum of earned income	**2017**	**2020**	**2025**	**2030**	**2045**	**2065**	**2085**
Pension contribution	13.8	14.0	14.3	14.7	15.2	18.2	19.7
State's share	50.5	55.4	65.4	75.0	66.4	29.2	18.6
Pension expenditure	-62.2	-68.0	-78.2	-88.3	-80.4	-46.5	-37.5
Operating costs	-1.3	-1.4	-1.4	-1.4	-1.2	-0.9	-0.8

Figure 4.14.
YEL expenditure and contribution relative to the sum of earned income 2005–2085

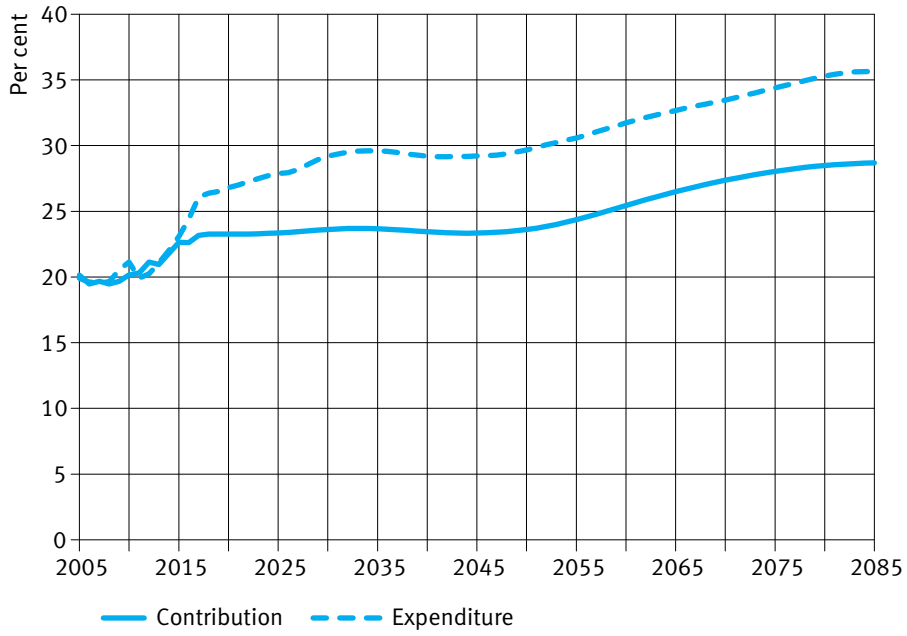
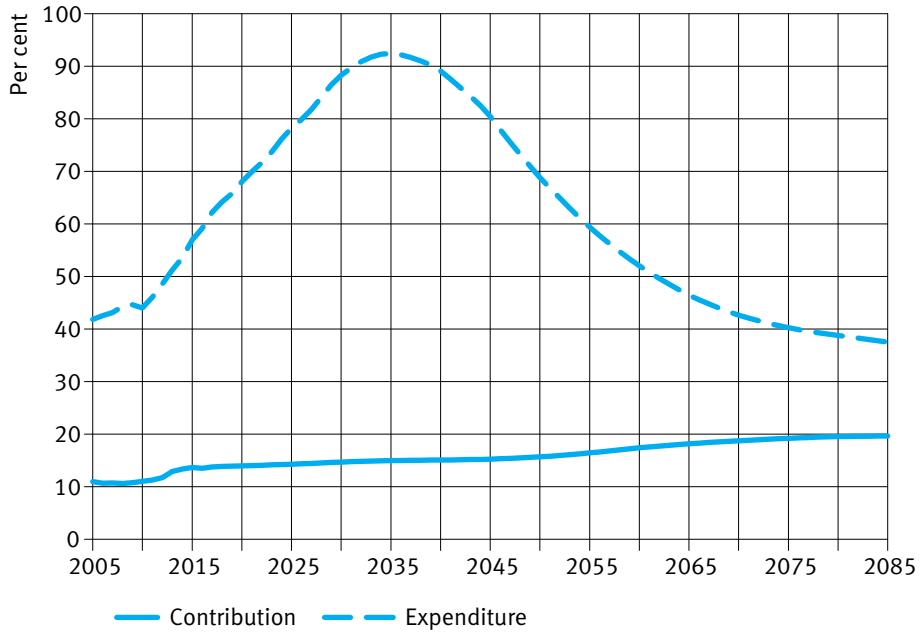


Figure 4.15.
MYEL expenditure and contribution relative to the sum of earned income 2005–2085



5 Sensitivity analysis

In this chapter, we analyse the sensitivity of the results of the baseline projection to changes in assumptions about economic and demographic development. Sensitivity analyses have been made to investigate assumptions about

1. mortality,
2. birth rates,
3. disability pension incidence rates,
4. growth in earnings,
5. employment rates, and
6. 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, the assumptions about earnings, employment and return on pension assets are combined into a *pessimistic economic scenario* and an *optimistic economic scenario*.

The sensitivity analyses are not extreme alternatives. 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 a strong impact. In addition, factors excluded from the review also influence pension levels and the financing of the pension system. Such factors include assumptions regarding migration and the incidence rates of old-age pensions. The effects of these factors have been assessed in previous reports (Tikanmäki et al. 2017; Kautto & Risku 2015). The impact of migration will be reviewed from many aspects in a report that will be published at the end of 2019.

For each sensitivity analysis we present the central results which are affected in a significant way by the assumption.

5.1 Mortality

- *In the projection with high mortality rates*, the decline of the mortality rate has been slowed down. A decline in mortality that takes three years to achieve in the baseline projection takes four years in the projection with high mortality rates.
- *In the projection with low mortality rates*, the mortality rates of persons who have turned 50 are lowered by shifting the mortality function by one year at 15-year intervals. The mortality rates for the intervening years are interpolated. Using this technique means that mortality is not too heavily concentrated within a short age interval. If the projection with low mortality had been done in an analogous way to the projection with high mortality, over the years, mortality would have concentrated heavily on those who are between 90 and 100 years old.

The mortality assumption deviates from the baseline projection in both alternatives as of 2019.

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 2035, life expectancy at age 63 is 25.4 years in the projection with low mortality rates, 24.4 years in the baseline projection and 23.8 years in the projection with high mortality rates. In 2085, the comparable figures are 32.5, 28.8 and 27.5 years.

The realised mortality rates will affect the retirement ages of those born in 1965 or later. The mortality rate of those born in 2000 will exceed that of the baseline projection by 1.5 years in the projection with low mortality rates. In the projection with high mortality rates, it will be seven months lower than in the baseline projection (Table 5.1). 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 2005. In the projection, the age at which the insurance obligation ends has been assumed to rise at the same pace as the retirement age.

The life expectancy coefficient for those born in 2000 is 0.839 in the projection with low mortality rates, 0.866 in the baseline projection, and 0.882 in the projection with high mortality rates. (Table 5.1.)

Table 5.1.
Retirement age and life expectancy coefficient in different mortality projections

Year of birth	Retirement age			Life expectancy coefficient		
	Baseline	Low mortality	High mortality	Baseline	Low mortality	High mortality
1960	64 yrs 6 mos	64 yrs 6 mos	64 yrs 6 mos	0.942	0.941	0.943
1970	65 yrs 8 mos	65 yrs 11 mos	65 yrs 6 mos	0.909	0.899	0.916
1980	66 yrs 8 mos	67 yrs 4 mos	66 yrs 3 mos	0.894	0.877	0.903
1990	67 yrs 5 mos	68 yrs 6 mos	66 yrs 11 mos	0.877	0.856	0.891
2000	68 yrs 2 mos	69 yrs 7 mos	67 yrs 7 mos	0.866	0.839	0.882

Mortality affects the expected effective retirement age through changes in the retirement age, but the effect is smaller on the expected effective retirement age than on the retirement age. Particularly in the long run, the rising retirement age affects the expected effective retirement age only little as, on the one hand, the disability and unemployment risks are high near retirement age and, on the other hand, deferring retirement past the retirement age becomes less common (Table 5.2).

The developments in mortality affect the retirement age and the level of pensions. However, these factors 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 Kela pensions. If the mortality rate becomes very low, both the life expectancy coefficient and the rising retirement age lose some of their effect as factors curbing the growth of expenditure due to, among other things, the growing number of disability pensions.

Figure 5.1.

Statutory pension expenditure relative to GDP and TyEL contribution relative to TyEL wage sum under different mortality assumptions

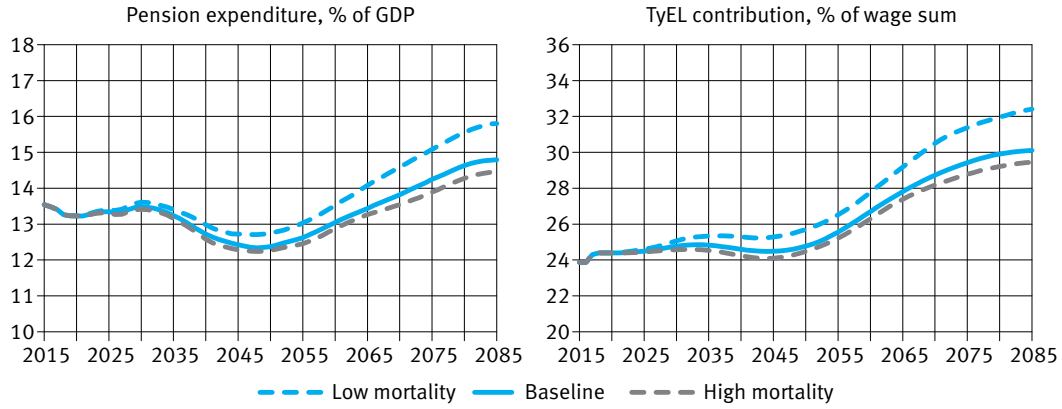


Table 5.2.

Sensitivity analysis, mortality (at 2017 prices)

5.2.1 Expected effective retirement age (years)

	2017	2020	2025	2030	2045	2065	2085
Baseline	61.2	61.6	62.5	62.8	64.1	65.1	65.4
Low mortality	-	0.0	0.0	0.0	0.2	0.3	0.3
High mortality	-	0.0	0.0	-0.1	-0.2	-0.2	-0.1

5.2.2 Pension recipients (1,000)

	2017	2020	2025	2030	2045	2065	2085
Baseline	1,466	1,510	1,559	1,622	1,634	1,732	1,777
Low mortality	-	1	9	23	73	151	222
High mortality	-	-1	-6	-13	-40	-69	-97

5.2.3 Total pension expenditure

		2017	2020	2025	2030	2045	2065	2085
€ billion	Baseline	30.0	31.6	34.4	37.2	42.5	58.2	78.5
	Low mortality	-	0.0	0.1	0.4	1.3	3.2	6.3
	High mortality	-	0.0	-0.1	-0.2	-0.7	-1.2	-2.4
% of GDP	Baseline	13.4	13.2	13.3	13.5	12.4	13.4	14.8
	Low mortality	-	0.0	0.1	0.1	0.3	0.6	1.0
	High mortality	-	0.0	0.0	-0.1	-0.1	-0.2	-0.3

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

		2017	2020	2025	2030	2045	2065	2085
Expenditure	Baseline	26.2	26.3	27.0	27.7	27.0	31.7	36.3
	Low mortality	-	0.0	0.1	0.2	0.5	1.3	2.3
	High mortality	-	0.0	-0.1	-0.1	-0.2	-0.3	-0.7
Contribution	Baseline	24.3	24.4	24.5	24.8	24.5	27.8	30.1
	Low mortality	-	0.0	0.1	0.3	0.8	1.4	2.3
	High mortality	-	0.0	-0.1	-0.2	-0.4	-0.4	-0.7
Assets	Baseline	224.8	209.8	205.8	204.2	221.9	267.1	308.6
	Low mortality	-	0.0	0.0	0.0	2.9	11.7	21.7
	High mortality	-	0.0	0.1	0.1	-1.7	-5.5	-9.6

5.2 Birth rates

In the baseline projection, the total fertility rate is assumed to be 1.45 as of 2018.

- *In the projection with low birth rates*, the total fertility rate is 1.20 as of 2019.
- *In the projection with high birth rates*, the total fertility rate is 1.70 as of 2019.

The preliminary total fertility rate of 2018 was 1.40 (Statistics Finland 2019c). This is the lowest rate in statistical history and the only time the total fertility rate has been lower than that of the baseline projection. The assumed total fertility rate in the projection with high birth rates is also low from a historical perspective. However, the rate was below that level for several years in the 1970s and the 1980s, as well as in 2015–2018.

The birth rate will not affect pension expenditure in a significant way until the 2060s. It will, however, affect the financing base of pensions already as of the late 2030s when those born in 2019 start to enter working life. The impact will grow gradually over several decades and be fully realised in the 2100s.

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 2017, the population aged 15–64 years numbered 3.44 million. In the baseline projection, the number goes down to 2.7 million by 2085. In the projection with low birth rates, the population aged 15–64 years numbers 2.3 million persons at year-end 2085, and in the projection with high birth rates, 3.2 million.

In the projection with low birth rates, the wage sum is 7.5 per cent lower than in the baseline projection by 2065. By 2085, it is 15.4 per cent lower. In the projection with low birth rates, the ratio between pension expenditure and GDP rises 2.4 percentage points higher than in the baseline projection in the period 2037–2085. In the same period, the TyEL contribution rises and reaches 34.1 per cent, which is 4.0 percentage points higher than in the baseline projection.

In the projection with high birth rates, the wage sum is 7.6 per cent higher than in the baseline projection by 2065, and 16.6 per cent higher by 2085. In the long run, the ratio between pension expenditure and GDP stays 1.9 percentage points lower than in the baseline projection. Similarly, the TyEL contribution stays 3.2 percentage points lower than in the baseline projection. (Table 5.3.)

Figure 5.2.

Statutory pension expenditure relative to GDP and TyEL contribution relative to TyEL wage sum at different birth rates

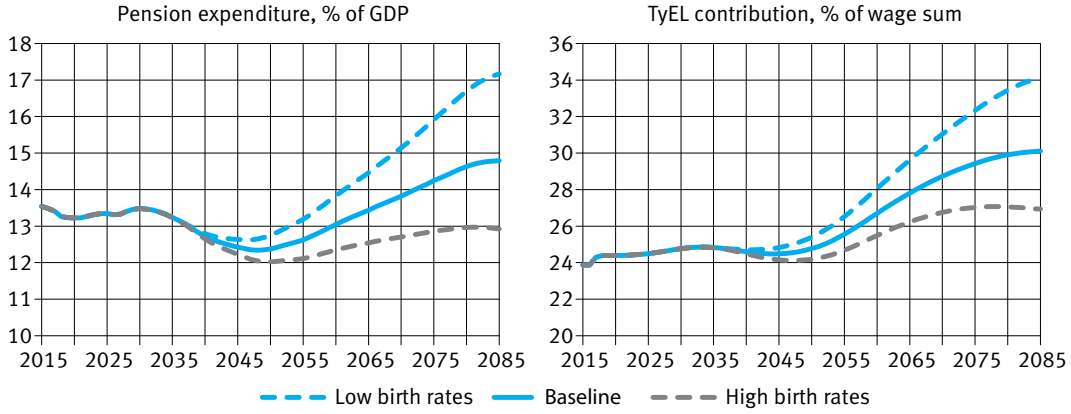


Table 5.3.

Sensitivity analysis, birth rates (at 2017 prices)

5.3.1 Employed (1,000)

	2017	2020	2025	2030	2045	2065	2085
Baseline	2,292	2,373	2,396	2,382	2,363	2,226	2,027
Low birth rates	-	0	0	-1	-42	-168	-313
High birth rates	-	0	0	1	42	170	337

5.3.2 Total pension expenditure

		2017	2020	2025	2030	2045	2065	2085
€ billion	Baseline	30.0	31.6	34.4	37.2	42.5	58.2	78.5
	Low birth rates	-	0.0	0.0	0.0	0.0	-0.3	-1.5
	High birth rates	-	0.0	0.0	0.0	0.0	0.3	1.5
% of GDP	Baseline	13.4	13.2	13.3	13.5	12.4	13.4	14.8
	Low birth rates	-	0.0	0.0	0.0	0.2	1.0	2.4
	High birth rates	-	0.0	0.0	0.0	-0.2	-0.9	-1.9

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

		2017	2020	2025	2030	2045	2065	2085
Expenditure	Baseline	26.2	26.3	27.0	27.7	27.0	31.7	36.3
	Low birth rates	-	0.0	0.0	0.0	0.5	2.5	6.0
	High birth rates	-	0.0	0.0	0.0	-0.5	-2.2	-4.7
Contribution	Baseline	24.3	24.4	24.5	24.8	24.5	27.8	30.1
	Low birth rates	-	0.0	0.0	0.0	0.3	1.8	4.0
	High birth rates	-	0.0	0.0	0.0	-0.3	-1.6	-3.2
Assets	Baseline	224.8	209.8	205.8	204.2	221.9	267.1	308.6
	Low birth rates	-	0.0	0.0	0.1	3.6	16.7	33.2
	High birth rates	-	0.0	0.0	0.0	-3.5	-14.5	-26.7

5.3 Disability pension incidence rate

The incidence rate of disability pensions has a greater impact on the statutory pension expenditure than that of other pension benefits. This is because the expenditure of disability pensions is the second largest after that of old-age pensions. The impact of the incidence rate of old-age pensions is limited since it mainly has an impact on the time of retirement. The expenditure of old-age pensions that are deferred past the retirement age is increased by the increment for late retirement. It makes deferring almost actuarially neutral.

In the baseline projection, the age and gender-specific disability incidence rate is expected to decline by 2.0 per cent per year in the initial years. The decline is curbed so that, by 2085, the incidence rate has declined by 32 per cent compared to the rate in 2018.

- *In the low incidence rate projection*, the age- and gender-specific disability pension incidence rates are expected to decrease by 3.1 per cent per year to begin with. The decline is expected to continue to slow down at the pace of the baseline projection. By 2085, the incidence rate will settle at 19 per cent below the baseline projection.
- *In the high incidence rate projection*, the age- and gender-specific disability pension incidence rates are expected to decrease by 1.1 per cent per year to begin with. The decline is expected to continue to slow down at the pace of the baseline projection. By 2085, the incidence rate will settle at 19 per cent above the baseline projection.

The changing incidence rate affects the number of persons retiring on a disability pension and thus also the labour force participation rate. The impact on the number of employed persons is less than half of the impact on the number of retirees since it is possible to retire on a disability pension also from unemployment or from outside the labour force.

In the low incidence rate projection, the number of pensioners is 20,000 fewer than in the baseline projection by 2045 and 30,000 fewer by 2085. A low disability incidence rate reduces not only the number of retirees on a disability pension but also the number of persons on an old-age pension since the retirees on a disability pension transition to an old-age pension as soon as they reach their retirement age. The low incidence rate reduces the disability pension expenditure in the long run by 17 per cent and the total pension expenditure by 1.6 per cent compared to the baseline projection.

In the high incidence rate projection, the number of retirees on a disability pension is 18,000 more than in the baseline projection by 2045 and 29,000 more by the end of the projection period. As in the low incidence rate projection, both the number of pensioners on a disability pension and on an old-age pension change. (Table 5.4.)

A high incidence rate increases the disability pension expenditure in the long run by 16 per cent and the total pension expenditure by 1.5 per cent compared to the baseline projection.

In the high incidence rate projection, the ratio of earnings-related pension expenditure to the sum of earned income grows by 2085 by 0.8 per cent more than in the baseline projection. Correspondingly, in the low incidence rate projection, the ratio is 0.9 per cent lower than the in the baseline projection. Two thirds of these differences are due to differences in pension expenditure and one third is due to differences in the sums of earned income.

Figure 5.3.

Statutory pension expenditure relative to GDP and TyEL contribution relative to TyEL wage sum under different disability incidence rates

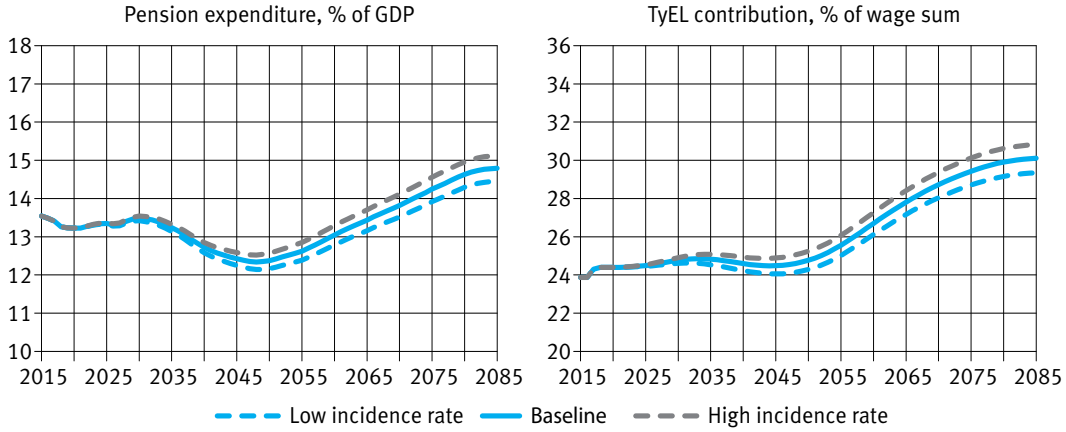


Table 5.4.

Sensitivity analysis, disability pension incidence rate (at 2017 prices)

5.4.1 Expected effective retirement age (years)

	2017	2020	2025	2030	2045	2065	2085
Baseline projection	61.2	61.6	62.5	62.8	64.1	65.1	65.4
Low incidence rate	-	0.0	0.2	0.3	0.4	0.6	0.6
High incidence rate	-	0.0	-0.1*	-0.2	-0.4	-0.5	-0.6

*In the baseline projection, the exact value is 62.47, and in the high incidence rate projection, 62.33 years.

5.4.2 Pension recipients (1,000)

	2017	2020	2025	2030	2045	2065	2085
Baseline projection	1,466	1,510	1,559	1,622	1,634	1,732	1,777
Low incidence rate	-	0	-3	-8	-20	-29	-30
High incidence rate	-	0	3	7	18	27	29

5.4.3 Total pension expenditure

		2017	2020	2025	2030	2045	2065	2085
€ billion	Baseline	30.0	31.6	34.4	37.2	42.5	58.2	78.5
	Low incidence rate	-	0.0	-0.1	-0.1	-0.4	-0.8	-1.3
	High incidence rate	-	0.0	0.0	0.1	0.4	0.8	1.2
% of GDP	Baseline	13.4	13.2	13.3	13.5	12.4	13.4	14.8
	Low incidence rate	-	0.0	0.0	-0.1	-0.2	-0.3	-0.3
	High incidence rate	-	0.0	0.0	0.1	0.2	0.3	0.3

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

		2017	2020	2025	2030	2045	2065	2085
Expenditure	Baseline	26.2	26.3	27.0	27.7	27.0	31.7	36.3
	Low incidence rate	-	0.0	-0.1	-0.1	-0.4	-0.7	-0.9
	High incidence rate	-	0.0	0.0	0.1	0.4	0.7	0.8
Contribution	Baseline	24.3	24.4	24.5	24.8	24.5	27.8	30.1
	Low incidence rate	-	0.0	0.0	-0.2	-0.4	-0.6	-0.8
	High incidence rate	-	0.0	0.0	0.1	0.4	0.6	0.7
Assets	Baseline	224.8	209.8	205.8	204.2	221.9	267.1	308.6
	Low incidence rate	-	0.0	0.0	-0.2	-1.8	-3.2	-3.9
	High incidence rate	-	0.0	0.0	0.2	1.7	3.2	3.9

5.4 Growth in earnings

In the baseline projection, the annual real growth rate in earnings as of 2022 is 1.5 per cent. In 2019-2021, the average growth rate is 1.0 per cent.

- *In the slow growth projection*, the real growth rate in earnings as of 2019 is 1.0 per cent per year.
- *In the rapid growth projection*, the real growth rate in earnings as of 2019 is 2.0 per cent per year.

The growth in earnings level has varied across different periods. For example, in 1998–2007, real earnings grew each year by 1.97 per cent on average. In 2008–2017, the annual growth was 0.90 per cent.

In the baseline projection, real earnings nearly triple during 2018–2085. In the slow growth projection, they double and in the rapid growth projection, they nearly quadruple relative to the level in 2017. The differences in the growth of earnings are directly reflected in the sum of earned income and GDP in the projection. The share of earnings in 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 2085 is 3,500 euros per month, while it is around 4,500 euros per month in the rapid growth projection (at 2017 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 to 50 per cent in the projection. The average pension in relation to average earnings is 3.3 percentage points below the baseline projection. The TyEL pension expenditure in relation to the wage sum is 2.6 percentage points below the baseline projection. (Table 5.5.)

The effect of the slow growth assumption is the opposite to that of the rapid growth assumption. In 2085, the average pension in the slow growth projection is approximately 2,800 euros per month. Relative to average earnings, the average pension is 3.7 percentage points higher than in the baseline projection and the TyEL pension expenditure exceeds that of the baseline projection by 2.9 percentage points in 2085.

The growth in earnings has a significantly smaller impact on the TyEL contribution rate than on the expenditure rate (Table 5.5). The contribution rate's relatively small dependency on earnings growth is related to 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.

Figure 5.4.

Statutory pension expenditure relative to GDP and TyEL contribution relative to TyEL wage sum under different earnings growth rates

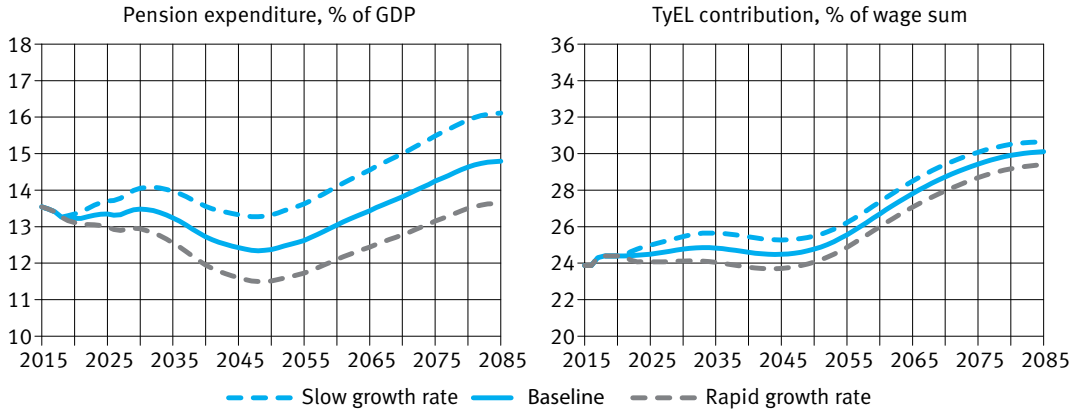


Table 5.5.

Sensitivity analysis, growth of earnings (at 2017 prices)

5.5.1 Average pension (€/month and relative to average earnings)

		2017	2020	2025	2030	2045	2065	2085
€/month	Baseline	1,656	1,683	1,770	1,844	2,081	2,692	3,535
	Slow growth rate	-	-2	-14	-34	-130	-384	-774
	Rapid growth rate	-	2	14	34	140	453	1,003
% of average earnings	Baseline	52.8	52.4	52.0	50.3	45.5	43.8	42.8
	Slow growth rate	-	0.5	1.4	2.1	3.2	3.6	3.7
	Rapid growth rate	-	-0.5	-1.4	-2.0	-3.0	-3.2	-3.3

5.5.2 Total pension expenditure

		2017	2020	2025	2030	2045	2065	2085
€ billion	Baseline	30.0	31.6	34.4	37.2	42.5	58.2	78.5
	Slow growth rate	-	0.0	-0.3	-0.7	-2.6	-8.2	-17.1
	Rapid growth rate	-	0.0	0.3	0.7	2.8	9.7	22.1
% of GDP	Baseline	13.4	13.2	13.3	13.5	12.4	13.4	14.8
	Slow growth rate	-	0.1	0.4	0.6	0.9	1.1	1.3
	Rapid growth rate	-	-0.1	-0.3	-0.5	-0.8	-1.0	-1.2

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

		2017	2020	2025	2030	2045	2065	2085
Expenditure	Baseline	26.2	26.3	27.0	27.7	27.0	31.7	36.3
	Slow growth rate	-	0.2	0.7	1.1	1.8	2.4	2.9
	Rapid growth rate	-	-0.2	-0.7	-1.1	-1.7	-2.2	-2.6
Contribution	Baseline	24.3	24.4	24.5	24.8	24.5	27.8	30.1
	Slow growth rate	-	0.0	0.5	0.7	0.8	0.7	0.5
	Rapid growth rate	-	0.0	-0.4	-0.7	-0.8	-0.7	-0.7
Assets	Baseline	224.8	209.8	205.8	204.2	221.9	267.1	308.6
	Slow growth rate	-	1.8	6.1	10.2	20.2	30.7	39.9
	Rapid growth rate	-	-1.7	-5.8	-9.4	-17.9	-26.1	-33.2

5.5 Employment

In the baseline projection, employment consists of assumptions regarding the levels of labour force flows, retirement and unemployment.

- *In the low employment projection*, the number of employed persons is 3.0 per cent lower than in the baseline projection.
- *In the high employment projection*, the number of employed persons is 3.0 per cent higher than in the baseline projection.

The number of employed gradually diverges from the baseline during 2019–2021. The number of employed changes at the same rate under all earnings-related pension acts and in all age and gender groups. For simplicity, unemployment is assumed to stay at the same level as in the baseline projection. This assumption has no substantial impact on the results of our projection.

A three per cent change in the number of employed equals a change in the employment rate of slightly over two per cent. In 2021, the number of employed persons differs from the baseline projection by 71,000 persons and the employment rate by 2.2 percentage points. The difference remains unchanged until 2045, after which it starts to narrow to 61,000 persons by 2085.

In the high employment projection, the wage sum and GDP are on a higher level than in the baseline projection. As a result, pension expenditure relative to GDP is 0.4 percentage points lower than in the baseline projection in 2022 (Table 5.6). Correspondingly, the ratio is higher in the low employment projection.

In the long run, pension expenditure will also 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 no longer deviates significantly from that in the baseline projection in 2085. 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 2085, the average pension at 2017 prices is 88 euros lower in the low employment projection than in the baseline projection. In the high employment projection, it is 88 euros higher than in the baseline projection.

Figure 5.5.

Statutory pension expenditure relative to GDP and TyEL contribution relative to TyEL wage sum under different employment assumptions

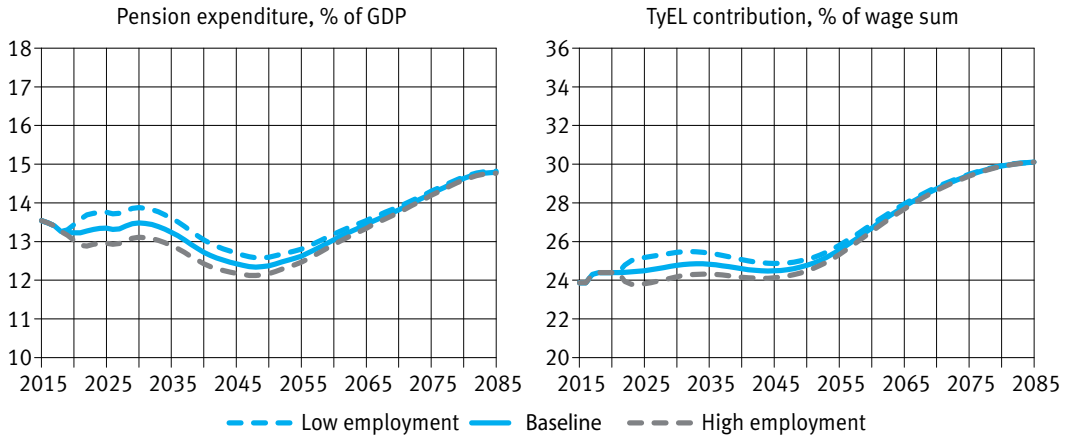


Table 5.6.

Sensitivity analysis, employment (at 2017 prices)

5.6.1 Employed (1,000)

	2017	2020	2025	2030	2045	2065	2085
Baseline	2,292	2,373	2,396	2,382	2,363	2,226	2,027
Low employment	-	-47	-72	-71	-71	-67	-61
High employment	-	47	72	71	71	67	61

5.6.2 Total pension expenditure

		2017	2020	2025	2030	2045	2065	2085
€ billion	Baseline	30.0	31.6	34.4	37.2	42.5	58.2	78.5
	Low employment	-	0.0	0.0	-0.1	-0.4	-1.3	-2.2
	High employment	-	0.0	0.0	0.1	0.4	1.3	2.2
% of GDP	Baseline	13.4	13.2	13.3	13.5	12.4	13.4	14.8
	Low employment	-	0.2	0.4	0.4	0.3	0.1	0.0
	High employment	-	-0.2	-0.4	-0.4	-0.2	-0.1	0.0

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

		2017	2020	2025	2030	2045	2065	2085
Expenditure	Baseline	26.2	26.3	27.0	27.7	27.0	31.7	36.3
	Low employment	-	0.4	0.8	0.8	0.6	0.2	0.0
	High employment	-	-0.4	-0.8	-0.8	-0.5	-0.2	0.0
Contribution	Baseline	24.3	24.4	24.5	24.8	24.5	27.8	30.1
	Low employment	-	0.0	0.7	0.7	0.4	0.1	0.0
	High employment	-	0.0	-0.7	-0.6	-0.4	-0.1	0.0
Assets	Baseline	224.8	209.8	205.8	204.2	221.9	267.1	308.6
	Low employment	-	2.7	4.5	4.2	2.7	1.0	0.3
	High employment	-	-2.6	-4.6	-4.2	-2.6	-0.9	-0.2

5.6 Return on pension assets

In the baseline projection, the expected real return on investments for the period 2019–2028 is 2.5 per cent per year, and 3.5 per cent as of 2029. The assumptions in the alternative projections are the following:

- *In the low return projection*, the expected real return is 1.0 percentage points lower than in the baseline projection as of 2019.
- *In the high return projection*, the expected real return is 1.0 percentage points higher than in the baseline projection as of 2019.

The return on pension assets does not affect pension expenditure. It does, however, play a key role in the long-term development of the TyEL contribution rate. To begin with, the amount of pension assets is approximately twice as large as the wage sum under TyEL. That means that an additional return of one percentage point would make it possible to reduce the TyEL contribution rate by approximately two percentage points, assuming that the additional return was immediately used to this purpose. In the long run, the ratio of the assets to the wage sum grows in the baseline projection, which means that the role of the investment return on pension assets is emphasized.

The return on assets affects the TyEL contribution rate with a delay and is visible, at first, in the amount of TyEL assets and solvency, from which, in time, the effects of the return on pension assets shifts to the funded component of old-age pensions and bonuses paid to customers. In the last year of the projection period, the contribution rate is 4.5 percentage points lower in the high return projection than in the baseline projection. Correspondingly, in the low return projection, the TyEL contribution rises to 33.3 per cent, or 3.2 percentage points higher than in the baseline projection. (Table 5.7.)

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). The difference in the TyEL contribution rate in 2085 between the low and high return projections is around eight percentage points. This corresponds roughly to the width of the 50 per cent confidence interval given in the above-mentioned report.

Figure 5.6.

TyEL contribution relative to TyEL wage sum under different return assumptions

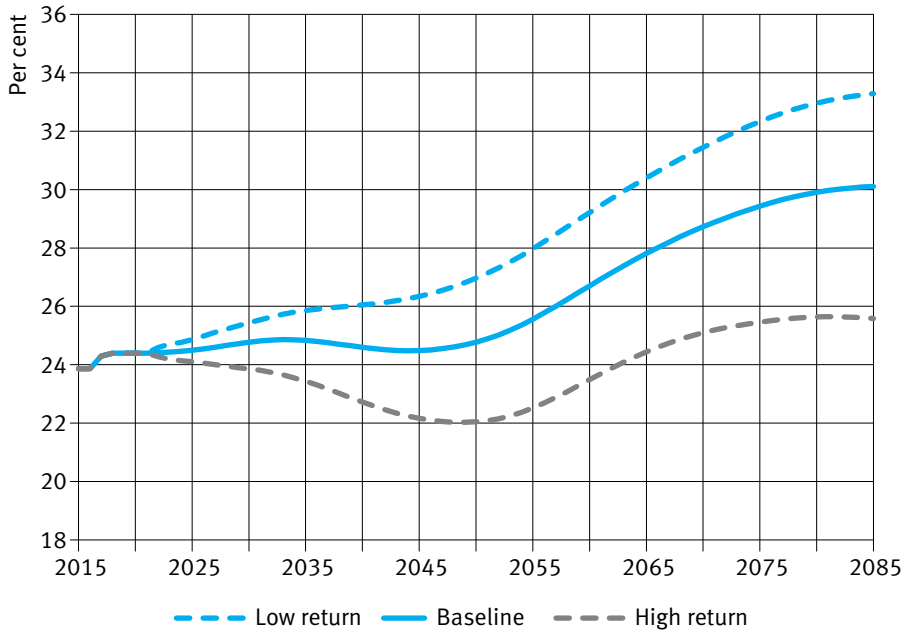


Table 5.7.

Sensitivity analysis, return on investments. TyEL expenditure, contribution and assets relative to TyEL wage sum (%)

		2017	2020	2025	2030	2045	2065	2085
Expenditure	Baseline	26.2	26.3	27.0	27,7	27,0	31,7	36,3
	Low return	-	-	-	-	-	-	-
	High return	-	-	-	-	-	-	-
Contribution	Baseline	24.3	24.4	24.5	24,8	24,5	27,8	30,1
	Low return	-	0.0	0.4	0,7	1,9	2,6	3,2
	High return	-	0.0	-0.4	-0,9	-2,3	-3,4	-4,5
Assets	Baseline	224.8	209.8	205.8	204,2	221,9	267,1	308,6
	Low return	-	-4.1	-13.2	-20,6	-35,6	-44,4	-55,0
	High return	-	4.2	14.0	22,4	40,9	57,6	76,4

5.7 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. By nature, the factors combined in the optimistic economic scenario improve the financing of earnings-related pensions. The factors combined in the pessimistic economic scenario weaken the financing of earnings-related pensions.

In the optimistic economic scenario, the pension expenditure relative to GDP ends up at a level 1.2 percentage points below that of the baseline projection in the long run. The TyEL contribution rate is more than 4 percentage points below the baseline projection in the long run. The purchasing power of pensions is considerably higher than in the baseline projection. The difference in purchasing power is mainly due to the more rapid growth in earnings, but also partly due to the improved employment rates. The average pension relative to average earnings is more than two percentage points below the baseline projection because the growth rate in earnings has a bigger impact on wages than on pensions. (Table 5.8.)

In the pessimistic economic scenario, the pension expenditure relative to GDP rises 1.4 percentage points above the baseline projection in the long run. The TyEL contribution rate rises already in the 2020s to a level two percentage points higher than in the baseline projection. In the long run, it is more than four percentage points higher. The purchasing power of pensions is lower than in the baseline projection, but the ratio of pensions relative to average earnings is higher.

The differences between the combined optimistic and pessimistic scenarios and the baseline projection deviate only slightly from the sum of the separate projections. The most important differences relate to the development of the TyEL contribution. In the pessimistic scenario, the TyEL contribution is 4.4 percentage points above the baseline projection in 2085. Calculated as a sum of separate alternative projections, the contribution rate is 3.7 percentage points above the baseline projection. The difference is 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 4.4 percentage points below the baseline projection in 2085. Calculated as a sum of separate alternative projections, the contribution rate is 5.2 percentage points below the baseline projection. When the pension assets exceed those in the baseline projection due to the high investment return, 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.

Figure 5.7.

Statutory pension expenditure relative to GDP and TyEL contribution relative to TyEL wage sum under different scenarios

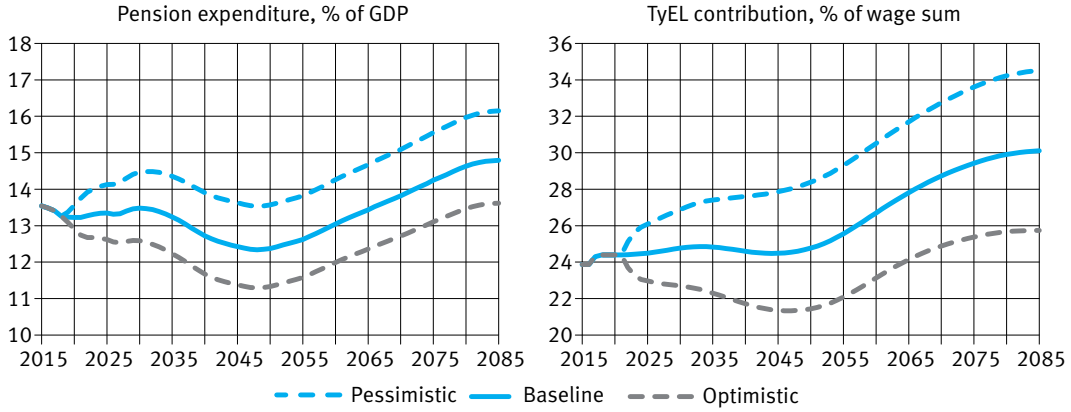


Table 5.8.

Sensitivity analysis, pessimistic and optimistic economic growth (at 2017 prices)

5.8.1 Average pension (€/month and relative to average earnings)

		2017	2020	2025	2030	2045	2065	2085
€/month	Baseline	1,656	1,683	1,770	1,844	2,081	2,692	3,535
	Pessimistic	-	-2	-14	-35	-139	-426	-842
	Optimistic	-	2	14	35	154	514	1,116
% of average earnings	Baseline	52.8	52.4	52.0	50.3	45.5	43.8	42.8
	Pessimistic	-	0.5	1.4	2.1	3.0	2.7	2.6
	Optimistic	-	-0.5	-1.4	-2.0	-2.7	-2.4	-2.3

5.8.2 Total pension expenditure

		2017	2020	2025	2030	2045	2065	2085
€ billion	Baseline	30.0	31.6	34.4	37.2	42.5	58.2	78.5
	Pessimistic	-	0.0	-0.3	-0.7	-2.9	-9.3	-18.8
	Optimistic	-	0.0	0.3	0.7	3.3	11.3	25.0
% of GDP	Baseline	13.4	13.2	13.3	13.5	12.4	13.4	14.8
	Pessimistic	-	0.3	0.8	1.0	1.2	1.2	1.4
	Optimistic	-	-0.3	-0.7	-0.9	-1.1	-1.1	-1.2

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

		2017	2020	2025	2030	2045	2065	2085
Expenditure	Baseline	26.2	26.3	27.0	27.7	27.0	31.7	36.3
	Pessimistic	-	0.6	1.6	2.0	2.4	2.6	2.9
	Optimistic	-	-0.6	-1.5	-1.8	-2.2	-2.3	-2.6
Contribution	Baseline	24.3	24.4	24.5	24.8	24.5	27.8	30.1
	Pessimistic	-	0.0	1.6	2.1	3.4	3.9	4.4
	Optimistic	-	0.0	-1.5	-2.1	-3.1	-3.7	-4.4
Assets	Baseline	224.8	209.8	205.8	204.2	221.9	267.1	308.6
	Pessimistic	-	0.3	-3.2	-7.7	-16.7	-19.9	-25.3
	Optimistic	-	-0.3	3.1	7.2	15.7	22.0	30.2

6 Comparison with previous report

In this section, we compare the results of this report with the previous long-term report of the Finnish Centre for Pensions (Tikanmäki et al. 2017).

6.1 Population projection and life expectancy coefficient

The main difference between the population projection of this report and the previous one is the considerably lower projected total fertility rate. In addition, yearly net migration has been projected at 2,000 persons lower than in the previous long-term projection. Because of these two factors, the total population will number less than projected in 2016 in all new birth year cohorts. In both projections, the old-age dependency ratio will follow the same track until 2030. After that, the projections are different. According to the current projection, the dependency ratio will exceed that in the previous projection by nearly ten percentage points by 2085. The speed at which mortality decreases is cut in half in 2070, or five years later than in the previous projection. (Table 6.1.)

Table 6.1.
Population forecasts in the 2019 and 2016 projections

	Realised	2019 projection			2016 projection		
	2017	2025	2045	2085	2025	2045	2085
Total fertility rate	1.49	1.45	1.45	1.45	1.7	1.7	1.7
Net migration (1,000)	14.8	15	15	15	17	17	17
Life expectancy at age 63 (years)	21.7	23.1	25.6	28.8	23.2	25.8	28.7
Population (1,000)							
Total	5,513	5,587	5,571	5,146	5,691	5,888	6,070
Under 15-year-olds	890	812	724	586	893	865	835
15–64-year-olds	3,443	3,406	3,299	2,746	3,419	3,455	3,348
65 years and over	1,179	1,369	1,549	1,815	1,379	1,568	1,887
Old-age dependency ratio (%)	34.2	40.2	46.9	66.1	40.3	45.4	56.4

In the high fertility sensitivity analysis presented in this report, the total fertility rate is 1.70. The same assumption was used in the baseline projection of the 2016 report.

The projected increase in life expectancy does not differ considerably from that in the previous report. As a result, the retirement age rises in this projection at nearly the same pace as in the previous one. Nevertheless, the life expectancy coefficient is slightly higher in this report than in the 2016 report since the realised life expectancies in 2015 and 2016 were lower than estimated. The difference in the life expectancy coefficient compared to the previous report is at most 0.8 per cent for those born in 1959. (Table 6.2.)

In the future, the pension system includes two adjustment mechanisms to account for increasing life expectancy. The level of mortality in the early 2020s affects how the

life expectancy coefficient and retirement age are weighted in the adjustment. The new population projection shifts the emphasis slightly towards retirement ages. For example, for those born in 1980, the estimated retirement age is one month higher than before but, correspondingly, the life expectancy coefficient makes a smaller cut in the pension amount.

Table 6.2.
Retirement age and life expectancy coefficient in the 2019 and 2016 projections, by year of birth

Year of birth	Retirement age		Life expectancy coefficient	
	2019 projection	2016 projection	2019 projection	2016 projection
1955	63 yrs 3 mos	63 yrs 3 mos	0.963	0.962
1960	64 yrs 6 mos	64 yrs 6 mos	0.942	0.935
1965	65 yrs 2 mos	65 yrs 2 mos	0.919	0.915
1970	65 yrs 8 mos	65 yrs 8 mos	0.909	0.905
1975	66 yrs 2 mos	66 yrs 2 mos	0.901	0.896
1980	66 yrs 8 mos	66 yrs 7 mos	0.894	0.888
1985	67 yrs 1 mos	67 yrs	0.886	0.880
1990	67 yrs 5 mos	67 yrs 5 mos	0.877	0.874
1995	67 yrs 10 mos	67 yrs 9 mos	0.872	0.867
2000	68 yrs 2 mos	68 yrs 1 mos	0.866	0.861

6.2 Employment and retirement

In the projection of this report, the employment rate is higher throughout the projection period than in the 2016 report. The difference in the near future is mainly due to the realised development. The annual average employment rate in 2018 rose to 71.7 per cent (Statistics Finland 2019b). In the 2016 report it was assumed that it would take until 2027 for the rate to reach this level.

In the long run, the employment rate settles at 1.6 percentage points above that in the previous projection. The difference is explained almost completely by the differences in population structure and unemployment rate. The fact that the demography is aging more rapidly than in the previous projection raises the employment rate. This is because the employment rates of the older working-age population are higher than those of the younger population. On the other hand, the unemployment rate has been assumed to be 0.5 percentage points below that of the previous projection in the long run. (Table 6.3.)

In 2025, the number of employed persons exceeds the previously projected number by 48,000 persons. Despite the higher employment rate, the number of employed persons will be lower than previously projected as of 2030. The difference will grow steadily throughout the projection period. In 2085, the number of employed persons is 16 per cent (or 381,000 persons) below the number projected in 2016. The difference is due to the shrinking of the working-age population.

The expected effective retirement age depicts the level in retirement rates in different years in a similar way as life expectancy depicts mortality rates. In the latest projection, the expected effective retirement age in 2025 is 0.2 years below that projected in 2016. By the end of the projection period, however, it will rise to 0.5 years above the number projected in 2016. The difference is mainly explained by the fact that the disability risk starts at a higher level, but is assumed to decline more strongly in the new projection. In the sensitivity analysis with a high disability retirement rate, the rate at which the disability risk declines is the same as in the baseline projection of the 2016 report. (Table 6.3.)

Up to 2045, the number of pension recipients does not deviate significantly from the previous projection. After 2045, the number of retirees will be permanently lower. The main reason for this is the lower population number than in the 2016 projection. The assumed lower number of new disability pensions also reduces the number of pensioners. (Table 6.3.)

Table 6.3.
Employment, retirement and number of pension recipients in 2019 and 2016 projections

	Realised	2019 projection			2016 projection		
	2017	2025	2045	2085	2025	2045	2085
Employment rate (%)	69.6	73.4	73.4	73.8	71.4	72.7	72.2
Number of employed persons (1,000)	2,292	2,396	2,363	2,027	2,348	2,456	2,408
TyEL	1,501	1,605	1,620	1,392	1,549	1,647	1,611
Private sector	1,770	1,867	1,862	1,599	1,812	1,906	1,867
Public sector	634	645	616	526	651	667	652
Expected effective retirement age, 25-year-olds	61.2	62.5	64.1	65.4	62.7	64	64.9
Pension recipients (1,000)	1,470	1,559	1,634	1,777	1,551	1,638	1,872
Pension recipients/employed	0.64	0.65	0.69	0.88	0.66	0.67	0.78

6.3 Pension expenditure and average benefits

In the 2016 projection, we estimated that the total pension expenditure relative to GDP would grow by 0.5 percentage points in 2016-2018. However, GDP grew faster and the pension expenditure slower than expected, so the ratio was reduced by 0.3 percentage points. The ratio will remain on a lower level than projected in the previous report until the year 2047. After that, the ratio will rise to a level 1.1 percentage points higher than in the previous projection. The difference is mainly due to the smaller number of employed persons relative to pensioners in the current projection. In the 2019 projection, the ratio of the sum of earned income to GDP is assumed to settle at 38 per cent in the long run (39% in the 2016 projection). The difference in the ratio of pension expenditure to GDP compared to the previous projection would be even higher in the long run without this change of assumption. (Table 6.4 and Figure 6.1.)

In the new projection, the earnings-related pension expenditure relative to the sum of earned income will exceed the level in the previous projection by 3.7 percentage points by 2085. However, in 2017-2029, the expenditure ratio will be at a lower level than projected in 2016 due to the more rapidly growing employment rate. (Table 6.4 and Figure 6.3.)
The ratio between the average pension and average earnings in the 2019 projection is lower than in the 2016 projection. In the first decades of the projection period, this difference is mainly due to the realised development. The average pension grew in 2016-2018 at a slower rate than projected in 2016, while average earnings grew faster. During the second half of the century, the age structure of pensioners will begin to deviate from the previously projected due to differences in the population projection. A lower birth rate leads to an older pensioner population than projected in 2016. This reduces the average earnings-related pension since the earnings-related pension index increases at a slower pace than the earnings level. (Figure 6.2).

Table 6.4.
Pension expenditure relative to GDP and earnings in the 2019 and 2016 projections

6.4.1 Pension expenditure relative to GDP (%)

	Realised	2019 projection			2016 projection		
	2017	2025	2045	2085	2025	2045	2085
Total	13.4	13.3	12.4	14.8	14.2	12.5	13.8
Earnings-related pensions	12.1	12.3	11.5	14.1	13.0	11.4	13.0
Kela pensions	1.1	0.8	0.7	0.5	1.0	0.8	0.5
SOLITA pensions	0.2	0.2	0.2	0.2	0.2	0.2	0.2

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

	Realised	2019 projection			2016 projection		
	2017	2025	2045	2085	2025	2045	2085
Total	31.6	32.5	30.3	37.1	33.3	29.3	33.4
TyEL	26.2	27.0	27.0	36.3	28.0	26.5	32.4
Private sector	27.5	28.2	27.7	36.3	29.1	27.0	32.4
Public sector	42.3	44.3	37.0	36.7	44.5	35.2	33.4

Figure 6.1.
Statutory pension expenditure relative to GDP 2005–2085

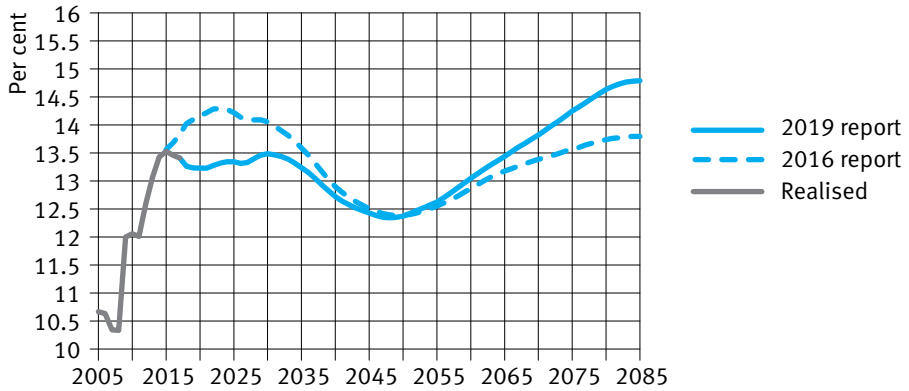


Figure 6.2.
Average pension relative to average earnings 2005–2085

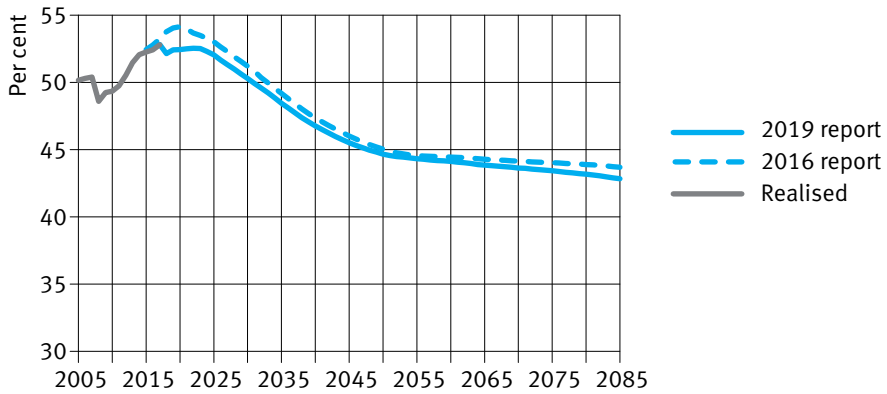
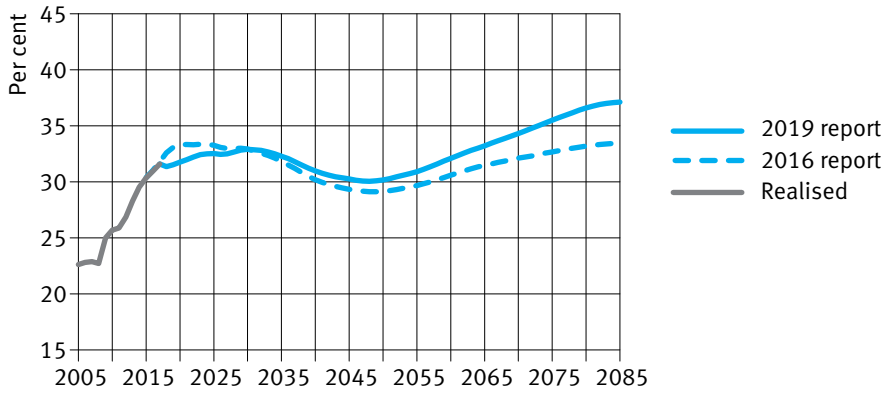


Figure 6.3.
Earnings-related pension expenditure relative to sum of earned income 2005–2085, all earnings-related pensions



6.4 Financing of TyEL pensions

In this report, the TyEL pension expenditure relative to the TyEL wage sum will be at a lower level than projected in 2016 up to 2030. After that, the expenditure ratio will exceed that of the previous projection. The difference in the early years of the projection period is due to the more positive economic and employment development than projected. In the long run, pension expenditure relative to the wage sum will grow, particularly due to changes in demography. (Figure 6.4).

The investment returns for TyEL assets in 2016 and 2017 were higher than previously projected. On the other hand, the realised return in 2018 and the projected return for the next decade are lower than projected in the 2016 report. In that report, the real investment returns were assumed to be 3.0 per cent in 2017-2026. In this report, the assumed real return is 2.5 per cent in 2019-2028. The long-term real return assumption is 3.5 per cent in both reports.

Because the wage sum has grown more rapidly than previously assumed, the leeway of TyEL funding is wider and there is not as much direct pressure to raise the contribution at year-end 2018 as previously projected. Nevertheless, the contribution level must be raised in the next decade as the investment return is lower than projected in the 2016 report. In the long term, the TyEL contribution level will be almost two percentage points higher than in the previous report as the expenditure level will exceed that of the 2016 projection. (Figure 6.5.)

The amount of TyEL assets at year-end 2018 does not differ significantly in the 2016 and 2019 reports. However, the ratio of assets to the wage sum is smaller in the current report since the wage sum has grown faster than assumed in the previous report. The assets relative to the wage sum will return to the level of the previous report in the mid-2030s, after which the ratio is permanently higher than in the previous projection. The long-term difference between the projections is mainly due to the reduced number of employed persons, which slows down the growth in the wage sum while the asset amount reacts to the change at a slightly slower pace. (Figure 6.6).

The ratio of assets to pension expenditure will return to its current level in the long run. Compared to the previous report, the ratio will differ towards the end of the projection period. The difference is partly explained by the change in how the surplus in the transition to old-age retirement is handled, as explained in section 4.6, and partly with other updates to the model. (Figure 6.7).

In this report, the additional funding of old-age pensions has been targeted until 2024 to those who have turned 55, and as of 2025, to those who have turned 65. In the previous report, the additional financing was targeted in 2017–2029 to those who have turned 70 years and as of 2030 to those who have turned 65 years. In the report in hand, the immediate need to even out the contribution is smaller, which is why we have simplified the assumptions. However, the contribution has been levelled out by changing the age groups to which the additional financing has been targeted due to the lower investment return assumption of the early years of the projection period.

According to this report, a sufficient constant contribution is 26.7 per cent (25.7% in the 2016 report) of the TyEL wage sum. The calculations of the constant contributions are explained in more detail in Appendix 2.

Table 6.5.
TyEL expenditure, contribution and assets relative to wage sum, and assets relative to expenditure in the 2019 and 2016 projections (%)

	Realised	2019 projection			2016 projection		
	2017	2025	2045	2085	2025	2045	2085
TyEL expenditure	26.2	27.0	27.0	36.3	28.0	26.5	32.4
TyEL contribution	24.3	24.5	24.5	30.1	24.8	24.4	28.3
TyEL assets	224.8	205.8	221.9	308.6	211.9	217.2	292.5
Assets/expenditure	857.6	761.2	822.5	849.9	757.5	820.7	903.3

Figure 6.4.
TyEL expenditure relative to wage sum 2005–2085

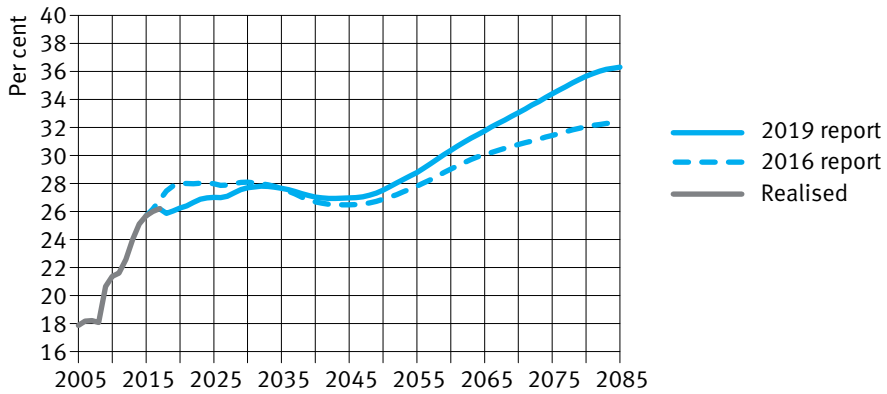


Figure 6.5.
TyEL contribution relative to wage sum 2005–2085

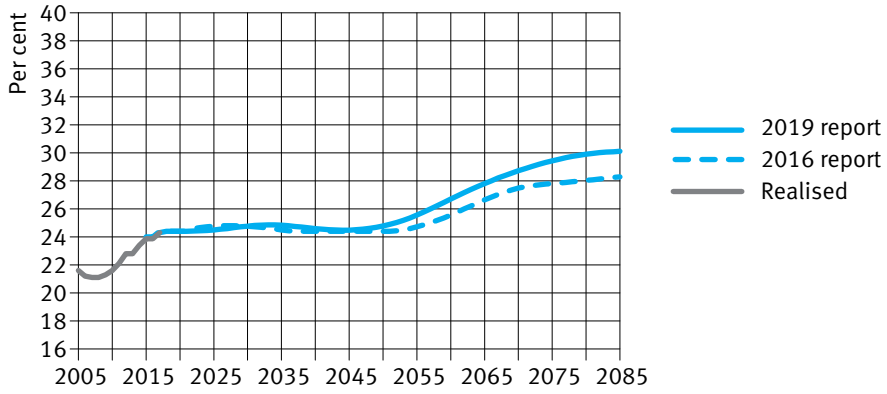


Figure 6.6.

TyEL assets relative to wage sum 2005–2085

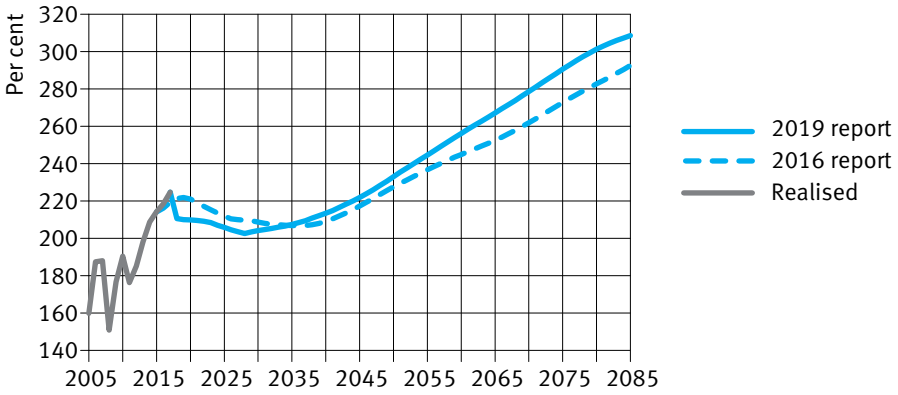
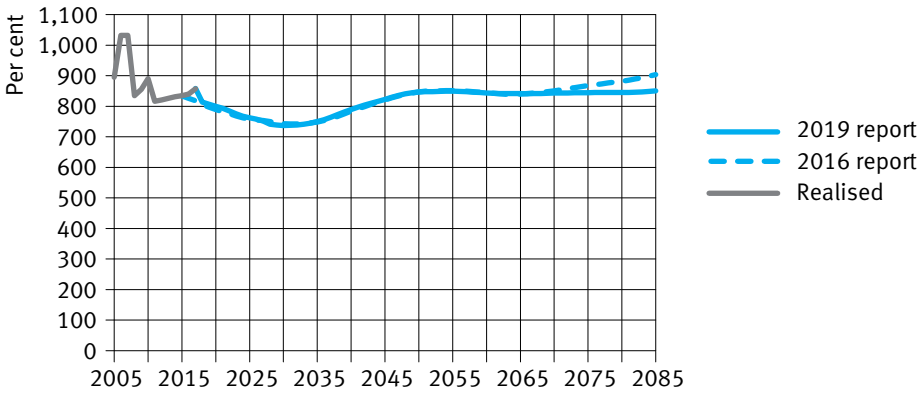


Figure 6.7.

TyEL assets relative to TyEL pension expenditure 2005–2085



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APPENDICES

Appendix 1. Indexing of Kela pensions

In the baseline projection, the pensions paid by Kela (the national and the guarantee pension) follow the consumer price index until 2023. As of 2024, Kela pensions will follow price and wage changes on a fifty-fifty basis (halfway index). In Table A1.1, the development of statutory 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, pensions paid by Kela are indexed to consumer prices throughout the projection period. In the second one, Kela pensions follow wage changes from 2024 onward.

Wage growth affects the level of earnings-related pensions through accrual rates, the wage coefficient and the pension index. Under current law, Kela pensions are in no way linked to wage development. Instead, a part of 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 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 (Table A1.1).

Table A1.1.

Pension expenditure and average benefits under different index rules for Kela pensions

A1.1.1 Kela pension expenditure relative to GDP (%)

	2017	2020	2025	2030	2045	2065	2085
Consumer price index	1.1	0.9	0.8	0.7	0.6	0.3	0.2
Halfway index	1.1	0.9	0.8	0.8	0.7	0.6	0.5
Wage index	1.1	0.9	0.8	0.8	1.0	1.1	1.2

A1.1.2 Total pension expenditure relative to GDP (%)

	2017	2020	2025	2030	2045	2065	2085
Consumer price index	13.4	13.2	13.3	13.4	12.3	13.2	14.5
Halfway index	13.4	13.2	13.3	13.5	12.4	13.4	14.8
Wage index	13.4	13.2	13.4	13.5	12.6	13.9	15.5

A1.1.3 Average pension relative to average wage (%)

	2017	2020	2025	2030	2045	2065	2085
Consumer price index	52.8	52.4	52.0	50.1	44.9	43.0	42.0
Halfway index	52.8	52.4	52.0	50.3	45.5	43.8	42.8
Wage index	52.8	52.4	52.1	50.5	46.3	45.4	45.0

A1.1.4 Full guarantee pension relative to average wage (%)

	2017	2020	2025	2030	2045	2065	2085
Consumer price index	24.2	23.8	22.4	20.8	16.7	12.4	9.2
Halfway index	24.2	23.8	22.8	21.9	19.6	17.0	14.7
Wage index	24.2	23.8	23.1	23.1	23.1	23.2	23.2

A1.1.5 Full national pension of a pensioner living alone relative to average wage (%)

	2017	2020	2025	2030	2045	2065	2085
Consumer price index	20.0	19.1	18.0	16.7	13.4	10.0	7.4
Halfway index	20.0	19.1	18.2	17.6	15.7	13.6	11.8
Wage index	20.0	19.1	18.5	18.5	18.5	18.6	18.6

Appendix 2. Sufficient constant contribution rate for TyEL, JuEL municipal pensions and all earnings-related pensions

The baseline projection illustrates the future development of the TyEL contribution according to current regulations. An alternative way to assess the necessary level of the TyEL contribution is to find a constant contribution rate that, together with the accumulated assets, would be sufficient to finance all future TyEL expenditure.

To determine a constant contribution rate, the baseline projection has been extended to the year 2100. After that point, the pension expenditure relative to the wage sum is assumed to stay unchanged. The growth of pension expenditure relative to the wage sum slows down and the ratio starts to slowly decrease after 2085. This is mainly due to the age structure of the population.

A sufficient TyEL contribution rate would be 26.7 per cent of the TyEL wage sum (Table A2.1). In 2017, the realised TyEL contribution rate was 24.3 per cent. As part of the competitiveness pact, the central labour market organisations have agreed to keep the contribution rate at 24.4 per cent of the wages until 2021.

According to the 2016 long-term projection, a sufficient constant contribution was 25.7 per cent. The new rate is higher than in the previous projection because of a higher pension expenditure rate relative to the wage sum, as well as the assumed lower investment return in 2019-2028. On the other hand, employment development that is better than in the previous projection reduces the constant contribution rate. The amount of the TyEL assets at the beginning of 2018 was very close to the assumption used in the 2016 projection, so the realised development of the assets does not considerably change the level of the constant contribution.

Correspondingly, the sufficient contribution for municipal pensions under JuEL would be 27.6 per cent (Table A2.2). In 2017, the contribution income under the municipal pension system of JuEL was 28.5 per cent of the wage sum (Keva 2018).

In the 2016 projection, the sufficient constant contribution rate of municipal pensions under JuEL was 26.0 per cent. The difference compared to the previous projection is mainly caused by the same factors as in the case of TyEL. The improvement in the employment rate in 2016-2018 was mainly due to the private sector, so the constant contribution rate for municipal pensions has risen more than that of TyEL.

The constant contribution rate sufficient to finance all earnings-related pensions would be 29.0 per cent of the sum of all earned income. The constant contribution of all earnings-related pensions is higher than the constant contribution of both TyEL and JuEL municipal pensions. This is mainly because the pension expenditures of JuEL State pensions and MYEL pensions are much higher relative to their sums of earned income than any of the other pension systems. In addition, the VEKL pension expenditure raises the sustainable constant contribution for the whole system. A comparable contribution income relative to the sum of earned income was 29.2 per cent in 2017. That means that the average contribution level of the earnings-related pension system is slightly over the minimal sustainable level. The

total contribution income, excluding the TVR contribution, was 25.1 billion euros, and the sum of earned income 85.9 billion.

In the 2016 report, the constant contribution rate sufficient to finance all earnings-related pensions was 28.1 per cent. Compared to that report, the level of the constant contribution has increased due to the higher ratio of pension expenditure to earned income and due to the lower investment return assumption. The change in the population projection raises the level of the constant contribution by 1.7 percentage points and the change in the expected investment return by 0.2 percentage points. On the other hand, the level of the constant contribution is reduced by a change in the projected number of starting disability pensions and an improved employment outlook.

The change in the constant contribution rate of all earnings-related pensions compared to the 2016 projection is slightly smaller than the changes in the constant contribution rates of TyEL and JuEL municipal pensions. This is because the JuEL State pension expenditure relative to its wage sum does not deviate as much from the 2016 report as do the pension expenditure ratios for TyEL and JuEL municipal pensions.

Conceptually, the balance calculation presented in Appendix 3 is close to this constant contribution rate calculation. According to both approaches, the contribution level of the whole earnings-related pension system is close to the long-term sustainable contribution level. The currently charged TyEL contribution is below the long-term sustainable level while the current contribution in the JuEL municipal pension system exceeds the sustainable contribution level.

The assumptions used in the projection affect the estimated sufficient constant contribution. In particular, the assumed return on pension assets has a significant effect on the required contribution rate. In this report, the expected real return is assumed to be 2.5 per cent in 2019–2028 and 3.5 per cent as of 2029.

If the return on pension assets were one percentage point higher, the TyEL contribution rate needed to finance the same pension expenditure would be roughly three percentage points lower than presented. If the return were one percentage point lower, the contribution rate would need to be nearly four percentage points higher. The effect on the contribution for municipal pensions is the same. A one percentage point higher return would reduce the contribution that covers all earnings-related pensions by 2.5 percentage points, while a one percentage point lower return would raise it by 3.1 percentage points. The TyEL and JuEL municipal pension contribution rates are the most sensitive with respect to investment returns because the amount of TyEL and JuEL municipal pension assets relative to the corresponding wage sums is higher during the projection period. (Tables A2.1–A2.3.)

Table A2.1.

Constant TyEL contribution rate, (wage sum € billion at 2017 prices; other quantities % of wage sum)

	2019	2020	2025	2030	2045	2065	2085	2100
Wage sum, € billion	59.3	60.1	65.0	70.2	88.3	112.0	137.2	162.0
Assets per 1 January	203.8	205.9	213.8	221.8	279.3	388.1	447.9	468.9
TyEL contribution rate	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7
TVR contribution rate	0.8	0.7	0.7	0.7	0.7	0.8	0.9	0.9
Return on investments	8.2	8.5	9.1	11.6	14.7	20.3	23.3	24.4
Pension expenditure	-26.0	-26.3	-27.0	-27.7	-27.0	-31.7	-36.3	-36.1
Operating costs	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
Other costs*	-0.5	-0.5	-0.4	-0.3	-0.2	-0.1	-0.1	-0.1
Assets per 31 December	212.3	214.5	222.1	232.1	293.6	403.4	461.7	484.0

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

Table A2.2.

Constant JuEL municipal contribution rate (wage sum € billion at 2017 prices; other quantities % of wage sum)

	2019	2020	2025	2030	2045	2065	2085	2100
Wage sum, € billion	17.7	18.0	19.7	21.4	26.7	33.8	41.4	48.8
Assets per 1 January	284.2	283.5	274.2	263.9	281.5	362.8	410.2	428.7
Contribution rate	27.6	27.6	27.6	27.6	27.6	27.6	27.6	27.6
TVR contribution rate	0.6	0.5	0.5	0.5	0.5	0.6	0.6	0.6
Return on investments	11.4	11.7	11.5	13.7	14.7	18.9	21.3	22.3
Pension expenditure	-30.4	-30.9	-32.3	-33.0	-30.6	-.33.0	-36.8	-36.4
Operating costs	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
Assets per 31 December	293.0	292.2	281.2	272.4	293.4	376.6	422.7	442.6

Table A2.3.

Constant contribution rate for all earnings-related pensions (wage sum € billion at 2017 prices; other quantities % of wage sum)

	2019	2020	2025	2030	2045	2065	2085	2100
Sum of earned income, € billion	90.0	91.2	97.7	104.9	129.9	164.5	201.6	238.1
Assets per 1 January	215.7	215.6	211.6	207.1	232.5	317.7	364.6	380.4
Contribution rate	29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
TVR contribution rate	0.7	0.6	0.6	0.6	0.6	0.7	0.8	0.8
Return on investments	8.7	8.9	8.9	10.8	12.2	16.6	19.0	19.8
Pension expenditure	-31.5	-31.8	-32.5	-32.9	-30.3	-33.2	-37.1	-36.8
Operating costs	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
Assets per 31 December	221.9	221.8	217.0	214.0	243.5	330.3	375.7	392.7

Appendix 3. Value of accrued pension rights and funding balance analysis

The annual earnings-related pension expenditure to be paid this 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 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 particular point in time.

The value of accrued pensions 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 projection is significant particularly in the case of the Finnish earnings-related pension system since the accumulated pension rights are, according to standard interpretation, property that is subject to constitutional protection.

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 system. In this Attachment, we present the results of both approaches.

Closed group analysis

When assessing the value of accrued pension rights, the discount rate used must be considered. In addition, 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. In the closed group analysis, the starting point is a computational exercise in which all pensions that have already accrued are paid to the insured but no new pensions accrue for anyone. The following pension components are considered to have accrued in the past:

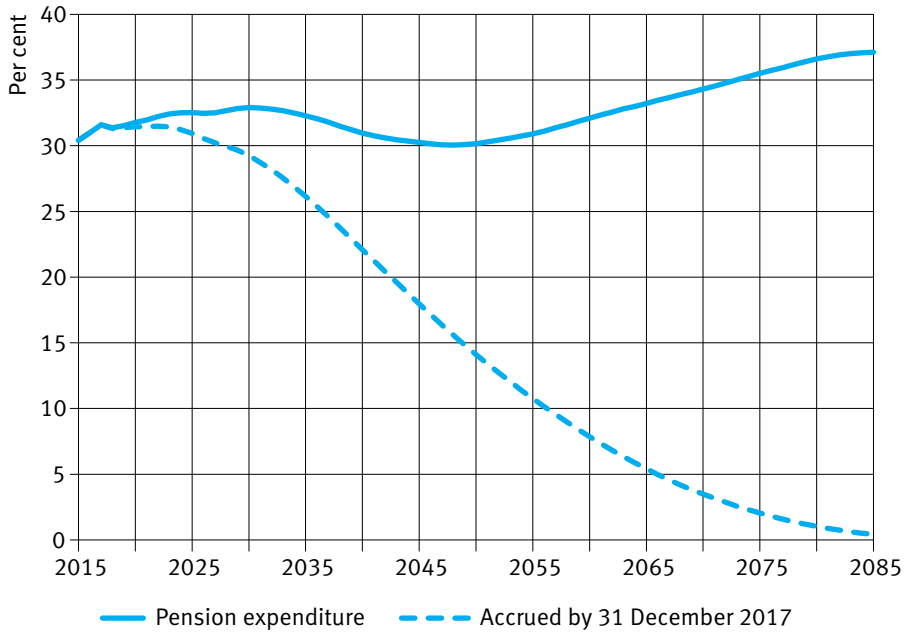
1. all earnings-related pensions already in payment, including their future index increases,
2. the old-age, partial old-age, disability, years-of-service and survivors' pension components that will start in the future and that are based on an already realised employment history or periods of social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

The pension expenditure from accrued pensions is calculated under the assumption that the retirement and termination rates are the same as they would be even if the pension accrual had not ended. In other words, the retirement and termination rates are the same as in the baseline projection in Chapter 4. Thus, among others, future disability pension expenditure is interpreted as a part of the accrued pension to the extent that this pension is based on an already realised employment history.

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 A3.1 presents the earnings-related pension expenditure that has accrued by 31 December 2017 and the total earnings-related pension expenditure relative to the sum of earned income. At the beginning of the projection period, the total pension expenditure consists of already accrued pensions. The pension expenditure that is based on already accrued pensions will drop to nearly zero by the end of the projection period.

Figure A3.1.
Total earnings-related pension expenditure and earnings-related pension expenditure accrued by 31 December 2017 relative to sum of earned income (%)



The discount rate used for future pensions has a substantial impact on the value of accrued pensions. Table A3.1 presents a baseline in which the value of accrued pensions is presented using a real discount rate of 2.5 per cent until 2028 and 3.5 per cent as of 2029. The discount rates correspond to the assumed return of assets of this projection.

With these assumptions the total value of earnings-related pensions accrued by the end of 2017 was 712.1 billion euros, of which TyEL pensions accounted for 412.6 billion euros.

In an alternative scenario a real discount rate of 1.5 per cent is used until 2028 and 2.5 per cent as of 2029. This corresponds to the low investment return scenario in Chapter 5. Hereinafter, this is called the low discount rate scenario. (Table A3.2.)

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 2017 is 28.4 per cent. In the scenario with a low discount rate, the funding ratio is 24.3 per cent.

Table A3.1.
Results of closed group analysis for 2017 when the real discount rate is 2.5% until 2028 and 3.5% as of 2029 (billion euros at present prices)

	TyEL	JuEL State	JuEL municipal	All earnings-related pensions
Assets per 31 Dec. 2017	126.2	19.6	52.3	202.3
Accrued pensions per 31 Dec. 2017	412.6	94.5	137.0	712.1
Funding ratio per 31 Dec. 2017 (%)	30.6	20.7	38.1	28.4

Table A3.2.
Results of closed group analysis for 2017 when the real discount rate is 1.5% until 2028 and 2.5% as of 2029 (billion euros at present prices)

	TyEL	JuEL State	JuEL municipal	All earnings-related pensions
Assets per 31 Dec. 2017	126.2	19.6	52.3	202.3
Accrued pensions per 31 Dec. 2017	486.2	107.3	159.3	832.1
Funding ratio per 31 Dec. 2017 (%)	25.9	18.3	32.8	24.3

Open group analysis

When assessing future pension accruals, the future pension expenditure and contribution income are discounted to present values. Three factors are central for the result: determining the future pension expenditure, determining the future contribution income and the used discount rate assumption. The pension expenditure is in line with the baseline projection in Chapter 4. The discount rate assumptions are the same as in the closed group analysis.

The contribution income is assumed to remain at the 2017 level. Both the TVR 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 TVR contribution develops as presented in the baseline projection. To retain comparability with the constant contribution calculations in Appendix 2, the reported contribution levels exclude the TVR contribution component. The contribution level of all earnings-related pension schemes, excluding the TVR contribution component, is 29.2 per cent of the sum of earned income. The present employee's contribution rate under TyEL is 24.3 per cent of the wage sum.

The baseline projection has been extended to 2100. In this analysis, we have assumed that the expenditure and contribution relative to the sum of earned income remain unchanged after that. The sum of earned income is projected to grow at a constant rate as of 2100. The constant real growth rate is 1.5 per cent, which is the same as the assumed long-term earnings growth rate.

Conceptually, the constant contribution calculation presented in Appendix 2 is close to this analysis. If the charged contribution is less than the constant contribution, the balance ratio is under 100 per cent. Correspondingly, if the charged contribution exceeds the constant

contribution, the balance ratio exceeds 100 per cent. Small differences arise because the constant contribution calculation starts in the year 2019 while the open group analysis starts already in 2018. The starting year of the constant contribution calculation (2019) is the first year in which all contributions have not yet been collected. On the other hand, the starting data of the pension expenditure projection is for a period up to 31 December 2017, which is a natural starting point for accrual projections.

The present value of the pension expenditure of the whole earnings-related pension system at year-end 2017 amounts to 1,631 billion euros, of which 712.1 billion euros has accrued before 31 December 2017 and 918.7 billion euros will accrue after that date. The combined present value of contributions and assets at year-end 2017 is 1,637.1 billion euros, which means that the ratio of the present value of contributions and assets to the present value of pension expenditure is around 100 per cent. In the TyEL scheme this balance ratio is 93 per cent and in the JuEL State pension scheme 124 per cent. This means that, in the future, there is a pressure to raise the TyEL contribution rate while, in the long run, the contribution rates for JuEL State pensions can be sustainably reduced. (Table A3.3.)

Table A3.3.

Results of open group analysis for 2017 when the real discount rate is 2.5% until 2028 and 3.5% as of 2029 (billion euros at present prices)

	TyEL	JuEL State	JuEL municipal	All earnings-related pensions
Accrued pensions per 31 Dec. 2017	412.6	94.5	137.0	712.1
Pensions accrued after 1 Jan. 2018	596.7	44.0	191.7	918.7
Present value of pension expenditure per 31 Dec. 2017	1,009.3	138.5	328.8	1,630.9
Assets per 31 Dec. 2017	126.2	19.6	52.3	202.3
Present value of pension contributions per 31 Dec. 2017	814.3	152.2	284.5	1,434.7
Contributions and assets per 31 Dec. 2017	940.5	171.7	336.8	1,637.1
Contribution rate as of 2017*	24.3	70.6	28.5	29.2
Balance ratio 31 Dec. 2017, %**	93.2	124.0	102.4	100.4

*Contribution rate without the TVR contribution. Present value of contributions includes the TVR contribution.

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

Table A3.4.

Results of open group analysis for 2017 when the real discount rate is 1.5% until 2028 and 2.5% as of 2029 (billion euros at present prices)

	TyEL	JuEL State	JuEL municipal	All earnings-related pensions
Accrued pensions per 31 Dec. 2017	486.2	107.3	159.3	832.1
Pensions accrued after 1 Jan. 2018	1,545.7	100.3	482.0	2,345.2
Present value of pension expenditure per 31 Dec. 2017	2,031.9	207.6	641.3	3,177.3
Assets per 31 Dec. 2017	126.2	19.6	52.3	202.3
Present value of pension contributions per 31 Dec. 2017	1,542.1	271.7	537.7	2,706.1
Contributions and assets per 31 Dec. 2017	1,668.2	291.3	590.0	2,908.4
Contribution rate as of 2017*	24.3	70.6	28.5	29.2
Balance ratio 31 Dec. 2017, %**	82.1	140.3	92.0	91.5

*Contribution rate without the TVR contribution. Present value of contributions includes the TVR contribution.

** 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

In principle, the open group analysis extends infinitely into the future, which means that it is necessary to take a stand on what happens to the pension expenditure and sum of earned income also after 2100. The significance of simplifications that have been made is reduced when we deal with a more remote future. Yet, in the low discount rate scenario, the pensions paid out after 2100 account for around 43 per cent of the present value of the pension expenditure of the whole earnings-related pension system. When using the discount rate of the baseline projection, the corresponding share is 19 per cent. The pension-scheme-specific weightings are presented in Table A3.5. In the low discount rate scenario, the long-term discount rate (2.5%) differs only slightly from the real growth of the sum of earned income (1.5%). In this case, the annual present value of pension expenditure decreases slowly over time, which explains the weight of the latter part of the projection period.

Table A3.5.

Share of post-2100-period of present value with different discount rates

	TyEL	JuEL State	JuEL municipal	All earnings-related pensions
Discount rate 2.5–3.5%				
Pension expenditure	21%	8%	19%	19%
Contribution income	17%	15%	17%	17%
Discount rate 1.5–2.5%				
Pension expenditure	45%	24%	43%	43%
Contribution income	41%	38%	41%	41%

Appendix 4. 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 TVR contribution that the Employment Fund credits to the earnings-related pension system. The method is described in more detail in Risku 2015.

In addition to the internal return, the pension contributions and benefits of different generations can be described with the present values of received benefits and paid contributions. 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 6.5 per cent. For those born between 1970–2000, it will be approximately 2.0–2.1 per cent. The lower internal rate of return for the younger generations is mainly due to the fact that earnings-related pensions are financed mainly through the PAYG system. The pension contributions paid by older generations have been lower than the present contribution level. (Table A4.1.)

In the 2016 long-term projection, the internal return of the younger generations settled at approximately 2.2 per cent. The slightly lower return of the new projection is mainly due to the lower disability pension expenditure. For those born after 1980, the lower return is also due to the higher TyEL contribution rate.

Women receive a higher internal rate of return on their pension contributions than men do. This is because women's pensions have higher present values relative to their earnings since women's life expectancy is higher than men's and most surviving spouse's pensions are paid to women.

Figure A4.1.
Real internal rate of return of pension contributions by birth year and gender

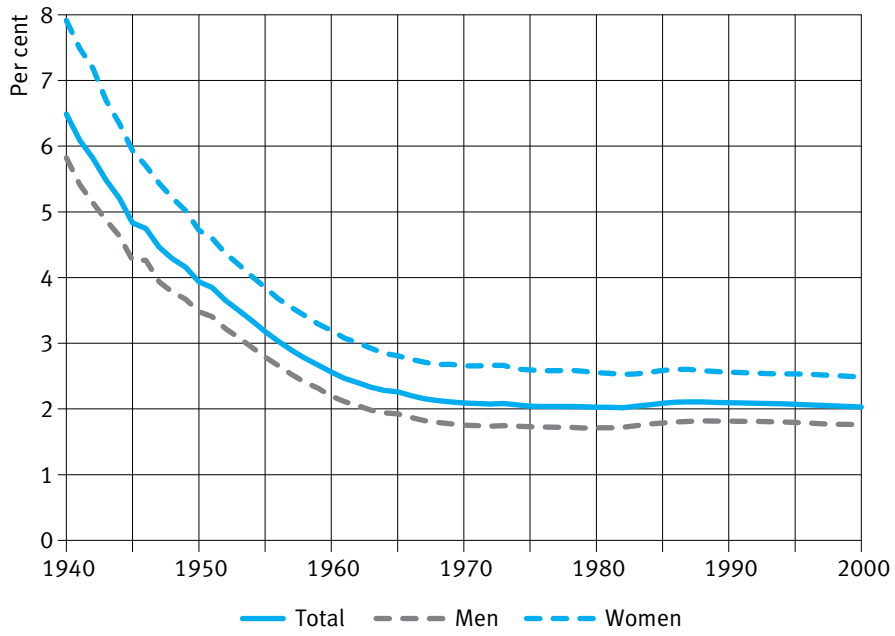


Table A4.1.
Real internal rate of return of pension contributions by birth year and gender (%)

Year of birth	Men	Women	Total
1940	5.8	7.9	6.5
1945	4.3	5.9	4.8
1950	3.5	4.7	3.9
1955	2.8	3.8	3.2
1960	2.2	3.2	2.6
1965	1.9	2.8	2.3
1970	1.8	2.7	2.1
1975	1.7	2.6	2.0
1980	1.7	2.6	2.0
1985	1.8	2.6	2.1
1990	1.8	2.6	2.1
1995	1.8	2.5	2.1
2000	1.8	2.5	2.0

Appendix 5. 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. Consequently, the 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 A5.1.
Period life expectancy in 2017–2085 by age and gender (years)

	2017	2020	2025	2030	2035	2045	2055	2065	2075	2085
Life expectancy at birth	81.5	82.4	83.4	84.3	85.2	86.8	88.3	89.5	90.3	90.8
Men	78.7	79.7	80.9	82.0	83.0	84.9	86.5	87.9	88.9	89.4
Women	84.2	85.0	85.8	86.6	87.4	88.8	90.0	91.1	91.8	92.3
Life expectancy at age 25	57.0	57.8	58.7	59.6	60.5	62.0	63.4	64.6	65.4	65.9
Men	54.3	55.2	56.3	57.3	58.3	60.1	61.7	63.1	64.0	64.6
Women	59.6	60.3	61.1	61.9	62.6	63.9	65.1	66.2	66.9	67.4
Life expectancy at age 63	21.7	22.3	23.1	23.8	24.4	25.6	26.7	27.7	28.4	28.8
Men	19.8	20.4	21.2	22.0	22.7	24.0	25.2	26.3	27.0	27.5
Women	23.5	24.1	24.7	25.4	26.0	27.2	28.2	29.1	29.8	30.1
Life expectancy at age 65	20.1	20.7	21.4	22.1	22.7	23.9	24.9	25.9	26.5	26.9
Men	18.2	18.9	19.6	20.3	21.0	22.3	23.5	24.5	25.2	25.6
Women	21.8	22.3	23.0	23.6	24.2	25.3	26.4	27.3	27.9	28.3

Table A5.2.
Cohort life expectancy in 2017–2085 by age and gender (years)

	2017	2020	2025	2030	2035	2045	2055	2065	2075	2085
Life expectancy at birth	90.8	91.0	91.3							
Men	89.2	89.5	89.9							
Women	92.4	92.6	92.9							
Life expectancy at age 25	64.3	64.6	65.0	65.4	65.8	66.4				
Men	62.4	62.8	63.3	63.8	64.2	64.9				
Women	66.3	66.5	66.8	67.1	67.4	67.9				
Life expectancy at age 63	24.0	24.4	25.1	25.7	26.3	27.4	28.2	28.7	29.1	29.5
Men	22.0	22.5	23.2	23.9	24.6	25.8	26.7	27.3	27.8	28.2
Women	25.9	26.2	26.9	27.5	28.0	29.0	29.7	30.1	30.5	30.9
Life expectancy at age 65	22.1	22.5	23.2	23.8	24.4	25.4	26.2	26.8	27.2	27.6
Men	20.2	20.6	21.4	22.1	22.7	23.9	24.8	25.4	25.9	26.3
Women	23.9	24.3	24.9	25.5	26.0	27.0	27.7	28.2	28.6	28.9

Appendix 6. Population projection by age and gender

Table A6.1.

Population projection for 2017–2085 by age and gender (1,000)

Men

	2017	2020	2025	2030	2035	2045	2055	2065	2075	2085
0–4	142	130	126	124	122	118	108	103	100	94
5–9	158	154	133	129	127	124	116	108	105	100
10–14	154	160	156	135	132	128	124	113	109	105
15–19	152	153	163	159	138	132	130	121	114	110
20–24	168	160	158	167	163	140	136	132	121	117
25–29	182	182	168	166	175	152	146	143	135	127
30–34	182	183	188	174	173	178	155	151	147	137
35–39	181	187	186	191	178	185	163	157	154	146
40–44	171	179	189	187	192	178	183	162	157	153
45–49	166	163	179	188	187	180	187	166	160	157
50–54	186	175	161	178	187	191	178	183	163	158
55–59	181	184	172	159	175	184	178	185	165	160
60–64	179	175	177	167	155	181	186	175	180	161
65–69	178	170	166	169	159	165	176	172	180	161
70–74	143	166	156	154	158	142	169	177	168	174
75–79	90	104	146	139	139	139	149	163	162	171
80–84	59	65	83	118	116	125	118	146	157	151
85–89	32	35	42	55	81	86	93	107	123	125
90–94	10	12	15	19	26	41	49	52	69	77
95–	2	2	3	4	5	11	14	16	21	26

Women

	2017	2020	2025	2030	2035	2045	2055	2065	2075	2085
0–4	136	124	121	118	117	113	103	99	95	90
5–9	152	147	127	124	121	119	111	103	100	96
10–14	148	153	149	130	126	122	118	108	104	101
15–19	144	146	154	151	132	126	123	115	108	105
20–24	160	150	149	157	154	132	127	124	114	110
25–29	172	171	157	156	164	142	136	133	126	118
30–34	171	171	176	161	160	164	143	139	135	126
35–39	170	175	174	178	164	170	150	144	141	133
40–44	162	169	177	175	179	165	168	148	144	140
45–49	162	156	170	178	176	167	173	153	147	144
50–54	184	173	156	170	178	180	166	170	150	146
55–59	184	185	172	155	170	176	167	173	154	148
60–64	188	182	182	169	154	175	178	165	169	150
65–69	192	184	177	177	166	165	171	164	170	152
70–74	164	189	177	171	172	147	169	173	161	165
75–79	117	129	176	166	162	154	156	164	159	165
80–84	89	96	113	155	149	150	133	156	163	153
85–89	64	63	71	87	122	121	122	129	141	138
90–94	30	33	34	40	50	74	82	79	99	106
95–	8	9	11	12	15	28	33	37	44	51

Appendix 7. Earnings per age and gender in 2017

Age, gender and earnings-related pension scheme specific average earnings as in Table A7.1 have been used in the LTP model. The income of the self-employed refers to their insured confirmed income.

Table A7.1.
Average earnings by age and gender in 2017 (€/month)

Men

	TyEL	YEL	MYEL	JuEL State	JuEL municipal
18–19	1,054	892	704	1,490	1,353
20–24	2,031	1,190	1,264	2,439	2,057
25–29	2,786	1,362	1,628	3,069	2 748
30–34	3,437	1,625	1,795	3,549	3,185
35–39	3,968	1,855	1,839	3,865	3,492
40–44	4,231	2,019	1,879	4,160	3,674
45–49	4,294	2,150	1,884	4,310	3,704
50–54	4,274	2,228	1,856	4,427	3,784
55–59	4,246	2,320	1,834	4,449	3,926
60–64	4,207	2,290	1,819	4,404	3 877
65–67	4,133	2,249	1,788	4,330	3,810
18–67	3,632	2,041	1,823	4,111	3,504

Women

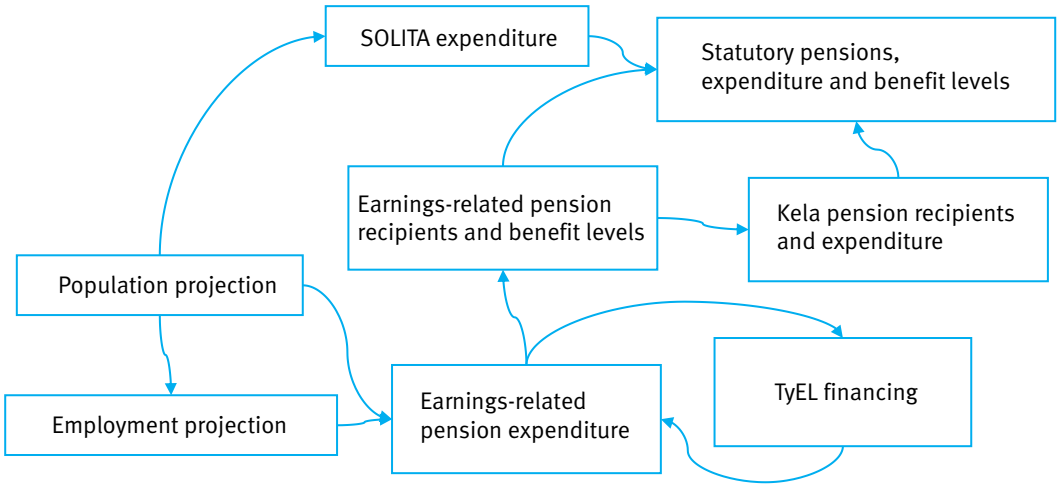
	TyEL	YEL	MYEL	JuEL State	JuEL municipal
18–19	851	869	642	1,595	1,725
20–24	1,484	1,038	1,244	2,162	2,311
25–29	2,050	1,188	1,535	2,518	2,516
30–34	2,402	1,372	1,636	2,775	2,494
35–39	2,769	1,511	1,657	3,025	2,722
40–44	3,074	1,653	1,605	3,392	2,977
45–49	3,220	1,806	1,606	3,641	3,010
50–54	3,176	1,938	1,561	3,680	3,061
55–59	3,095	2,064	1,509	3,741	3,079
60–64	3,071	2,035	1,502	3,698	3,049
65–67	3,017	2,001	1,476	3,636	2,997
18–67	2,570	1,739	1,569	3,488	2,858

Appendix 8. 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 system and can be used to make projections for planning and forecasting purposes. Unless otherwise stated, pension acts and other regulations governing the system are assumed to remain unchanged throughout the projection period.

The model consists of several interconnected modules (Figure A8.1).

Figure A8.1.
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 system, 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. The age- and gender-specific unemployment rates have been adjusted to keep the unemployment rate at this level throughout the projection period.

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[12] and other JuEL 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;
- 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 system.

The states of receiving a partial disability pension or a partial old-age pension are each further divided into two states 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 an earnings-related unemployment allowance payable for 500 days, those on a basic daily allowance and those receiving a labour market subsidy. Those entitled to additional days of the earnings-related unemployment allowance have their own state. The inactive state includes persons who transfer from work covered by the pension scheme under examination to work covered by some other scheme or who exit the labour

12 Specifically, the employees of Keva's member organisations.

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 9).

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 module 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. 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 number of earnings-related pension recipients and the average earnings-related pension are calculated once the pension expenditure of all pension schemes is known. 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 using the population projection and the projected size of starting earnings-related pensions. From the earnings-related pension projection, the average size of starting pensions per age and gender can be established, but the model does not provide information on the size distribution of pensions. As for the national pension and guarantee pension projections, it is assumed that the size distribution for starting earnings-related pensions will follow the current distribution. In addition, the amount of the national pension is proportionate to the time that the pensioner has lived in Finland or in a country that Finland has a social security agreement with. In the module, the value used for the proportioning coefficient comes from the ELSI model.

The SOLITA module is a simple projection of the development of SOLITA expenditure based on the population projection. The starting point for the projection is the current SOLITA expenditure, grouped by age and gender. For those of active age (18-62 years), SOLITA pensions will grow at the same rate as general wages. For those who are 63 and above, SOLITA 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. Within certain limits, the population for whom the average pension will be projected can be selected. In this report, the chosen population consists of persons living in Finland who receive a pension other than a part-time pension, a partial old-age pension or a survivors' 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:

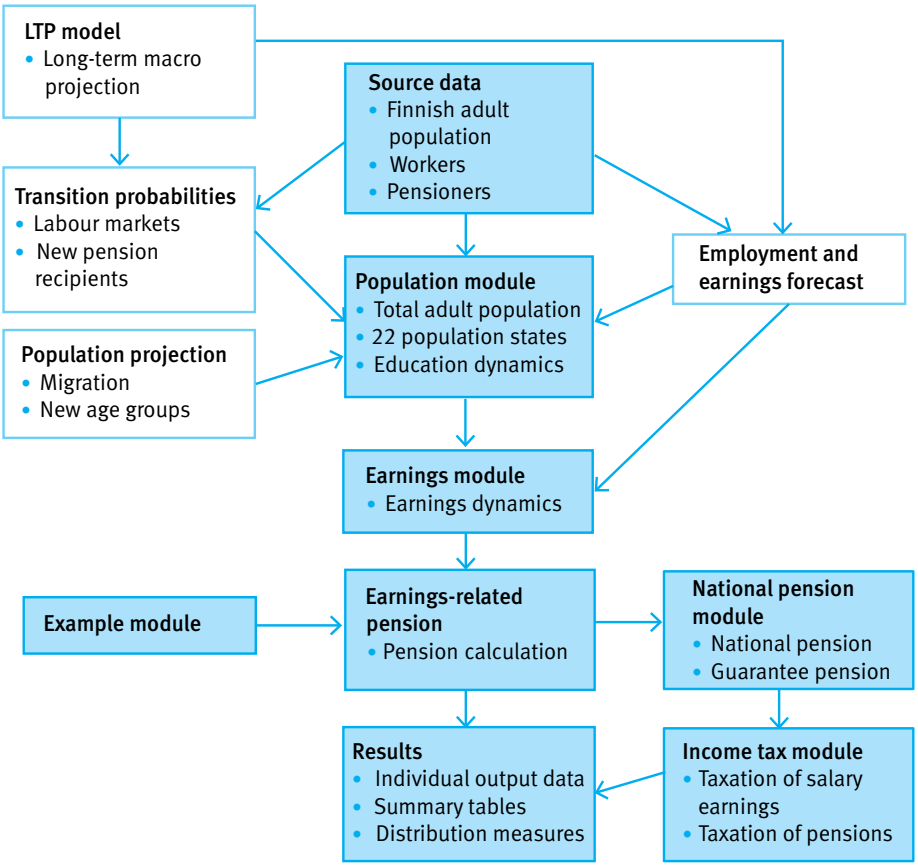
- population distribution over different schemes and different states within the schemes,
- wages of the insured and other earnings for which pension accrues,
- amount of accrued pension,
- technical provision and the amount of pension assets,
- the size of pensions in payment,
- transition probabilities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

The figures that depict the starting point of the projection are from the following sources: the statistical database and pension register of the Finnish Centre for Pensions; the joint earnings and accrual register of the earnings-related pension system; the joint register 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 9. ELSI microsimulation model description

ELSI is a longitudinal microsimulation model with dynamic aging. It depicts the Finnish statutory earnings-related pension system. In other words, the ELSI model is used to simulate the effects of the pension system by modelling people's life spans on an individual level. The model has a modular structure. It includes modules for the source data, population, earnings, earnings-related pensions, Kela pensions, taxation and results. Figure A9.1 illustrates the structure of the model.

Figure A9.1.
Structure of the ELSI model



The model simulates the socially insured adult population of Finland. The source data includes around 4,670,000 persons, which corresponds to the socially insured adult population of Finland in 2012[13]. The source data has been compiled from the registers of the earnings-related pension system. The data has been supplemented with Statistics Finland's data on educational levels.

13 The module includes also persons who have accrued earnings-related pension up to 2012 although they have not been part of the socially insured adult population of Finland in 2012.

In the model, individuals move from one population state to another based on transition probabilities defined by state, age, gender and educational level. Changes in educational level are simulated in a similar way. There are five educational levels in the model: *primary education, vocational education, high school education, lower tertiary education* and *at least higher tertiary education*. When reporting the results, the vocational degrees and the high school degrees have been lumped together into a secondary education degree. The division is based on the Finnish Standard Classification of Education 2011 (Statistics Finland).

Based on simulated states, individuals are given simulated earnings and social benefits for which they accrue a pension. When individuals transition to retirement in the simulation, their earnings-related pension is calculated based on their simulated working life and earnings. The model does not take into account 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 projected earnings-related pension, a national and a guarantee pension is calculated for the individual. The calculation of survivors' pensions is not included in the model. However, the survivors' pensions of the earnings-related pension scheme and foreign pensions are taken into account by using an imputing technique when calculating the national pension. This way, the model gives a more realistic level for the national pension and guarantee pension expenditure.

When all pensions have been calculated, the individual's net earnings can be calculated by taking into account the taxation of income from earnings and pensions. After the simulation phases, statistics for various distributions can be collected for the different population groups. We never present results on an individual level or for very small groups.

The ELSI model has been calibrated to be compatible with the results of the LTP model. In other words, the key result variables produced by the models do not differ significantly. For a more detailed description of the ELSI model, consult Tikanmäki et al. 2014 and Sihvonen 2015. A projection model estimated in the master's thesis Tarvainen 2017 has been used as a simulation model of earnings.

The results on the median pensions and pension distributions in sections 4.4 and 4.5 have been produced with the ELSI model.

07
2019

FINNISH CENTRE FOR PENSIONS,
REPORTS

Statutory Pensions in Finland – Long-term Projections 2019

The report presents the Finnish Centre for Pensions' long-term projections regarding the development of statutory pensions from 2019 to 2085. The main focus of the report is on projections of earnings-related pensions. The report examines the development of pension expenditure and the benefit level, as well as the financing of private sector earnings-related pensions. The main results depict the development of contributions and assets under the Employees Pension Act.

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.

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