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

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

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

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TO THE READER

The Finnish statutory pensions are the earnings-related pensions, the national pension, the guarantee pension, and pensions based on the Military Injuries Act, the Motor Liability Insurance Act and the Workers' Compensation Insurance Act. This report presents the Finnish Centre for Pensions' long-term projections of statutory pensions for the period 2016–2085.

This report was originally published in Finnish in October 2016. The previous similar report was published in 2013 (in Finnish; in 2014 in English). In 2015, two reports on the effects of the 2017 earnings-related pension reform were published. The reports were written at different stages of the preparation of the reform. The most significant change compared to the report in 2013 is the 2017 pension reform. Compared to the projections published in 2015, the most substantial changes are the new population forecast and the updated expected economic outlook. As for the content, this report has been expanded with projections made using the ELSI microsimulation model. These projections depict pension levels by gender and educational level, as well as the development of pension distributions. Other new content includes the sensitivity analyses on the effects of immigration as well as estimates on the internal rate of return of the Employees Pensions Act (TyEL) for different birth cohorts.

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 and Mikko Sankala have prepared the projections on earnings-related pensions with the LTP model. Heikki Tikanmäki and Hannu Sihvonen have prepared the projections using the microsimulation model. Kaarlo Reipas has prepared the employment and national pension projections, while Jukka Appelqvist and Hannu Sihvonen have collected and edited the register data used in the projections. Jukka Appelqvist has prepared the short-term economic forecasts. Juha-Matti Kallinen has prepared the population forecast that underlies the projections. Heikki Tikanmäki has coordinated the writing of the report. The report was translated into English by Lena Koski. Merja Raunis has prepared the report for publication.

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Helsinki – March 2017

Heikki Tikanmäki, Jukka Appelqvist, Kaarlo Reipas, Mikko Sankala and Hannu Sihvonen

SUMMARY

This report presents the Finnish Centre for Pensions' 2016 long-term projections of the development of statutory pension expenditure and the benefit level. The report also includes financing projections for the earnings-related pension acts. The main result from the financing projections is the development of contributions and assets under the Employees Pensions Act (TyEL) for the years 2016–2085.

The projections follow Statistics Finland's population forecast from 2015, which we have extended to 2085. According to the forecast, the population will continue to grow throughout most of the projection period. At year-end 2015, the population in Finland amounted to 5.49 million. It is projected to grow to 6.1 million by the end of 2085. The population growth is mainly due to the rising number of people aged 65 and above. With the exception of the 2030s and the early 2040s, the working-age population will decrease throughout the projection period never to reach the starting level.

The old-age dependency ratio (the ratio of persons aged 65 and above to the 15–64-year-olds) will continue to grow until 2085, but at a slower pace after 2030.

In 2015, the old-age dependency ratio was 32.4 per cent. It is projected to rise to 56.4 per cent by 2085. The weakening of the old-age dependency ratio in the near future is a consequence of the current age structure in Finland. However, the steadily rising life expectancy causes the old-age dependency ratio to weaken throughout the projection period. In 2015, life expectancy at birth was 81.3 years. It is projected to rise to above 90 years by 2085.

The employment rate in 2013–2015 was 68.3 per cent. According to the employment projection, it is expected to increase to 70 per cent in 2020 and reach 72 per cent by the end of the 2020s. After that, the employment rate will vary between 72 and 73 per cent, depending on the age-structure of the working-age population. The growth in the employment rate follows from an increasing labour force participation rate and a decreasing unemployment rate. The employment rate of the elderly will rise partly as a result of the expected postponing of retirement due to, among other things, the 2017 pension reform. In 2015, the expected effective retirement age was 61.1 years. It is projected to rise to 62.7 years by 2025 and to stabilise at slightly below 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 at age 62. In 2015, the life expectancy coefficient for the 62-year-olds was 0.972. It will be 0.91 and 0.85 in 2030 and 2085, respectively. For those born in 1965 or later, the retirement age will also be adjusted to changes in life expectancy. The retirement age will be 66 years and 7 months for those born in 1980 and approximately 68 years for those born in 2000.

In 2015, the total statutory pension expenditure was 13.6 per cent of GDP. It will be at its highest – slightly more than 14 per cent – in the 2020s. In the 2040s, the ratio of pension expenditure to GDP will decrease to just over 12 per cent, after which it will begin to grow slowly again in 2050. At the end of the projection period, the pension expenditure will grow to nearly 14 per cent of GDP.

In 2015, the earnings-related pension expenditure for the whole economy was 30.4 per cent relative to the sum of earned income. The expenditure ratio will grow until 2020, at which time it will be slightly over 33 per cent. After 2025, the ratio will decrease, standing at approximately 29 per cent in 2050. From then on, it will grow again to slightly over 33 per cent by the end of the projection period. The increase in the expenditure ratio is caused by the growth in old-age pension and disability pension expenditure.

In 2015, the average monthly pension was 1,613 euros. The purchasing power of the average pension is projected to grow continuously, reaching 3,700 euros in 2085 at 2015 prices. Relative to the average wage, the average pension will increase slightly over the next few years. This growth is due to two factors: first, the earnings growth is expected to be slow in the near future. Second, the gradually terminating pensions of the oldest pensioners are low since they started working before the pension acts came into force in the 1960s. In contrast, the new pensions are based on a full working life. The relative pension level will begin to decrease around the year 2020. The main reason for the decrease is the life expectancy coefficient, which adjusts the benefit level to correspond to changes in life expectancy. 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 changes made to 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 inside gender groups. However, the differences in pension levels will decrease between genders. The pensions for people of different educational levels will develop more-or-less at the same rate. Men with a higher university degree and men and women with a basic-level education form the exception. For both groups, pensions will develop at a below-average rate because of changes in the educational structure. In the future, those with a higher-level education will not form as selective a group as previously. Correspondingly, the group with a basic-level education will include relatively more people who are, on average, less well off. It will also include relatively more immigrants.

The TyEL contribution rate will rise from 24.0 per cent in 2015 to 24.8 per cent at the end of the 2020s. After that, it will go down to 24.4 per cent for about one decade. The contribution rate will rise again in the 2050s to a little over 28 per cent by 2085, the end of the projection period. The increase in the contribution rate is a result of the increase in pension expenditure. By the end of the century, the TyEL assets will also grow relative to the wage sum. In contrast, the amount of assets relative to the pension expenditure will remain constant.

A constant TyEL contribution rate of 25.7 per cent would be sufficient to finance expenditures indefinitely. In 2015, the contribution rate was 24.0 per cent of the wage sum. Similarly, a sufficient constant contribution rate for local government pensions would be 26.0 per cent relative to the local government wage sum. In 2015, that rate was 29.8 per cent. The contribution level sufficient to finance the total pension expenditure under all earnings-related pension acts would be 28.1 per cent. In 2015, the comparable figure was 28.5 per cent.

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

Changes in mortality would affect the development of retirement ages and the benefit levels due to the life expectancy coefficient. However, these adaptation mechanisms would not remove all the effects of a rising life expectancy on expenditure. First of all, they do not affect the pensions of those who have already retired. Furthermore, the life expectancy coefficient does not apply to pensions paid by Kela. In addition, the rise in the retirement age does not affect, in full, the effective retirement age. This phenomenon will be accentuated if the retirement age rises quickly as a result of a rapid increase in life expectancy.

Immigration strengthens the financing of the earnings-related pension system. Most immigrants are young, working-age people or children. Immigration increases the number of working people and the wage sum, even when the employment rates of the immigrants are lower than those of the original population. In general, immigrants will not be paid pensions until much later. Although immigration will increase Kela's pension expenditure, it will also reduce the total pension expenditure relative to GDP.

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. 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 term, the TyEL contribution rate would be approximately 0.7 percentage points below that of the baseline projection.

The *employment rate* affects the pension expenditure relative to the wage sum both in the short and the medium term. If the employment rate falls short of that in the baseline projection, the accrued earnings-related pension rights are lower than those in the baseline projection. In the latter part of this century, a constant deviation from the baseline projection will not show in the pension expenditure 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 later lead to a lower TyEL contribution rate. A one-percentage-point increase in investment returns would reduce the contribution rate slightly less than one percentage point in 2025 and by more than three 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 fast earnings growth reduce the pension expenditure relative to GDP. In the long run, this ratio will remain approximately one percentage point below the baseline projection. In addition, high investment returns will lower the contribution rate. The TyEL contribution rate will be 2–4 percentage points below the baseline projection. In the optimistic scenario, the average pension will be considerably higher than in the baseline projection. However, 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 term, the ratio of pension expenditure to GDP will be slightly more than one percentage point higher than in the baseline projection. The TyEL contribution rate will be 2–4 percentage points higher than in the baseline projection as of the early 2020s. 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 2016 pitkän aikavälin laskelmat lakisääteisten eläkemenojen ja etuustason kehityksestä. Työeläkelakien osalta raportti sisältää myös rahoituslaskelmia, joiden keskeisimpiä tuloksia ovat TyEL-maksun ja -varojen kehitys vuosille 2016–2085.

Laskelmissa käytetään Tilastokeskuksen väestöennustetta vuodelta 2015, jota on jatkettu Eläketurvakeskuksessa vuoteen 2085 saakka. Ennusteen mukaan Suomen väestö kasvaa lähes koko ennustejakson ajan. Vuoden 2015 lopussa väestön määrä oli 5,49 miljoonaa, ja sen arvioidaan olevan 6,1 miljoonaa vuonna 2085. Väestön kasvu on pääosin seurausta 65 vuotta täyttäneen väestön osan kasvusta. Työikäisen väestön määrä supistuu 2030-lukua ja 2040-luvun alkua lukuun ottamatta koko ennustejakson ajan. Työikäisten määrä ei saavuta koko ennustejaksolla enää lähtövuoden tasoa.

Vanhushuoltosuhteen (65 vuotta täyttäneet suhteessa 15–64-vuotiaisiin) kasvu jatkuu vuoteen 2085 asti, mutta muutos hidastuu vuoden 2030 jälkeen. Vuonna 2015 vanhushuoltosuhde oli 32,4 prosenttia ja sen arvioidaan olevan 56,4 prosenttia vuonna 2085. Vanhushuoltosuhteen heikkeneminen lähitulevaisuudessa johtuu Suomen nykyisestä ikärakenteesta. Eliniän jatkuva pidentyminen kuitenkin aiheuttaa sen, että vanhushuoltosuhde heikkenee koko ennustejakson ajan. Vuonna 2015 vastasyntyneen elinajanodote oli 81,3 vuotta. Ennusteen mukaan se nousee vuoteen 2085 mennessä yli 90 vuoteen.

Työllisyysaste vuosina 2013–2015 oli 68,3 prosentissa. Työllisyysennusteen mukaan työllisyysaste nousee siten, että vuonna 2020 se on 70 prosenttia ja 2020-luvun lopulla saavuttaa 72 prosentin tason. Tämän jälkeen työllisyysaste vaihtelee 72 ja 73 prosentin välillä työikäisten ikärakenteen mukaan. Työllisyysasteen nousu on seurausta työvoimaosuuden kasvusta ja työttömyysasteen alenemisesta. Ikääntyneiden työllisyyttä kasvattaa osaltaan se, että eläkkeelle siirtymisen odotetaan myöhentyvän muun muassa vuoden 2017 työeläkeuudistuksen seurauksena. Vuonna 2015 eläkkeellesiirtymisiän odote oli 61,1 vuotta. Laskelman mukaan se on 62,7 vuotta vuonna 2025 ja vakiintuu vajaaseen 65 vuoteen ennustejakson lopulla.

Vanhuuseläkkeen suuruus sopeutetaan eläkeikäisten elinajanodotteen muutokseen elinaikakertoimen avulla. Elinaikakertoimen arvo lasketaan jokaiselle syntymävuosiluokalle erikseen. Vuonna 2015 elinaikakerroin oli 62 vuotta täyttäville 0,972. 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 ja 7 kuukautta vuonna 1980 syntyneille ja kasvaa noin 68 vuoteen vuonna 2000 syntyneisiin mennessä.

Lakisääteiset kokonaiseläkemenot olivat 13,6 prosenttia bruttokansantuotteesta vuonna 2015. Korkeimmilleen osuus nousee 2020-luvulla, jolloin se on reilut 14 prosenttia. 2040-luvulla osuus laskee reiluun 12 prosenttiin, kunnes se kääntyy lievään kasvuun vuoden 2050 paikkeilla. Ennustejakson lopussa eläkemenot nousevat vajaaseen 14 prosenttiin bruttokansantuotteesta.

Koko talouden työeläkemeno suhteessa talouden työtulosummaan oli 30,4 prosenttia vuonna 2015. Työeläkemenon suhde työtulosummaan kasvaa vuoteen 2020 saakka, jolloin se on runsaat 33 prosenttia. Vuoden 2025 jälkeen suhde alenee, ja vuonna 2050 työeläkemeno on noin 29 prosenttia työtulosummasta. Tämän jälkeen työeläkemeno suhteessa työtulosummaan kasvaa saavuttaen runsaan 33 prosentin tason ennustejakson lopulla. Työeläkemenon kasvu suhteessa työtulosummaan on seurausta vanhuus- ja työkyvyttömyyseläkemenojen kasvusta.

Vuonna 2015 keskieläke oli 1 613 euroa kuukaudessa. Eläkkeiden ostovoima kasvaa jatkuvasti ja vuonna 2085 keskimääräinen eläke on lähes 3 700 euroa vuoden 2015 hintatasossa. Keskieläkkeen taso nousee lähivuosina hieman suhteessa yleiseen ansiotasoon. Tähän vaikuttaa kaksi tekijää. Ensinnäkin ansiotason kasvun ennakoidaan olevan hidasta lähitulevaisuudessa. Toiseksi päättyvät vanhimpien eläkeläisten työeläkkeet ovat vielä matalia, koska työeläkelait tulivat voimaan 1960-luvulta lähtien. Sen sijaan alkavat työeläkkeet perustuvat täyteen työuraan. Suhteellinen eläketaso kääntyy laskuun vuoden 2020 tienoilla. 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 ennustejakson aikana, mutta sukupuolten väliset eläke-erot pienenevät. Eri koulutustasojen eläkkeet kehittyvät suurin piirtein samaa tahtia koko ennustejakson ajan. Poikkeuksena ovat ylemmän korkeakoulututkinnon suorittaneet miehet sekä perusasteen koulutuksen suorittaneet miehet ja naiset. Näiden ryhmien eläkkeiden kehitys on keskimääräistä heikompaa. Keskeisin syy näihin muutoksiin on koulutusrakenteen muutos, jonka takia tulevaisuuden korkeakoulutetut eivät ole yhtä valikoitunut ryhmä kuin historiassa. Vastaavasti peruskoulutettujen ryhmään valikoituu tulevaisuudessa keskimäärin entistä huono-osaisempia henkilöitä sekä maahanmuuttajia.

TyEL-maksu nousee vuoden 2015 24,0 prosentista 24,8 prosenttiin 2020-luvun lopulla. Tämän jälkeen maksutaso laskee 24,4 prosentin tasolle noin kymmenen vuoden aikana. Maksutaso alkaa nousta uudestaan 2050-luvulla. TyEL-maksu saavuttaa runsaan 28 prosentin tason ennustejakson lopussa vuonna 2085. Maksutason nousu on seurausta eläkemenojen kasvusta. Vuosisadan loppupuolella myös TyEL-varat kasvavat suhteessa palkkasummaan. Sen sijaan eläkemenoon suhteutettuna TyEL-varat pysyvät vakaina.

TyEL-maksun riittävä vakiotaso olisi 25,7 prosenttia. Tällä maksutasolla voitaisiin rahoittaa TyEL:n menot pysyvästi. Vuonna 2015 TyEL-maksu oli 24,0 prosenttia TyEL:n palkkasummasta. Vastaavasti kunnallisten eläkkeiden eläkemaksun riittävä vakiotaso olisi 26,0 prosenttia suhteessa kuntasektorin palkkasummaan. Vuonna 2015 KuEL:n maksutulo oli 29,8 prosenttia suhteessa KuEL:n palkkasummaan. Kaikkien työeläkelakien eläkemenojen rahoittamiseen riittävä maksutaso suhteessa koko talouden työtulosummaan olisi 28,1. Vuonna 2015 vertailukelpoinen maksutulo suhteessa talouden työtulosumman oli 28,5 prosenttia.

Raportissa tutkitaan tulosten herkkyyttä keskeisimpien oletusten suhteen.

Kuolevuuden kehitys vaikuttaa eläkeikien kehitykseen sekä 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.

Maahanmuutto vahvistaa työeläkejärjestelmän rahoitusasemaa. Maahanmuuttajat ovat tyypillisesti nuorehkoja työikäisiä sekä lapsia. Maahanmuutto kasvattaa työllisten määrää ja palkkasummaa, vaikka maahanmuuttajien työllisyysasteet ovatkin kantaväestöä matalampia. Heille maksettavat eläkkeet tulevat maksettaviksi keskimäärin vasta pitkän ajan kuluttua. Vaikka maahanmuutto kasvattaakin Kelan eläkemenoa, se alentaa myös kokonaiseläkemenon BKT-osuutta.

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

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

Eläkevarojen tuotto vaikuttaa maksutasoon ja eläkevarojen määrään. Sijoitustuottojen nousu kasvattaisi aluksi eläkevarojen määrää ja pidemmällä aikavälillä alentaisi TyEL:n maksutasoa. Prosenttiyksikön nousu sijoitustuotoissa alentaisi TyEL-maksua vuonna 2025 vajaan prosenttiyksikön ja vuosisadan loppupuolella vaikutus olisi yli kolme 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 noin prosenttiyksikön matalammaksi kuin perusvaihtoehdossa. Edellä mainittujen tekijöiden lisäksi maksutasoa alentavat korkeat sijoitustuotot. TyEL-maksu jää noin 2–4 prosenttiyksikköä 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 runsaan prosenttiyksikön korkeammaksi kuin perusvaihtoehdossa. TyEL-maksu on 2–4 prosenttiyksikköä perusvaihtoehtoa korkeampi 2020-luvun alkupuolelta alkaen. Keskimääräinen eläke on pessimistisessä skenaariossa perusvaihtoehtoa matalampi. Eläkkeiden taso suhteessa talouden keskiansioon muodostuu kuitenkin perusvaihtoehtoa korkeammaksi.

ABBREVIATIONS AND KEY TERMS

The major pension acts (in force on 1 Jan. 2017)

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 (before 2017)
VaEL	State Employees' Pensions Act (merged into JuEL in 2017)

Key terms

retirement rate	Number of (new) retirees during a calendar year divided by the number of insured.
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.
disability incidence rate	Number of (new) disability retirees during a calendar year divided by the number of insured.
termination rate	Number of terminating pensions during a calendar year dividied by the number of pensions in payment.
(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.
expected effective retirement age	The expected age of retirement. The expectation is calculated analogously to life expectancy.
wage sum	The sum of wages and salaries, including employee's pension contributions.
earned income	Includes wages and salaries, as well as the income insured by the self-employed.

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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 2016–2085. The previous similar report was published in the autumn of 2013 (in Finnish; in 2014 in English). In 2015, two reports on the effects of the 2017 earnings-related pension reform were published. In February, a report in which the projections were based on the agreement between the labour market organisations was published (Kautto and Risku 2015). As the preparations progressed, the details of the reform were specified. As a result, in the autumn of 2015, a projection based on the government bill was published (Reipas and Sankala 2015). The next long-term projections are planned to be published in 2019.

Statutory pensions under review are earnings-related pensions, national pensions and the guarantee pension (Kela pensions), as well as pensions paid based on the Military Injuries Act, the Compensation for Military Injuries Act, the Motor Liability Insurance Act and 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 receive 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 citizens with a minimum income in old age or in the event of incapacity for work. SOLITA pensions provide benefits in certain special cases. In 2015, the statutory pension expenditure was 28.4 billion euros, of which 89 per cent were earnings-related pensions, 9 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 already known when making the projections have been taken into account. The main focus of the report is on projections for earnings-related pensions. Key results include developments in pension expenditure, the average pensions and the financing of private sector earnings-related pensions. New to this report are the results of the future development of pension distributions and the future development of pension levels per educational groups.

Compared to the report in 2013, the most significant change is the 2017 pension reform. As a result of the reform, the retirement ages will rise and be linked to the development of life expectancy. When the life expectancy coefficient is determined, the link between retirement ages and life expectancy will be taken into consideration. The age-specific accrual rates will be standardised after a transition period. In addition, the earnings-related pension contribution paid by the wage earner will no longer be deducted from the pensionable wages. Instead of the accelerated accrual rate, an increment for deferred retirement will be used to compensate for late retirement. The part-time pension will be abolished. New pension types will be introduced: the partial old-age pension and the years-of-service pension. The age limits relating to the funding of the old-age pension under the Employees Pensions Act and the portion to be funded will be changed, and the mortality factor will be updated and the proportion of the equity-linked buffer funds will be increased. The

earnings-related pension reform also means changes to the age limits of Kela pensions. In these projections, it is assumed that the increase of the age limit for the right to additional days of unemployment security for those born in 1961 will be realised as stated in the agreement on the 2017 pension reform.

Other changes considered in the projections include the effects of the competitiveness pact on the TyEL contribution, the reform of the private-sector earnings-related pension providers' solvency, the reform of the Seafarer's Pensions Act, the termination of the TEL supplementary pension scheme and the farmers' early retirement scheme.

The benefit rules of the main public sector pension acts will be combined into the Public Sector Pensions Act, but the pensions of the different sectors will be financed separately. In the future, there will be separate financing acts for State and Church pensions. The financing of local government pensions will be regulated in separate chapters in the Keva Act. As a rule, these pensions will be handled in this report by financing act. This is a technical amendment and does not affect the content of the presented projections.

When making the projections, a decision on which factors to take into account has been made. The labour force transfer between earnings-related pension acts that may be the result of the social welfare and health care reform and the regional government reform that are under way have not been taken into account. The cut in the national pension index for 2017 included in the government budget proposal has been taken into account, but not the planned cuts for 2018 and 2019. In the projections, the act on pension support[1] that is under way has not been taken into account. Its impact on the statutory pension system on the whole is minor.

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 15 March 2016 in which the future development of earnings, employment and expected investment returns were discussed. The speakers and participants represented pension providers, economic research institutions and ministries. However, the decisions on which assumptions to use have been made at the Finnish Centre for Pensions.

Due to the current low interest rate, the expected real return on pension assets has been cut down to three per cent for the next ten years. After that, the expected real return goes up to 3.5 per cent, as it was in the previous report. The long-term expected real growth of the earnings level has been reduced by 0.1 percentage points to 1.5 per cent. The new assumption is in line with the long-term economic growth projections drawn up by six forecasting institutions in 2015 (Hyytinen and Uusitalo 2015). The assumptions used in this report have been selected so that they make sense individually and form a consistent whole.

The transition probabilities and the starting point of the projections are based on the register data available to the Finnish Centre for Pensions. This data is reliable and comprehensive, with the exception of some minor shortages. At this stage, however, there is not and cannot be register data available on all changes. Among other things, the trends observed in the register data on the transfer to disability and old-age pensions have been extended into a new age range because of the rising retirement age.

1 So-called *Lex Lindström*.

According to legislation, the TyEL contribution has to be defined at such a level that the financial regulations are met. The same principle has been adhered to in the TyEL financing projections of this report.

Chapter 2 describes the main features of the pension laws after the 2017 pension reform. 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. This report is compared mainly with the report *Effects of the 2017 earnings-related pension reform – Projections based on the government bill* (Reipas and Sankala 2015).

The appendices include supplementing projections and offer more details on the modelling framework and the assumptions used. 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, while 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 two persons to review the content of this report. Their evaluations have been published online at www.etk.fi (in Finnish).

2 Statutory pension benefits and pension financing

The earnings-related pension scheme consists of several pension acts. Together, they cover the different sectors of the economy. Nearly all work carried out by wage and salary earners and the self-employed between the ages of 18 and 67 is insured under one of the pension acts. The sector of the employer or the type of the entrepreneurial activity determine which pension act is applied. As of the beginning of 2017, the age at which the insurance obligation starts will be lowered to 17 years in most pension acts. Self-employed persons and farmers have to take out insurance at age 18. 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 speaking, there have been significant differences in these rules. At present, there are also substantial differences between different 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 (in Finnish) on the determination of earnings-related pensions, see *Työeläkkeen laskentaopas* (2016). Tuomikoski et al. (2007) and Lehmuskero et al. (2010) describe the financing technique of private sector earnings-related pension insurance.

2.1 Pension acts included in the report

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

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

Public sector pension acts and regulations included in the report are:

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

The Public Sector Pensions Act came into force at the beginning of 2017. It replaced the currently valid 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 employees and officials of the Social Insurance Institution of Finland (Kela). The public sector financial regulations will be kept separate. The financing of the JuEL pensions are regulated by the following acts:

1. Act on the Financing of State Pension Cover,
2. Keva Act,

3. Act on the Financing of the Evangelical Lutheran Church Pension Cover, and
4. Act on the Social Insurance Institution of Finland.

As a rule, JuEL pensions are handled per financing act, that is, as JuEL state pensions and JuEL municipal pensions. The pensions of the employees of the Evangelical-Lutheran Church and Kela are handled as a part of the total public sector. JuEL public pensions correspond to the former State Employees' Pensions Act (VaEL) and JuEL local government pensions to the former Local Government Pensions Act (KuEL). In the parts of the report that deal with previous history, the names of the former pension acts have been used. Local government pensions are referred to either as local government pensions under KuEL or under JuEL, depending on the period that the review concerns. Correspondingly, State pensions are referred to either as VaEL state pensions or as JuEL state pensions.

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

For the most important pension acts (TyEL, YEL, MYEL, JuEL state and JuEL local government), the expenditure projections are presented by pension act. 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 acts, 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 discussed only in the projections of the constant contribution rates in Appendix 2.

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

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

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

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

1. the Motor Liability Insurance Act (LVL),
2. the Workers' Compensation Act (TyTAL),
3. The Military Injuries Act (SoVL), and
4. the Compensation for Military Injuries Act (SotapL).

The SOLITA pensions have been included in this projection only in general terms.

2.2 Benefit types and levels

Earnings-related pension

Accrual rules. As of 2017, earnings-related pensions will accrue based on the earned income as of age 17 for wage earners and as of age 18 for self-employed workers. Pension will accrue until the age when the insurance obligation ends. That age will be determined separately for each age group. Persons below the age of 17 or above the age when the insurance obligation ends will not accrue a pension and cannot insure their work. Pension will accrue at a rate of 1.5 per cent of the earnings for insured persons of all ages. During the transition period from 2017 to 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 accrual rate for social benefits is 1.5 per cent per year. The accrual is based on the same amount of 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. For other types of daily allowance, except the job alternation leave allowance, the basis for the pension is 65 per cent of the earnings. For the job alternation leave allowance, the basis for the pension is 55 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 of the annual earnings. The pension accrual is calculated using an earnings base of 719 euros per month (at 2016 prices). The amount is linked to the wage coefficient. VEKL benefits are paid as a supplement to other earnings-related pensions, excluding the part-time pension.

Age limits. The retirement age for an old-age pension is 63 years for persons born in 1954 or earlier. The retirement age 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 imputed 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 postponing retirement until the target retirement age, the increase for late retirement will offset the effects of the life expectancy coefficient. The definition of the target retirement age does not take into account possible new pension rights earned for the period that retirement is postponed.

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

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-time 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.

Benefit types. After the 2017 pension reform, the earnings-related benefits are the disability, old-age, partial old-age, years-of-service and survivors' pensions. The part-time pension will be abolished.

Disability pension. The disability pension can be granted either as a full pension or a partial pension, depending on the insured person's degree of disability. The partial disability pension is half of the full disability pension amount. 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 per year of the 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.

Part-time pension. A part-time pension may be granted to an insured person who reduces their working hours so that the earnings decrease to 35–70 per cent of their stabilised earnings level. The age limit for a part-time pension is 58 years for those born in 1952 or earlier, 60 years for those born in 1953, and 61 years for those born between 1954 and 1955. The amount of the part-time pension is half of the earnings reduction caused by the decrease in working hours. Pension accrues in a regular manner for work done while receiving a part-time pension. Part-time pensions will not be granted after 1.1.2017, but previously granted part-time pensions will be paid as usual.

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 continues to work past their retirement age, the pension will grow by 0.4 per cent for each month that the retirement is postponed. If the insured works while receiving a pension, new pension will accrue at a rate of 1.5 per cent. Once the person reaches the age at which the insurance obligation ends (the age is determined separately for each age group), no more pension will accrue.

Partial (early) old-age pension. After 1 February 2017, an insured person aged 61 or above can retire on a partial old-age pension. Those born in 1964 can do so after turning 62 years. Those born in 1965 or later can retire on 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 pension. If the pension is taken 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 late, the part taken will be permanently increased by 0.4 per cent for each month that the pension is postponed 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 as much as for a disability pension. The years-of-service pension is the same amount as the disability pension earned by the time that the pension payments start, 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 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 the expected 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 the life expectancy coefficient. If the disability begins in 2027 or later, the projected pension component will also 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.

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 disability pensions, partial old-age pensions or part-time 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 2016, the full national pension was 634 euros per month for a single person. For a married or cohabiting person, it was 563 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 54 euros is deducted from the national pension, until no national pension is paid at all. However, the increase for late retirement and the lump-sum increase paid to young recipients of an earnings-related disability pension are 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 taken into account 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 and a country with which Finland has a social security agreement.

The guarantee pension raises the level of the smallest pensions to a minimum pension level. In 2016, this minimum level was 767 euros per month. All statutory pensions paid from Finland and corresponding foreign benefits affect the amount of the guarantee pension. Such pensions are deducted in full from the guarantee pension.

All benefits and earnings limits of the national pension, as well as the amount of the guarantee pension, have been linked to the cost-of-living 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. The national pension has been raised occasionally by a decision of the Parliament. The last such raise took place at the beginning of 2008. As of March 2011, the guarantee pension has been paid to those with the smallest pensions. The guarantee pension was raised as of the beginning of 2016. The national pension index of 2015 was reduced, and the 2017 budget proposal also includes a reduction of the national pension index.

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 workers' compensation pension is paid to the injured after a fixed period of a daily allowance. Based on the Military Injuries Act (SoVL), annuity is paid to disabled war veterans and others who have become disabled or ill as a result of a military accident before 1991. Military accidents and diseases

incurred during military service in 1991 and after are compensated under the Compensation for Military Injuries Act (SotapL).

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 prefunded while the rest of the pension will be 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 local government earnings-related pensions were financed from the PAYG system 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 1990 to accommodate future state pension expenditure.

The pension expenditure of the self-employed and farmers has been financed from the PAYG system since the inception of these pension schemes. Also 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.

In the following sections, we describe in more detail how private sector earnings-related pensions are financed.

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' and part-time pensions, as well as the partial old-age and the years-of-service pensions introduced in the 2017 pension reform, are financed in full using the PAYG system.

As of 2017, old-age pensions are funded for all insured work done before retirement. Previously, the pre-funding was done up to age 55. 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.

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 2016, the contribution rate was 22.8 per cent of the wage sum. As of 2016, the employee's share of contributions is equally large in both MEL and TyEL. The State contributes approximately 30 per cent of the pension expenditure for sailors.

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 2015, the State paid approximately seven per cent of the YEL expenditure and nearly 80 per cent of the MYEL expenditure. The large role of the State in regard to 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 guiding regulations. Exceptions to this principle have been described in the report. Future changes to laws that were known at the time of making the projections have been taken into account.

In order to make projections that describe the future pension expenditure and its financing, assumptions regarding the demographic development, employment, retirement rates, earnings growth, inflation, and the return on pension assets have to be made. The assumptions made are described in sections 3.1–3.4. The employment projection is one of the preliminary results and will be discussed in connection with the other results of the baseline projection.

The selection of assumptions is steered by, among other things, the International Standard of Actuarial Practice 2 (ISAP2). According to the instructions, the selected assumptions in the baseline projection are as neutral as possible. That means that the assumptions are neither underestimates nor overestimates. As far as possible, we have turned to international source literature and expert estimates when selecting the assumptions.

3.1 Population

The population in the baseline projection follows Statistics Finland's population forecast from 2015, which covers the time period until 2065. This forecast is carried out per region. The population forecast for the total country is the sum of the regional forecasts. The population forecast in this report follows the assumptions used by Statistics Finland, but at a national level. As a result, the population figures differ to some extent from those of Statistics Finland's population forecast. The differences are minor and hold no significance for the results.

Table 3.1.

Population forecast for the years 2015–2085.

3.1.1 Life expectancy at age 63

	2015	2020	2025	2030	2045	2065	2085
Total	21.7	22.5	23.2	23.9	25.8	27.8	28.7
Men	19.7	20.5	21.3	22.1	24.1	26.4	27.4
Women	23.5	24.2	24.9	25.6	27.3	29.2	30.0

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

	2015	2020	2025	2030	2045	2065	2085
Total	5,490	5,596	5,691	5,769	5,888	6,018	6,070
0–14-year-olds	898	905	893	882	865	847	835
15–64-year-olds	3,469	3,426	3,419	3,409	3,455	3,400	3,348
65 years and over	1,124	1,264	1,379	1,479	1,568	1,771	1,887
Old-age dependency ratio, %	32.4	36.9	40.3	43.4	45.4	52.1	56.4

The starting year for the population forecast is the year 2014. The main assumptions made in the forecast are as follows:

1. the total fertility rate is 1.70,
2. the net migration is 17,000 persons per year (14,000 in 2015), and
3. the decrease in mortality rates observed in 1987–2014 will continue in 2015–2065.

The population forecast has been extended from 2065 according to the assumptions above, apart from the decrease in mortality rate, which is slowed to half after 2065.

In the long term, the decreasing mortality rates used in the forecast will accumulate into a considerable increase in longevity. The male life expectancy at age 63 is projected to rise from 19.7 years in 2015 to over 27 years in 2085. For women, the projected rise during the same period goes from 23.5 years to 30 years. Decreasing mortality rates imply that these so-called period life expectancies underestimate the life expectancy of each age cohort since they are calculated using the available mortality rates for a given calendar year. The cohort life expectancies, however, are calculated using projected mortality rates. In 2015, the cohort life expectancy for men at age 63 was 21.8 years and for women 25.8 years. (Appendix 6.)

The old-age dependency ratio (the ratio of persons aged 65 and over to 15–64-years-olds) will rise from the current 32.4 per cent in 2015 to more than 43 per cent by 2030. The increase will continue after that, but at a slower pace. In 2085, the old-age dependency ratio will be over 56 per cent. Until 2030, the old age dependency ratio will grow both due to the growing number of people who have turned 65 years and the decrease in the size of the working-age population. After 2030, the number of working-aged people will begin to slowly grow again, but the number of elderly people will grow faster. In the 2040s, the number of working-aged people will decrease again as the number of elderly people will continue to grow. (Table 3.1.)

3.2 Retirement rates

Retirement rates refer to the relative proportion of people retiring in one year compared to 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 2015. As of 2015, the retirement rates are assumed to develop following the trends described below. The 2017 pension reform in particular will affect the retirement rates. Apart from the changes due to the reform, the assumptions on the future development of the retirement rates are mainly the same as in the 2013 projection.

The future development of the disability incidence rate is based on a past trend for the period 1996–2011. During these years, the age-adjusted disability incidence rate decreased at an average rate of 1.1 per cent per year. In this report, the past trend is extrapolated to continue, but the rate of decrease has been slowed down gradually. By 2025, the disability incidence rate will decrease by 9 per cent and by 2065 by 18 per cent, compared to the rate in 2015. The reasons 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.

As a result of the 2017 pension reform, retirement ages will rise. That means that such age groups, which under the previous pension laws would have been entitled to an old-age pension, will be included in the disability incidence rates. In previous years, the disability incidence rate has been the higher the older the workers are. This trend has been extrapolated to continue every time the retirement age has risen. These choices have been explained in more detail in Kautto and Risku (2015).

As retirement ages have risen, people that have not reached the retirement age have been prevented from retiring on an old-age pension. The old-age incidence rates have been raised for persons older than that. However, all working persons have been assumed to retire on an old-age pension by the time they have reached the age at which the insurance obligation ends. In addition, the lower retirement ages under the supplementary pensions of the Employees' Pensions Act and the Seafarer's Pensions Act will cease for the most part in the 2040s at the latest.

The last part-time pensions will begin in January 2017. As of 2017, the partial old-age pension incidence rate is assumed to be similar to the incidence rate of the current part-time pension, but on a twice as high level. The partial old-age pension can also be taken late, after reaching the retirement age. For simplicity, the assumption in this projection is that 50 per cent of the earned pension will be drawn as a partial old-age pension. The preliminary results of a questionnaire to be published by the Finnish Centre for Pensions in the early 2017 suggests that nearly half of the respondents were unable to answer the question "Do you think you will use the opportunity to take out a partial old-age pension?".[2] Experiences from the pension reform in Norway in 2011 indicates that many people, if given the chance, may want to draw a pension while working (Haga 2015). Thus, the popularity of the partial old-age pension comes with a significant amount of uncertainty. The assumption can be specified once statistical data on the use of this pension type becomes available.

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 has reached the required age limit will retire on a years-of-service pension. In the 2030s, this corresponds to approximately two per cent of the entire age cohort. As the age limits rise, the share will go down.

3.3 Growth in earnings level and inflation

The long-term annual growth in real earnings is assumed to be 1.5 per cent. The assumption has been reduced by 0.1 percentage points compared to the 2013 report. As for inflation, the long-term assumption used is 1.7 per cent, which is the same as in the previous report.

The assumptions concerning the growth in earnings-level and inflation for the early years of the projection period (2016–2021) are based on the economic forecast drawn up at the Finnish Centre for Pensions in September 2016. Due to the weak economic outlook and the

2 The questionnaire survey was carried out in early 2016. The respondents were between 54 and 62 years old and they numbered 2,170. The respondents were informed of the content of the 2017 pension reform.

projected moderate increases to earnings in the collective agreements, the average annual real growth in earnings in 2016–2021 will be merely 0.6 per cent. The real growth in the earnings-level is assumed to reach its long-term growth rate at the end of the period for the economic forecast. The average inflation rate in 2016–2021 is assumed to be 1.2 per cent.

The average real growth in earnings throughout the projection period 2016–2085 is 1.4 per cent per year.

The assumed 1.5 per cent growth rate of real earnings corresponds to the realised historical growth rate in the past 40 years. However, the growth rate of earnings has varied quite extensively over that period. (Table 3.2.)

Typically, the real growth in earnings has exceeded 1.5 per cent in the last three decades, with the exception of the last few years and the recession in the 1990s. However, the historical development could overestimate the growth potential for the Finnish economy. Apart from the last few years, the growth has been exceptionally fast in Finland compared to other countries. There are no grounds to assume that the exceptionally fast growth will continue also in the future.

Adjusting the assumption of the growth in earnings to a lower level also reflects the recent discussions on the development of potential output in Finland. For example, six different Finnish research institutes have recently issued more cautious long-term projections on the growth of GDP and productivity. On average, these six institutions projected productivity to grow by 1.3 per cent in the first decade and 1.5 per cent in the next one (Hyytinen and Uusitalo 2015).

This report projects the real growth of earnings in the first decade to be around 1 per cent per year. The assumed growth is slightly lower than the assumed growth in productivity for the same period in the projections of the six domestic research institutes (Hyytinen and Uusitalo 2015). If the planned income policy that aims to improve competitiveness is realised, the growth in earnings for wage earners will be slow in the first years of the period. After a period of slow growth in the near future, the assumed real growth in earnings of 1.5 per cent corresponds to the average productivity projections of long-term economic forecasts for the period 2026–2035.

As a rule, the earnings in each age and gender group under different pension acts are expected to grow at a rate of the index of wage and salary earnings. The changes in the division of the labour force under the different earnings-related pension acts and the changes in the age structure of the labour force affect the growth in earnings in the overall economy. The most significant structural change that affects the earnings level is the decreasing number of persons insured under MYEL. The remaining farms will be larger than average, which is why the average MYEL income will grow faster than the general growth in earnings. The reducing number of farms increases the average earnings also because, as the number of persons insured under MYEL drops, the number of persons insured under TyEL grows. The effect of the structural changes on the earnings level is minor.

The social welfare and health care reform and the regional government reform will most likely increase the number of people working in the private sector and reduce the number of people working in the public sector. The reform proposal is still under work. Consequently, it is impossible to present a reliable numerical impact assessment of the reform's effects on

the transfer of the labour force between the sectors. That is why this reform has not been taken into account in the projections of this report.

The assumed inflation 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 related to 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.
Real growth of earnings level, 1976–2015.

Length of period	Years	Growth rate*, %
40 years	1976–2015	1.52
20 years	1976–1995	1.40
	1996–2015	1.64
10 years	1976–1985	0.81
	1986–1995	1.99
	1996–2005	2.19
	2006–2015	1.10

* Geometric mean.
Source: Own calculation, Statistics Finland (the cost-of-living index and the index of wage and salary earnings).

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.

In previous reports, we have used the same return assumption throughout the entire projection period. The assumed long-term real return in the 2011 and 2013 reports was 3.5 per cent per year. The current investment environment is ill-suited for the use of a fixed return assumption. The exceptionally low interest level makes it particularly challenging to reach the usual long-term return rate. When the interest rate presumably rises in the future, the rising interest level will, in turn, lower the prices of older long-term bonds and reduce the overall return on invested pension assets.

It is impossible to reliably predict the short-term returns on shares. However, it is unlikely that the recent high returns on shares that relate to the recovery period following the financial crisis will continue in the future as the appreciation levels of shares have already risen. The historically high price of shares in relation to their return, the slow economic outlook, the population ageing and the high public debts in many countries support a more cautious assumption, according to which the return on shares is also likely to be moderate in the near future.[3]

3 For recent analyses of investment return outlooks, see, for example, McKinsey Global Institute (2016) and Ilmanen et al. (2016).

Due to the unexceptional nature of the current investment environment, the assumed real rate of turn on pension assets in the baseline projection is projected to stay at 3 per cent for 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 level of previous projections, that is, to an annual rate of 3.5 per cent. (Tables 3.3 and 3.4.)

In the current challenging investment environment it is easy to imagine a trajectory in which even the assumption of a three-per-cent investment return over the next 10 years is too optimistic. As a rule, the 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 5.5 we present sensitivity analyses using both higher and lower assumed return rates.

The assumed rate of return for pension assets have been derived according to Tables 3.3 and 3.4. For comparison, the tables also include TyEL pension providers' realised investment allocation per 31 December 2015. This report bypasses a more extensive analysis of the uncertainty relating to the investment returns of pension assets. Instead, the impact of investment returns on the funding of TyEL pensions has been illustrated via sensitivity analyses.

Table 3.3.

Assumed real return on pension assets by asset type, 2017–2026 (%).

	Realised allocation	Assumption	
	31 Dec. 2015*	Allocation	Rate of return
Money market investments	4.6	5	0.3
Bonds and loans	35.1	33	1.3
Real estate	11.3	12	3.3
Shares and other investments	48.9	50	4.3
Total	100.0	100	3.0

* TyEL pension providers.
Source: The Finnish Pension Alliance TELA.

Table 3.4.

Assumed real return on pension assets by assets type, 2027–2085 (%).

	Realised allocation	Assumption	
	31 Dec. 2015*	Allocation	Rate of return
Money market investments	4.6	5	0.8
Bonds and loans	35.1	33	1.8
Real estate	11.3	12	3.8
Shares and other investments	48.9	50	4.8
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. The proportion of bonds and loans decreases correspondingly. In the long term, the change reflects, most of all, the decision of the 2017 pension reform to increase the rate of equity-linked buffer funds, which will allow 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.

Table 3.5.

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

		Growth in earnings level		Return on pension assets	
Year	Inflation[a]	Nominal	Real	Nominal	Real[b]
1997–2015[c,d]	1.6	3.2	1.6	5.8	4.1
1997–2005	1.5	3.6	2.1	7.2	5.6
2006–2015	1.8	2.9	1.1	4.6	2.8
2010	1.2	2.6	1.4	10.7	7.6
2011	3.5	2.7	-0.8	-3.0	-5.7
2012	2.8	3.2	0.4	8.4	5.9
2013	1.4	2.1	0.6	8.3	6.6
2014	1.1	1.4	0.4	6.8	6.3
2015	-0.2	1.4	1.6	5.0	5.2
2016	0.4	1.2	0.8	3.6	3.2
2017–2026	1.6	2.6	1.0	4.6	3.0
2027–2085	1.7	3.2	1.5	5.3	3.5

a Change in the cost-of-living index, annual mean value.
b The real return has been calculated based on changes in price levels at the end of the year.
c Geometric mean.
d Comparable statistics on investment returns as of 1997.
Source: Own calculations, Statistics Finland and The Finnish Pension Alliance TELA.

3.5 Indexing of Kela pensions

As for the indexing of Kela pensions, we have deviated from current laws. Under the act on the national pension index, Kela pensions are linked 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. However, despite discretionary increases, Kela's pensions have lagged behind the long-term earnings growth. The real value of the full national pension rose by slightly more than 12 per cent from 2000 to 2015. The real value of earnings grew by 27.5 per cent during the same period. As of 2011, the guarantee

pension has been paid to those with the smallest pensions. In 2016, the level of the guarantee pension was raised separately.

In this report, we have projected future increases in the level of Kela pensions as of the year 2022 by linking these benefits to the increases in the earnings level and consumer prices on a fifty-fifty basis. This choice 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 on indexation with the half-way index is the same as in Kela's actuarial report (Social Insurance Institution of Finland 2015). Apart from the year 2017, Kela pensions will follow the development of consumer prices until 2021. As for 2017, the cut in the national pension index included in the state budget has been taken into account. However, the planned freezing of the national pension index in 2018 and 2019 have not been taken into account. Instead, the index increases for these years have been calculated under the regular rules.

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, it does so only as of the year 2022.

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 a part of the statutory pension expenditure. In section 4.3, the earnings-related pension expenditure is discussed separately for the different pension acts and benefit types.

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

The financing projections for TyEL, YEL and MYEL pensions in section 4.6 depict the financing according to current laws and other guiding regulations. Supplementary financing projections on earnings-related pensions are discussed 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 necessary prerequisite for making the expenditure projection. It is based on the population forecast, the estimated entry and exit rates that depict changing labour force participation, and the assumed unemployment rate. The projected development of the retirement age and the life expectancy coefficient follow from the mortality rates and life expectancies of the population forecast. The expected effective retirement age depicts annual retirement rates in a similar way as life expectancy depicts annual mortality rates. One of the key aims of the 2017 pension reform is to raise the expected effective retirement age so that it is at least 62.4 years in 2025.

The data for 2015 are partly a result of the projection and may differ slightly from their statistical values. The money amounts are in 2015 prices.

4.1 Employment, effective retirement age and the life expectancy coefficient

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 2013 projection. The estimated employment development is very similar to that in the previous projection, with the exception of the effect of the 2017 pension reform on the employment rates of the elderly. A short description of the method can be found in Appendix 8.

The number of employed persons is projected to rise by approximately 39,000 during the period 2015–2020. The employment rate will increase until the 2030s to the level of approximately 73 per cent. After that it will settle at about 72 per cent. The fluctuation in the number of employed persons is due to changes in the age structure of the working-age population. The number of employed persons will grow evenly until 2040, after which the growth rate will slow down and eventually decrease slightly. This is due to the reduced number of working-age people. (Table 4.3.)

The increase in the employment rate during the first decades of the projection period is due to several factors. As the labour force exit rates in the older age groups decrease, the participation rate of the 15–64-year-olds increases. In addition, as unemployment among the young and middle-aged is reduced, the overall employment rate will grow. Among those approaching retirement age, the rising retirement ages will both increase the employment rate and the unemployment rate.

The way in which the labour force is divided into sections that are covered by different pension acts has implications for the expenditure and financing under the individual pension acts. However, these legal boundaries have limited relevance for the total pension expenditure since the pension benefits are by and large uniform under the different pension acts.

In general, the relative allocation of employed persons covered by different pension acts is assumed to stay at the 2013 and 2014 levels. There are, however, two important exceptions.

First, the proportion of MYEL insured has decreased steadily, and this trend is assumed to continue. In 2015, there were 67,000 persons insured under MYEL. The number has been assumed to be reduced by nearly 60 per cent by 2050. After that, the proportion of MYEL insured will stay constant. As the number of 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 follows roughly the estimate made by the Farmers' Social Insurance Institution (Mela).

Second, the number of state employees has reduced. This trend will continue. Primary and secondary school teachers and employees of state-aided institutions are insured under VaEL if they were born before 1970 and fulfil the relevant requirements for continuous employment. Those born after 1970 are insured under KuEL. University employees born before 1980 are insured under VaEL whereas younger university employees are insured under TyEL. For these reasons, the proportion of VaEL insured will decrease while the relative share of KuEL and TyEL insured will increase. The projected development of the number of transferring persons follows the estimates made by Keva. In the beginning of 2017, the public sector pension acts merged to one act, the Public Sector Pensions Act (JuEL). As the financing of local government and state employees' pensions is kept apart, we have reviewed these groups separately.

Many other factors may influence the allocation of workers under different pension acts. 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. In addition, the projection has not taken into account the social welfare and health care (SOTE) reform and the regional government reform. These reforms are still being prepared.

The employment and unemployment rates in Table 4.3 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 questionnaire 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 less unemployed persons in the survey data compared with the register data.

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 the expected life expectancy. The estimate of the development of the retirement age presented in Table 4.1 is based on the population forecast. 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 1985, and 68 years for those born in 1998. The rise in life expectancy will slow down due to the assumptions regarding the development of the mortality rate. (Table 4.1.)

Table 4.1.

Age limits of the earnings-related pension scheme for those born between 1953 and 2000.[4]

Year of birth	Retirement age	Target retirement age	Year of birth	Retirement age	Target retirement age
1953	63 yrs		1965	65 yrs 2 mo	67 yrs 2 mo
1954	63 yrs	63 yrs 9 mo	1966	65 yrs 3 mo	67 yrs 4 mo
1955	63 yrs 3 mo	64 yrs 1 mo	1967	65 yrs 4 mo	67 yrs 5 mo
1956	63 yrs 6 mo	64 yrs 6 mo	1968	65 yrs 6 mo	67 yrs 7 mo
1957	63 yrs 9 mo	64 yrs 10 mo	1969	65 yrs 7 mo	67 yrs 9 mo
1958	64 yrs	65 yrs 3 mo	1970	65 yrs 8 mo	67 yrs 11 mo
1959	64 yrs 3 mo	65 yrs 8 mo	1975	66 yrs 2 mo	68 yrs 7 mo
1960	64 yrs 6 mo	66 yrs	1980	66 yrs 7 mo	69 yrs 3 mo
1961	64 yrs 9 mo	66 yrs 4 mo	1985	67 yrs	69 yrs 11 mo
1962	65 yrs	66 yrs 9 mo	1990	67 yrs 5 mo	
1963	65 yrs	66 yrs 10 mo	1995	67 yrs 9 mo	
1964	65 yrs	67 yrs	2000	68 yrs 1 mo	

The estimate of the development of the life expectancy coefficient is based on population statistics for the years 2003 to 2014 and the population forecast from 2015 onwards. As life expectancy increases, the life expectancy coefficient becomes smaller which, in turn, reduces the level of earnings-related pensions. As of those born in 1965, the changes in the retirement ages will be taken into account when calculating the life expectancy coefficient. That is why the reduction of the life expectancy coefficient will slow down as of the year 2027. In 2015, the life expectancy coefficient for those turning 62 that year was 0.972. According to the population forecast, mortality will decrease so that in 2025,

4 No target retirement age has been calculated for the younger age groups since the target retirement age would be higher than the age at which the insurance obligation ends for these age groups.

for example, the life expectancy coefficient for a 62-year-old will be 0.920 and in 2030 it will be 0.909. (Table 4.2.)

The target retirement age is the age at which the reduction of the life expectancy coefficient can be offset by the increase in the pension 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.

Table 4.2.

Life expectancy coefficient at age 62, 2015–2085.

	2015	2020	2025	2030	2045	2065	2085
Coefficient	0.972	0.946	0.920	0.909	0.883	0.860	0.848

The expected effective retirement age depicts the level of the retirement rate for each year (Table 4.3.3). The retirement rates used in the projection have been described in Chapter 3. In 2015, the expected effective retirement age for a 25-year-old person was 61.1 years. The expected effective retirement age will rise to 62.7 years by 2025 and to approximately 65 years by 2085. The main cause for the rising effective retirement age is the rising retirement age. However, the expected effective retirement rate grows clearly slower than the retirement age. On the one hand, the rise in the retirement age will result in a growing number of disability pensions and, on the other hand, a reduced number of persons who will postpone retirement past their retirement age. Towards the end of the projection period, postponing retirement will become less common also because the retirement age will be very close to 70, the age at which the insurance obligation ends.

People retiring on a partial old-age pension have not been taken into account when calculating the expected effective retirement age. However, all those who have transferred from a partial old-age pension to a full old-age pension, as well as all those who have retired on a years-of-service pension will be taken into account as having retired.

Table 4.3.

Employment rate and expected effective retirement age, 2015–2085.

4.3.1 Number of employed (1,000)

	2015	2020	2025	2030	2045	2065	2085
TyEL	1,454	1,504	1,549	1,585	1,647	1,630	1,611
YEL	204	209	214	218	225	224	223
MYEL	66	53	43	36	27	27	27
JuEL State	137	120	111	102	87	86	85
JuEL local governments	480	497	514	530	552	547	540
Private	1,730	1,771	1,812	1,845	1,906	1,888	1,867
Public	643	643	651	659	667	661	652
Total	2,261	2,301	2,348	2,389	2,456	2,436	2,408

4.3.2 Employment and unemployment rates, %

	2015	2020	2025	2030	2045	2065	2085
Employment rate, 15–64-year-olds	68.1	70.0	71.4	72.5	72.7	72.3	72.2
Share of employed population	41.2	41.1	41.3	41.4	41.7	40.5	39.7
Unemployment rate	9.4	7.4	7.1	7.0	7.7	8.1	8.4

4.3.3 The expected effective retirement age for a 25-year-old person, years

	2015	2020	2025	2030	2045	2065	2085
Expected effective retirement age	61.1	62.0	62.7	63.0	64.0	64.7	64.9

4.2 Total pension expenditure and number of pension recipients

The sizes of the labour force and the earnings 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 estimate of the development of gross domestic product (GDP)[5] is based on the development of the wage sum. The projection assumes that the wage sum relative to GDP will remain unchanged in the long run. The economic situation has been taken into account so that this ratio will decrease from 40 per cent in 2015 to the pre-financial-crisis level of 39 per cent by the end of the decade.

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 2015, statutory pension expenditure amounted to 13.6 per cent of GDP. In the

5 In 2014, a new system of national accounts (ESA 2010) was introduced in the European Union. As a result, the definition of, for example, GDP changed. The assessment of the development of GDP in the 2013 report has been adjusted in this report to adapt to its new definition.

near future, GDP will grow moderately while the number of retirees will grow rapidly. In addition, pensions will rise faster than earnings for another few years. For these reasons, the ratio of pension expenditure to GDP will grow for another ten years to approximately 14.2 per cent. Between 2025 and 2045, the ratio will go down to 12.5 per cent. Although the population will age throughout the projection period, the rising effective retirement age will curb the growth in the number of retirees until 2050. In addition, the average pension will grow more slowly than the average earnings. (Table 4.4 and Figure 4.1.)

The pension amounts are reviewed in more detail in section 4.4.

In the long run, the rising of the effective retirement age will slow down and the number of employed will begin to decrease. These factors will lead to a rapidly growing number of retirees relative to the number of working-age people. At the same time, as the average pension in relation to the average earnings will stabilise around the year 2050, the ratio of pension expenditure to GDP will start to rise and continue to do so until the end of the century.

Earnings-related pensions account for 90 per cent of the statutory pension expenditure. 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 forecast. In the baseline projection, these pensions are indexed to changes in consumer prices until 2021, taking into account the reduction of the national pension index by 0.85 per cent in 2017 as presented in the state budget. As of 2022, 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, combined with the rising retirement age for national pensions, will steadily reduce the size of Kela pensions relative to the average earnings and the pension expenditure relative to GDP throughout the projection period. 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, the approximate estimate is based on the given demographic and economic development. The starting point is the current pension expenditure grouped by age and gender. For the working-age population, the projected SOLITA benefits develop in line with earnings. For those who have reached the retirement age, the SOLITA benefits follow the earnings-related pension index.

At the end of 2015, roughly 1.54 million people received a statutory pension. This figure includes, among others, pensioners who live abroad and those who receive only a survivors' pension. In this report, the projected number of pensioners includes pension recipients who live in Finland and who receive a pension other than a survivors' pension, a part-time pension or a partial old-age pension. In 2015, approximately 1.43 million persons met this definition. (Table 4.4.)

Demographic development and retirement rates are the key factors determining the number of pension recipients. The number of pension recipients will grow to approximately 1.9 million by 2085 (Table 4.4.4). The number of persons aged over 65 will grow from 1.1 million

at year-end 2015 to nearly 1.9 million in 2085. That means that the number of elderly people will grow considerably faster than the number of retirees. The difference is explained by the rising effective retirement age.

Table 4.4.

Total pension expenditure and number of pension recipients 2015–2085 (at 2015 prices).

4.4.1 GDP and earned income (€ billion)

	2015	2020	2025	2030	2045	2065	2085
GDP	209.1	223.1	243.0	267.0	346.3	464.3	620.3
Sum of earned income	83.5	86.1	94.8	104.1	135.1	181.1	241.9

4.4.2 Pension expenditure (€ billion)

	2015	2020	2025	2030	2045	2065	2085
Total pension expenditure	28.4	31.6	34.6	37.5	43.3	61.2	85.6
Earnings-related pensions	25.4	28.7	31.5	34.3	39.6	57.0	80.9
Kela pensions	2.5	2.4	2.5	2.6	2.9	3.1	3.2
SOLITA pensions	0.5	0.5	0.6	0.6	0.8	1.1	1.5

4.4.3 Pension expenditure relative to GDP (%)

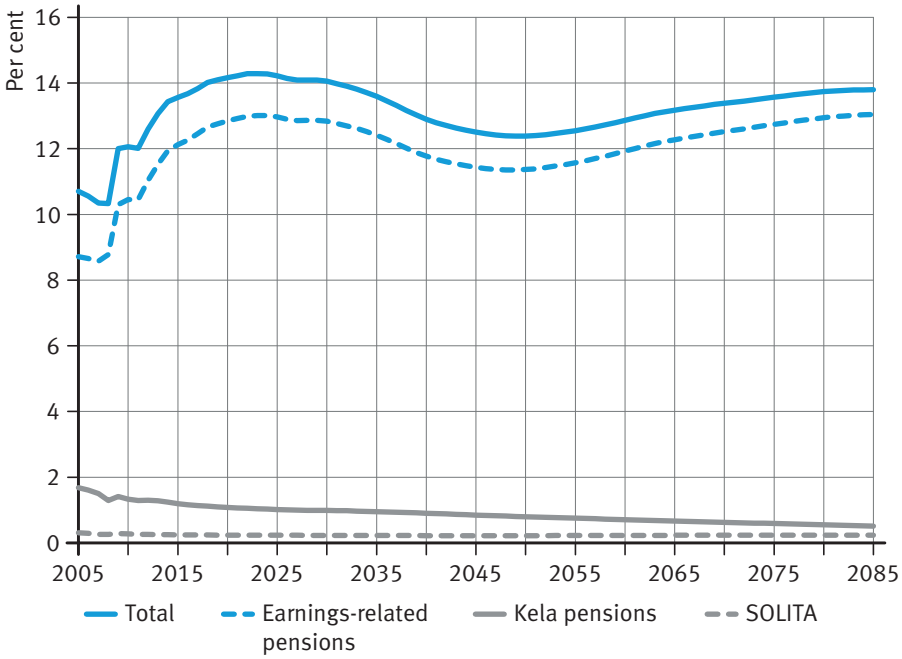
	2015	2020	2025	2030	2045	2065	2085
Total pension expenditure	13.6	14.2	14.2	14.1	12.5	13.2	13.8
Earnings-related pensions	12.1	12.8	13.0	12.8	11.4	12.3	13.0
Kela pensions	1.2	1.1	1.0	1.0	0.8	0.7	0.5
SOLITA pensions	0.2	0.2	0.2	0.2	0.2	0.2	0.2

4.4.4 Pension recipients and employed persons (1,000)

	2015	2020	2025	2030	2045	2065	2085
Employed	2,261	2,301	2,348	2,389	2,456	2,436	2,408
Pension recipients	1,427	1,504	1,551	1,615	1,638	1,782	1,872
Pension recipients/ employed	0.63	0.65	0.66	0.68	0.67	0.73	0.78

The ratio of pension recipients to the employed population will grow. In 2015, the number of pension recipients per one hundred employed was 63. In 2025, it will be 66. The changes in the age structure of the population in 2025–2045 will keep the ratio relatively stable. After 2045, the number of pension recipients will grow and be around 78 per one hundred employed in 2085.

Figure 4.1.
Statutory pension expenditure relative to GDP in 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 2015 and 2035. At the same time, the earnings-related pension benefits will still be maturing. However, the rising retirement age and the reducing average pension relative to the average earnings will slow down the growth in old-age pensions, and the old-age pension expenditure relative to the sum of earned income will decrease after 2020. 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 earned income has reduced throughout the 2000s. This trend is largely due to the decreasing number or people on a disability pension. The underlying reasons for that is, on the one hand, the lower incidence rate of disability pensions and, on the other hand, the fact that the baby boomers have retired on an old-age pension. However, the disability pension expenditure relative to the sum of earned income will increase when the rising retirement age will result in a growing number of retirees on a disability pension. In addition, the 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 2015, the corresponding figure was 2.6 per cent. In 2017–2035, the expenditure will stay at around 2.3 per cent. After that it will rise. The disability pension expenditure is projected to rise to 3.6 per cent of the sum of earned income by 2085.

The first partial old-age pensions will be 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 its receivers will be reduced. In addition to that, the life expectancy coefficient will reduce starting pensions relative to the average earnings. For these reasons, the expenditure relative to the sum of earned income will slowly take a downward turn after 2025. Drawing the partial old-age pension early will permanently reduce the part that is drawn early. That is why even a large number of partial old-age pensions drawn early will not significantly increase the earnings-related pension expenditure.

Years-of-service pensions will be granted in 2018 at the earliest. Since it is a new pension, the projections concerning it come with significant uncertainty. The annual number of recipients is assumed to grow to slightly less than 2,000 by the end of the 2020s. Once the age at which people can retire on this pension rises, the number of recipients will decrease. Once the pensions have matured, the pension expenditure in 2030 will be around 0.03 per cent of the sum of earned income and will decrease during the projection period to approximately 0.02 per cent. The low expenditure is due to the assumed level at the beginning of the year and to the fact that years-of-service pensions are paid for a maximum period of two years.

The part-time pension expenditure was slightly less than 0.2 per cent of the sum of earned income in 2015. Part-time pensions will no longer be granted as of 2017, and in a few years, the part-time pension expenditure will cease altogether.

The majority of survivors' pensions are paid to the widow after the death of her retired husband. 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 also grow. However, the development of the population forecast's mortality rates means that people will die at increasingly higher ages. This will reduce the time spent in widowhood. Consequently, the annual number of paid survivors' pensions will be reduced. The size of the average survivors' pension in relation to the average wage will also be reduced. During the projection period, the survivors' pension expenditure will decrease steadily from 2.0 per cent in 2015 to 1.2 per cent in 2085.

The expenditure for farmers' early retirement aid was approximately 0.1 per cent of the earned income in 2015. The farmers' early retirement aid will no longer be granted as of 2018, and in a few years, the expenditure will cease altogether.

The expenditure ratios differ considerably from one pension act to another. In 2015, the expenditure ratio was the highest for VaEL and MYEL pensions and the lowest for YEL and TyEL pensions. The gaps will widen until the end of the 2020s, as the expenditure ratios of VaEL and MYEL pensions will grow more strongly than that of other pension acts. In the long run, however, the expenditure ratio for all pension acts will converge towards the same level of 30 per cent (Table 4.5). Many factors underlie the act-specific differences in pension expenditure ratios. Some are historical and their effect will disappear over time whereas others are permanent.

The number of insured under VaEL and MYEL has declined, which has led to their current high expenditure ratios. The continued decline will keep the expenditure ratios high. Employees are assumed to transfer mainly to work that is covered by TyEL, but partly also to the municipal sector. This will further emphasize the differences between the acts.

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 approximately six years higher than men's (Appendix 6). The survivors' pension evens out the difference in pension expenditure. 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 places a larger emphasis on earnings from later stages of working life. Until 2025, the accrual rates are also higher for older workers.

The age and gender distributions of the insured differ greatly between pension acts. Those insured under TyEL are younger than average. The proportion of men is also higher than average for TyEL. The public sector insured and the self-employed workers are older than average. The proportion of women is high in the public sector, while the self-employed workers are, on average, more often men. In the projection, it is assumed that the age structures of the different pension acts will draw closer to each other. With the exception of the acts for the self-employed, the age structure will be close to average for all pension acts by 2085. The differences in gender distributions are assumed to remain nearly unchanged.

For the most part, the accrual rates are the same for all pension acts. However, there have been and continues to be differences which influence the way in which pension expenditure develops under different pension acts. Until the 1990s, public sector employees had more generous pension benefits than did private sector employees. These differences are still visible both in pensions that are in payment and starting pensions. In particular, some professions among state employees retain their higher-than-average pension benefits also in the future.

The Act on Compensation for Pension Accrual from State Funds for Periods of Childcare and Periods of Study (VEKL) came into force at the beginning of 2005. The full impact of VEKL on expenditure will be realised decades from now since a pension based on these benefits accrues mainly to persons who are at the beginning of their working lives. The VEKL pension scheme will have reached its maturity in about 60 years when those currently in their 30s are among the oldest of the pensioners. At that point, the VEKL expenditure will be 0.8 per cent of the economy's wage sum. 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 unpaid 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. Similar to VEKL's impact on expenditure, the full impact of unpaid periods on pension expenditure will be evident only after several decades. However, the maturing process is quicker because, opposed to the accrual periods of VEKL, earnings-related social benefits are paid mainly to older persons. The pension expenditure accrued during unpaid periods is included in the pension expenditure under each earnings-related pension act. The allocation between the earnings-related pension acts is done in relation to the earned income during the year in which the pension is paid.

Table 4.5.

Earnings-related pension expenditure per pension act and benefit type 2015–2085 (at 2015 prices).

4.5.1 Sum of earned income (€ billion)

	2015	2020	2025	2030	2045	2065	2085
TyEL	53.2	55.9	62.2	68.8	90.7	122.3	164.3
YEL	4.8	4.9	5.4	5.9	7.7	10.4	13.9
MYEL	1.4	1.2	1.1	1.1	1.2	1.7	2.3
JuEL state	6.2	5.4	5.3	5.3	5.6	7.3	9.4
JuEL local government	16.8	17.5	19.4	21.6	28.0	37.0	48.9
Private	59.6	62.3	69.1	76.3	100.1	135.0	181.3
Public	23.8	23.8	25.6	27.9	34.9	46.0	60.6
Total	83.5	86.1	94.8	104.1	135.1	181.1	241.9

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

	2015	2020	2025	2030	2045	2065	2085
TyEL	13.7	15.6	17.4	19.3	24.0	36.8	53.2
YEL	1.1	1.3	1.5	1.7	2.1	3.2	4.5
MYEL	0.8	0.8	0.8	0.8	0.7	0.6	0.8
JuEL state	4.4	4.6	4.7	4.6	3.7	3.0	3.4
JuEL local government	4.6	5.5	6.3	7.0	8.2	11.5	16.1
Private	15.8	18.0	19.9	22.1	27.0	40.8	58.8
Public	9.3	10.5	11.4	12.1	12.3	15.0	20.3
VEKL	0.0	0.0	0.0	0.0	0.2	1.2	1.9
Total	25.4	28.7	31.5	34.3	39.6	57.0	80.9
of which for unpaid periods	0.1	0.2	0.3	0.5	1.2	2.7	3.9

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

	2015	2020	2025	2030	2045	2065	2085
TyEL	25.7	28.0	28.0	28.1	26.5	30.1	32.4
YEL	22.9	26.4	27.3	28.1	27.5	30.6	32.3
MYEL	57.1	67.9	72.1	74.0	57.9	36.6	33.9
JuEL state	71.8	85.7	88.8	88.0	66.2	41.3	36.5
JuEL local government	27.2	31.3	32.4	32.4	29.2	31.0	32.8
Private	26.5	28.9	28.8	28.9	27.0	30.2	32.4
Public	39.2	44.1	44.5	43.3	35.2	32.7	33.4
VEKL*	0.0	0.0	0.0	0.0	0.2	0.6	0.8
Total	30.4	33.3	33.3	32.9	29.3	31.5	33.4
of which for unpaid periods	0.1	0.2	0.4	0.5	0.9	1.5	1.6

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

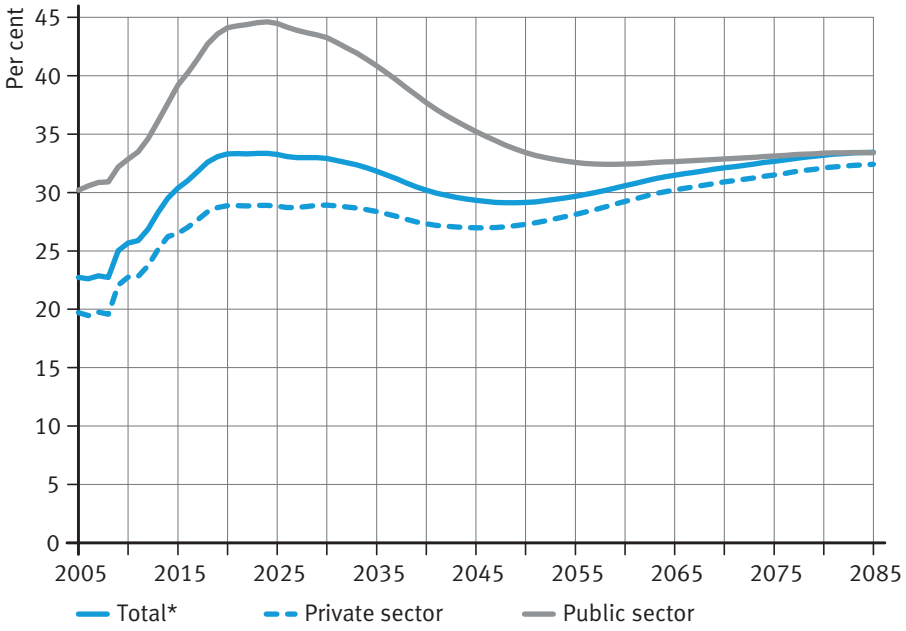
4.5.4 Earnings-related pension expenditure per benefit type, relative to the sum of earned income (%)

	2015	2020	2025	2030	2045	2065	2085
Old-age pension	25.6	28.7	28.7	28.6	24.9	26.8	28.3
Disability pension	2.6	2.3	2.3	2.2	2.6	3.2	3.6
Partial old-age pension	0.0	0.3	0.4	0.3	0.3	0.3	0.2
Years-of-service pension	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Part-time pension	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Survivors' pension	2.0	1.9	1.8	1.7	1.5	1.2	1.2
Special pensions for farmers	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Total pension expenditure	30.4	33.3	33.3	32.9	29.3	31.5	33.4

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

Figure 4.2.

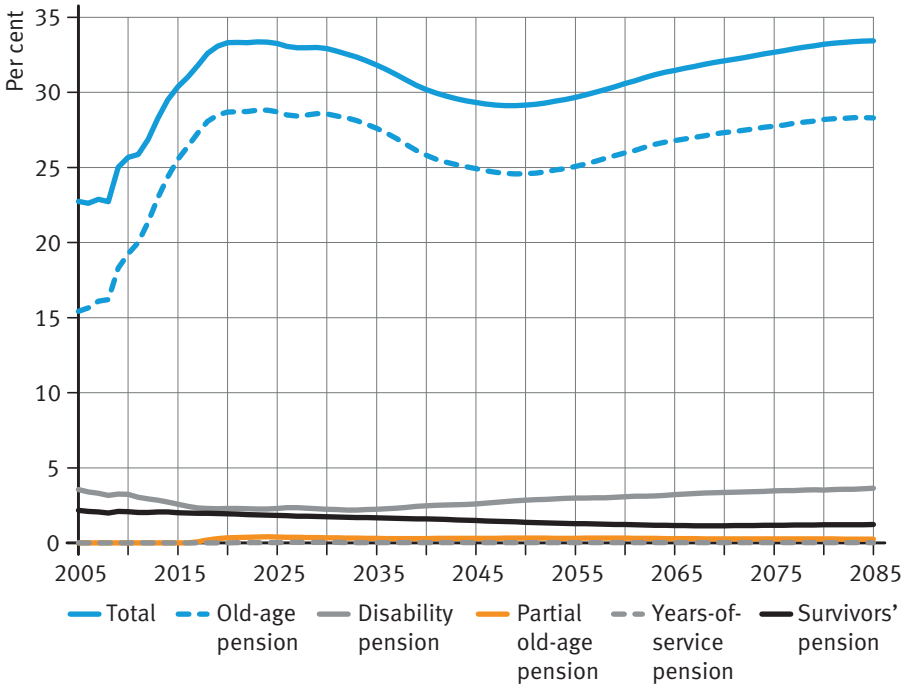
Earnings-related pension expenditure relative to the sum of earned income by sector, 2005–2085.



* Includes the expenditure under VEKL

Figure 4.3.

Earnings-related pension expenditure relative to the sum of earned income 2005–2085 by benefit type.



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 as pensions.

The purchasing power of the average pension will grow from 1,613 euros to approximately 3,700 euros per month in the period 2015–2085 (Table 4.6). The growth in purchasing power mainly follows from an increase in earnings since earnings-related pensions are tied to earnings via accrual rates and indexing. The average pension will grow more rapidly after 2035. The faster growth is explained by the 2017 pension reform, which extends working lives, increases the projected pension component (which means higher disability pensions) and mitigates the life expectancy coefficient. In the long run, however, the relative share of Kela pensions in the amount of the average pension will be reduced since the national pension index is assumed to follow the growth in earnings and the growth in prices on a fifty-fifty basis.

In 2015, the average pension was slightly more than half of the average earnings of the insured[6]. This ratio will continue to increase in the next few years. There are two reasons for this development. First, the average earnings will grow slowly in the near future. Second, 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, the starting pensions are already based on a full working life.

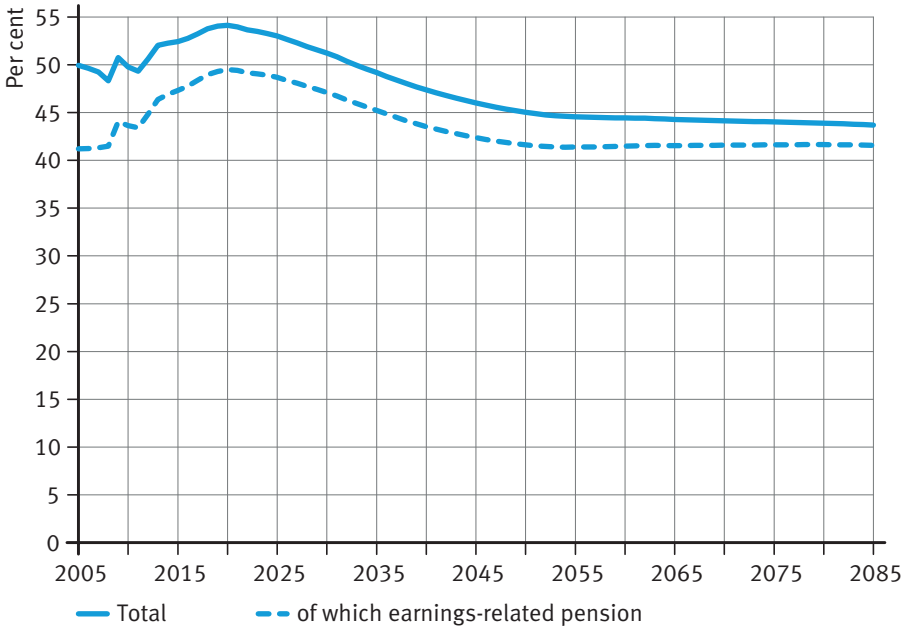
As of 2020, pensions will grow slower than the average wages, mainly due to the life expectancy coefficient. The final salary principle came to an end in 2005, and the higher public sector accrual rates were abolished in the 1990s. These changes will further reduce the ratio of earnings-related pensions to the average earnings. The average pensioner will also become older in the next few decades as the baby boomers grow older. This will reduce the ratio of pensions to earnings since the indexation is only partly tied to the earnings development. (Table 4.6 and Figure 4.4.)

Table 4.6.
Average pension and average earnings (at 2015 prices).

	2015	2020	2025	2030	2045	2065	2085
Average earnings, €/month	3,076	3,117	3,362	3,632	4,582	6,195	8,371
Average pension €/month	1,613	1,688	1,782	1,860	2,109	2,743	3,658
of which earnings-related pension €/month	1,456	1,542	1,637	1,711	1,942	2,574	3,481
% of average wage	52.4	54.1	53.0	51.2	46.0	44.3	43.7

6 The average earnings is the total sum of earned income of the economy divided by the number of employed people. The gross pension is compared to the gross earnings. If income transfers and differences in household sizes were taken into consideration, the relative income of pensioners would be higher.

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 of pensions received in one's own right, per gender and educational level[7]. Survivors' pensions and SOLITA pensions are not included in this figure as they are not included in the ELSI microsimulation model that we have used. However, survivor's pensions have been taken into account 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 non-tertiary education, and higher academic education. Individuals are classified according to the highest degree they have attained.

By and large, the same factors affect both the median and the average pensions. The median pensions per educational level will develop at the same rate as prices until the 2050s. After that, they will start to grow in real terms. Relative to median earnings[8], median pensions will decline until the 2050s, after which they will develop according to the growth in earnings.

The development of the 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 only a primary education includes a higher portion 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 two reasons. First, the working life for

7 The median income is the amount separating the higher half of the income distribution from the lower half. In a typical pension distribution, the median is lower than the average.

8 The median income is the median income of the employed in the ELSI model.

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 general population.

The median pensions of those with a higher academic education will even slightly decrease in real terms by 2040. Attaining a higher academic education was uncommon in the past, but its prevalence has increased in the younger cohorts. As a consequence, the group of pensioners with a higher academic education will not be as selective in the future as it is today. 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.

The median pensions of the whole population develop faster than the median pension of the different educational groups. This follows from the fact that 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 higher. (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 we have used a different measure of central tendency. The medians are clearly lower than the averages also in the statistical pension distributions.

Table 4.7.

Median values of pensions received in one's own right, by educational level and gender, as well as the median earnings (at 2015 prices, €/month).

	2015	2020	2025	2030	2045	2065	2085
Men	1,540	1,591	1,663	1,729	1,909	2,457	3,250
Men, primary education	1,297	1,301	1,320	1,311	1,230	1,551	2,078
Men, secondary education	1,469	1,489	1,542	1,601	1,752	2,189	2,871
Men, post-secondary education	2,328	2,294	2,312	2,337	2,445	3,063	4,110
Men, higher academic education	3,453	3,380	3,379	3,341	3332	4,231	5,674
Women	1,149	1,189	1,274	1,356	1,558	2,071	2,839
Women, primary education	1,014	1,041	1,084	1,115	1,076	1,250	1,628
Women, secondary education	1,157	1,170	1,216	1,262	1,365	1,675	2,193
Women, post-secondary education	1,697	1,690	1,717	1,742	1,809	2,261	3,079
Women, higher academic education	2,566	2,507	2,495	2,470	2,476	3,283	4,520
All	1,282	1,331	1,415	1,497	1,691	2,242	3,027
Median earnings	2,633	2,660	2,855	3,121	4,042	5,500	7,405

Figure 4.5.

Median of pensions received in one's own right, by educational level, men (at 2015 prices, €/month).

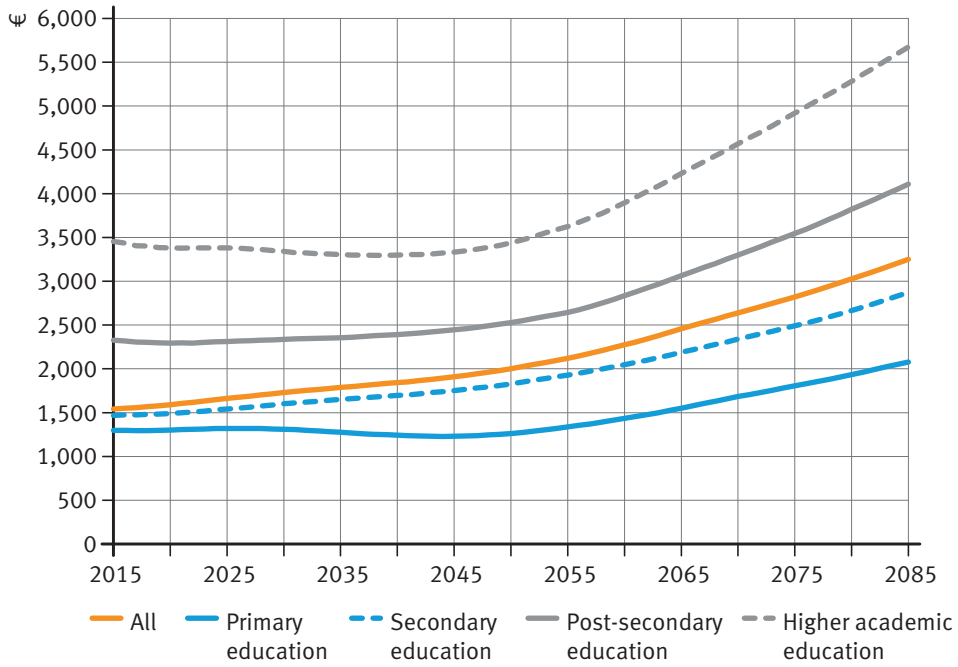


Figure 4.6.

Median pensions received in one's own right, by educational level, women (at 2015 prices, €/month).

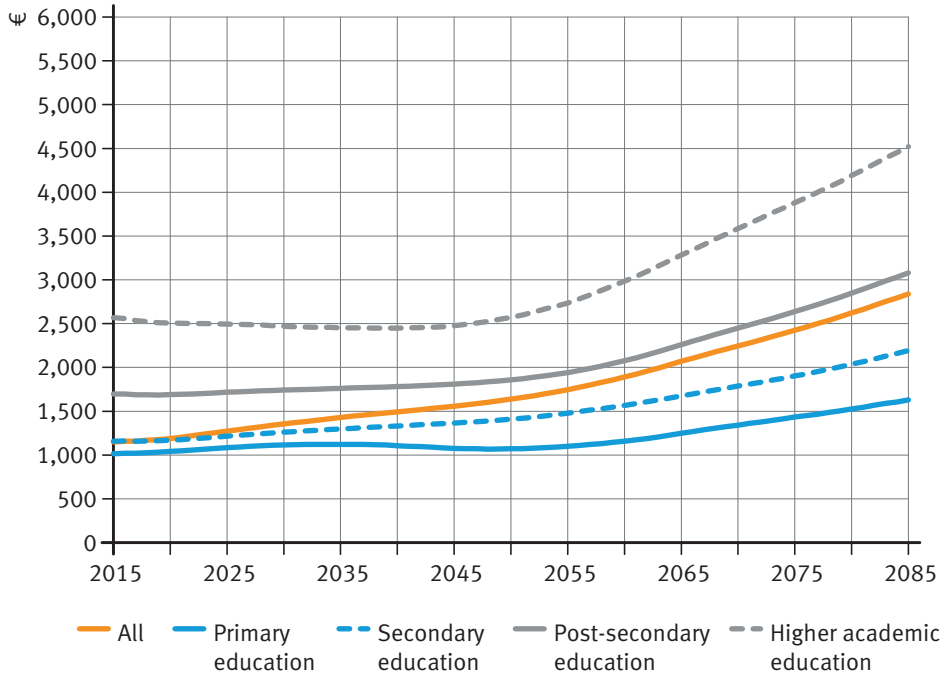


Figure 4.7.
Median pensions received in one's own right relative to median earnings, by educational level, men.

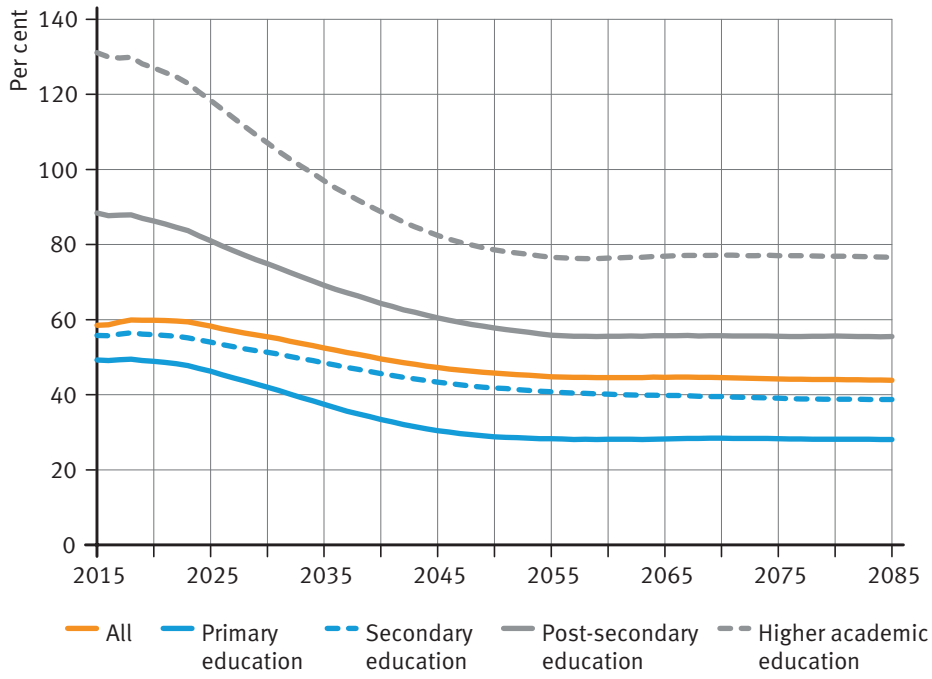
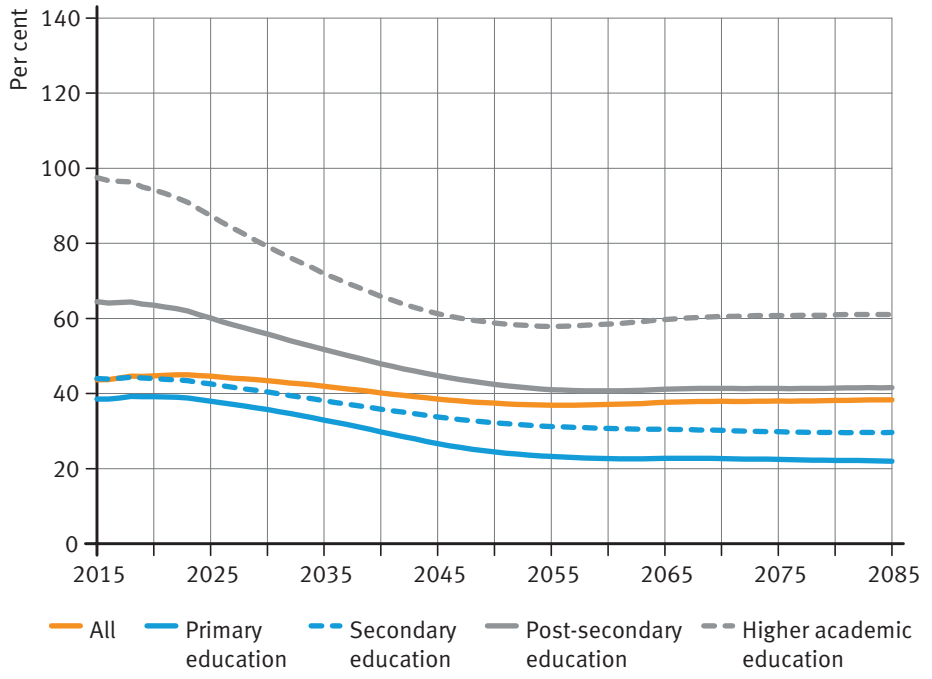


Figure 4.8.
Median of pensions received in one's own right relative to median earnings, by educational level, women.



4.5 Pension distributions

The distribution of pensions is examined by gender using percentiles. The percentiles under review are the median as well as the lower and the upper quartiles.[9] Half of the pensions lie between the lower and the upper quartiles. Pensions received in one's own right from both the earnings-related, national and guarantee pension schemes have been included. The distributions have been calculated using the ELSI microsimulation model.

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. Women's pension distribution broadens slightly towards the end of the projection period. The pension gaps between men and women will narrow during the simulation period. The gender differences reflect the realised wage and employment gaps with a delay of several decades. If the survivors' pensions were included in the analysis, the gender differences in pensions would be smaller than what they are now.

The pensions of the upper quartile and the median pensions for men consist of only earnings-related pensions throughout the projection period. Pensioners of the lower quartile receive also a national pension throughout most of the projection period. Men's lower quartile will exceed the national pension's maximum income limit for single pensioners in the 2070s. Women receiving a median pension may receive some national pension from the beginning of the simulation period to the 2040s. At that point, the median pension of women will exceed the national pension's income limit for single pensioners. Thus the development of national pensions plays a role only in the development of the lower quartiles and, to a lesser extent, in the development of the median pension of women at the beginning of the projection period. The lower quartiles of both genders are higher than the guarantee pension throughout the simulation period, so the development of the guarantee pension is not visible. The development of earnings-related pensions is visible in the development of all percentiles. (Table 4.8 and Figures 4.9–4.10.)

The differences in pension levels are mainly caused by divergence in earnings-related pensions. The national pension and the guarantee pension even out the differences. The significance of the national pension is reduced during the projection period as the national pension index grows at a slower pace than the earnings.

Table 4.8.

Distribution of pensions received in one's own right, by gender (at 2015 prices, €/month).

	2015	2020	2025	2030	2045	2065	2085
Men, lower quartile	1,097	1,097	1,128	1,163	1,274	1,658	2,216
Men, median	1,540	1,591	1,663	1,729	1,909	2,457	3,250
Men, upper quartile	2,170	2,249	2,357	2,451	2,708	3,416	4,457
Women, lower quartile	841	879	945	1,010	1,167	1,489	1,955
Women, median	1,149	1,189	1,274	1,356	1,558	2,071	2,839
Women, upper quartile	1,533	1,632	1,753	1,859	2,119	2,921	3,958

9 25 per cent of the observations are smaller than the lower quartile, 50 per cent smaller than the median, and 75 per cent smaller than the upper quartile.

Figure 4.9.

Distribution of pensions received in one's own right, men (at 2015 prices, €/month).

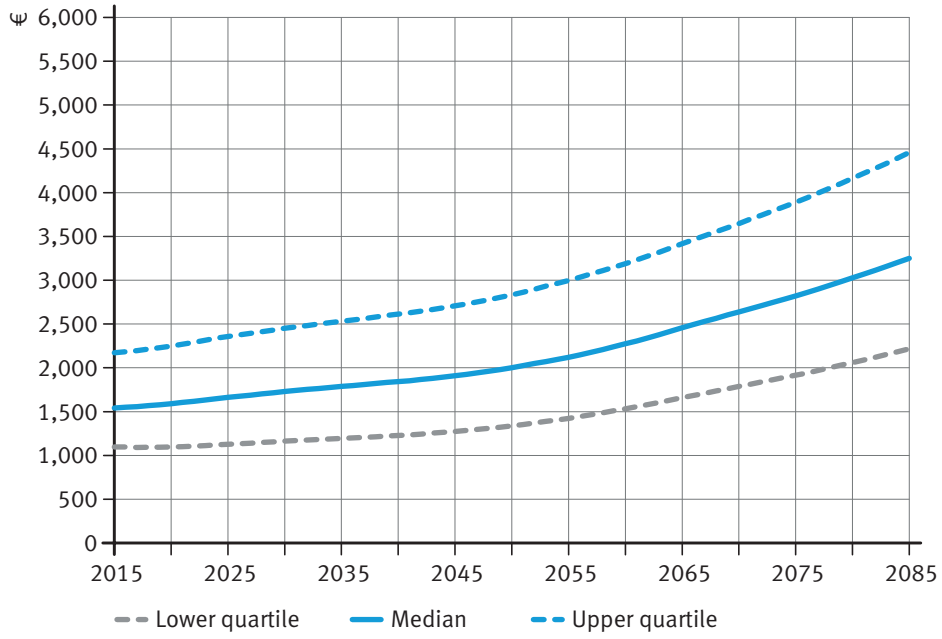
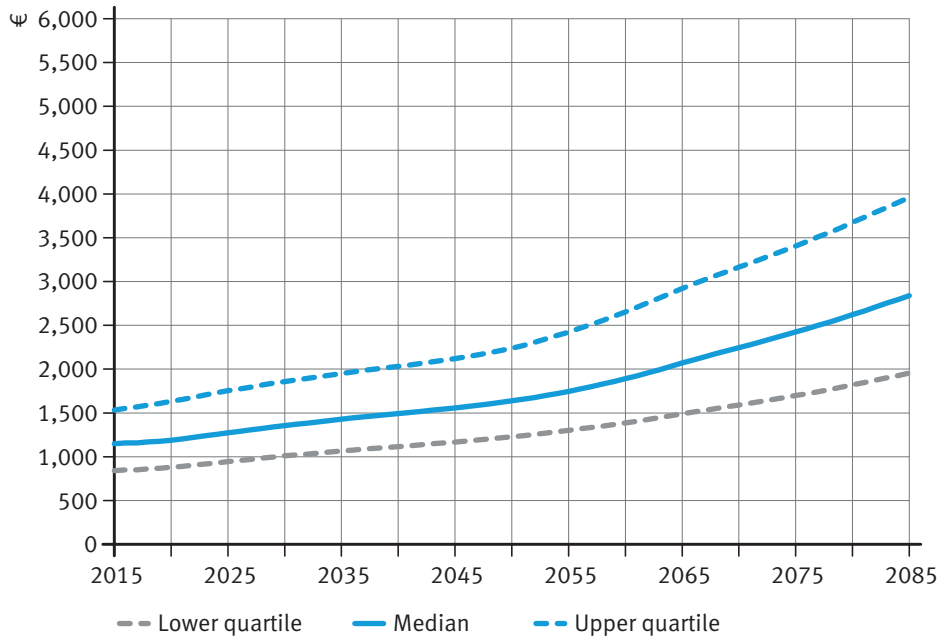


Figure 4.10.

Distribution of pensions received in one's own right, women (at 2015 prices, €/month).



4.6 Financing of private sector earnings-related pensions

Financing of pension expenditure under the Employees Pensions Act

The yearly pension contributions of private sector workers have exceeded the pension expenditure from the founding of the pension scheme to the early 2010s. From 2010 to 2012, the TyEL pension expenditure and contribution income were roughly equal. After that, the expenditure has exceeded the contribution income and will continue to do so on a permanent basis. The difference is financed with investment returns on pension assets.

In connection with negotiations on the 2017 pension reform, the TyEL contribution rate was set until 2019. In the competitiveness pact agreed on in the spring of 2016, the central labour market organisations set the contribution rate until 2021. In this projection, the TyEL contribution rate is 24.4 per cent of the wage sum for the period 2017–2021, as agreed in the above negotiations.

The contribution rate has to be raised as the pension expenditure grows as of the early 2020s 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 at most to 24.8 per cent of the wage sum towards the end of the 2020s, after which it will return to 24.4 per cent in the 2030s. The TyEL contribution rate must be raised as of the 2050s due to increasing pension expenditure (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. During the projection period, the funded component of the contribution will grow more than the pooled component. The need to raise the pooled component has been reduced as a result of previous years' contribution increases and the 2017 pension reform. The funded contribution component grows due to an expansion of the age interval of funded old-age pensions, a change in the mortality model used in the funding of old-age pensions, and the rising retirement age, which will increase the number and level of disability pensions. In these projections, it is assumed that the amount of operating expenses relative to the TyEL wage sum will remain stable throughout the projection period.

The amount of TyEL assets relative to the wage sum will remain at its current level until the 2040s, after which the assets relative to the wage sum will start to grow (Table 4.10 and Figure 4.12). The assets relative to the pension expenditure will be reduced somewhat until 2030, after which they will grow again (Figure 4.13). By 2085, pension assets relative to pension expenditure will return to the 2010 level. However, due to fluctuations in investment returns, the ratio of pension assets to wage sum or pension expenditure may fluctuate strongly.

According to TyEL, funded old-age pension are increased based on the return on pension assets and 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 at those aged 70 years or more in 2017–2029 and to those aged 65 years or more as of 2030.

The funded component in Table 4.9 includes the funded old-age and disability pension contributions. Similarly, the funded expenditure includes the funded components of the old-age and disability pensions in payment.

In 2015, the employee's basic contribution was 5.7 per cent of the wage sum. Those aged 53 and over paid a higher contribution of 7.2 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. Between 2017 and 2025, the employee's raised contribution is 1.5 percentage points higher than the basic contribution. It will be charged of employees aged between 53 and 62 years. 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).

Table 4.9.

TyEL financing in 2015–2085 (€ million, at 2015 prices).

4.9.1 Contribution income and wage sum

	2015	2020	2025	2030	2045	2065	2085
Wage sum	53,192	55,888	62,247	68,842	90,746	122,323	164,325
Contribution income	12,766	13,637	15,417	17,046	22,142	32,598	46,482
Employer	9,559	9,470	10,667	11,896	15,518	22,293	31,293
Employee, basic contribution	2,376	3,184	3,683	5,150	6,625	10,305	15,189
Employer, raised contribution	831	983	1,067	-	-	-	-
Funded component	1,989	2,610	3,077	3,398	5,039	7,677	11,129

4.9.2 Pension expenditure

	2015	2020	2025	2030	2045	2065	2085
Old-age pension	11,296	13,260	14,738	16,473	20,133	31,039	44,704
Disability pension	1,355	1,243	1,398	1,522	2,293	3,861	5,869
Years-of-service pension	-	4	15	19	19	24	29
Partial old-age pension	-	148	206	203	245	318	378
Survivors' pension	969	995	1,056	1,130	1,329	1,526	2,232
Part-time pension	50	0	-	-	-	-	-
Total	13,670	15,649	17,413	19,348	24,020	36,768	53,212
of which funded	2,767	3,742	4,608	5,358	6,769	10,244	15,427

4.9.3 Assets and cash flows

	2015	2020	2025	2030	2045	2065	2085
Assets per 1 Jan.	109,589	120,194	127,960	138,911	189,058	297,159	462,513
Contribution income, TyEL	12,766	13,637	15,417	17,046	22,142	32,598	46,482
Contribution income, other*	654	570	558	525	747	1,211	1,831
Return on investments	5,271	5,428	6,042	7,258	9,908	15,554	24,208
Expenditure, TyEL	-13,670	-15,649	-17,413	-19,348	-24,020	-36,768	-53,212
Expenditure, other**	-281	-272	-245	-215	-114	-71	-87
Operating costs	-385	-366	-407	-450	-593	-800	-1,075
Assets per 31 Dec.	113,944	123,541	131,911	143,728	197,127	308,883	480,660

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

	2015	2020	2025	2030	2045	2065	2085
Technical provision from old-age pensions	68,636	83,049	90,842	97,278	128,060	199,449	308,838
Total technical provisions	88,437	96,984	103,053	109,991	148,110	227,533	346,102
Solvency capital	25,507	26,557	28,858	33,737	49,017	81,350	134,558
Assets	113,944	123,541	131,911	143,728	197,127	308,883	480,660

* Contribution income from the Unemployment Insurance Fund and, until 2016, the supplementary pension provision under TEL.

** Supplementary pension provision under TEL, contribution losses, net expenses from TyEL and MEL pooling, and a transitory contribution to the State.

Table 4.10.

TyEL financing, 2015–2085 Wage sum (€ million, at 2015 prices); other contribution income relative to wage sum (%).

4.10.1 Contribution income and wage sum

	2015	2020	2025	2030	2045	2065	2085
Wage sum	53,192	55,888	62,247	68,842	90,746	122,323	164,325
Contribution income	24.0	24.4	24.8	24.8	24.4	26.6	28.3
Employer	18.0	16.9	17.1	17.3	17.1	18.2	19.0
Employee, basic contribution	5.7	7.2	7.3	7.5	7.3	8.4	9.2
Employee, raised contribution	7.2	8.7	8.8	-	-	-	-
Funded component	3.7	4.7	4.9	4.9	5.6	6.3	6.8

4.10.2 Pension expenditure

	2015	2020	2025	2030	2045	2065	2085
Old-age pension	21.2	23.7	23.7	23.9	22.2	25.4	27.2
Disability pension	2.5	2.2	2.2	2.2	2.5	3.2	3.6
Years-of-service pension	-	0.0	0.0	0.0	0.0	0.0	0.0
Partial old-age pension	-	0.2	0.3	0.2	0.2	0.1	0.1
Survivors' pension	1.8	1.8	1.7	1.6	1.5	1.2	1.4
Part-time pension	0.1	0.0	-	-	-	-	-
Total	25.7	28.0	28.0	28.1	26.5	30.1	32.4
of which funded	5.2	6.7	7.4	7.8	7.5	8.4	9.4

4.10.3 Assets and cash flows

	2015	2020	2025	2030	2045	2065	2085
Assets per 1 Jan.	206.0	215.1	205.6	201.8	208.3	242.9	281.5
Contribution income, TyEL	24.0	24.4	24.8	24.8	24.4	26.6	28.3
Contribution income, other*	1.2	1.0	0.9	0.8	0.8	1.0	1.1
Return on investments	9.9	9.7	9.7	10.5	10.9	12.7	14.7
Expenditure, TyEL	-25.7	-28.0	-28.0	-28.1	-26.5	-30.1	-32.4
Expenditure, other**	-0.5	-0.5	-0.4	-0.3	-0.1	-0.1	-0.1
Operating costs	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7
Assets per 31 Dec.	214.2	221.1	211.9	208.8	217.2	252.5	292.5

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

	2015	2020	2025	2030	2045	2065	2085
Technical provision from old-age pensions	129.0	148.6	145.9	141.3	141.1	163.1	187.9
Total technical provisions	166.3	173.5	165.6	159.8	163.2	186.0	210.6
Solvency capital	48.0	47.5	46.4	49.0	54.0	66.5	81.9
Assets	214.2	221.1	211.9	208.8	217.2	252.5	292.5

* Contribution income from the Unemployment Insurance Fund and, until 2016, the supplementary pension provision under TEL.

** Supplementary pension provision under TEL, contribution losses, net expenses from MEL in TyEL and MEL pooling, and a transitory contribution to the State.

Figure 4.11.

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

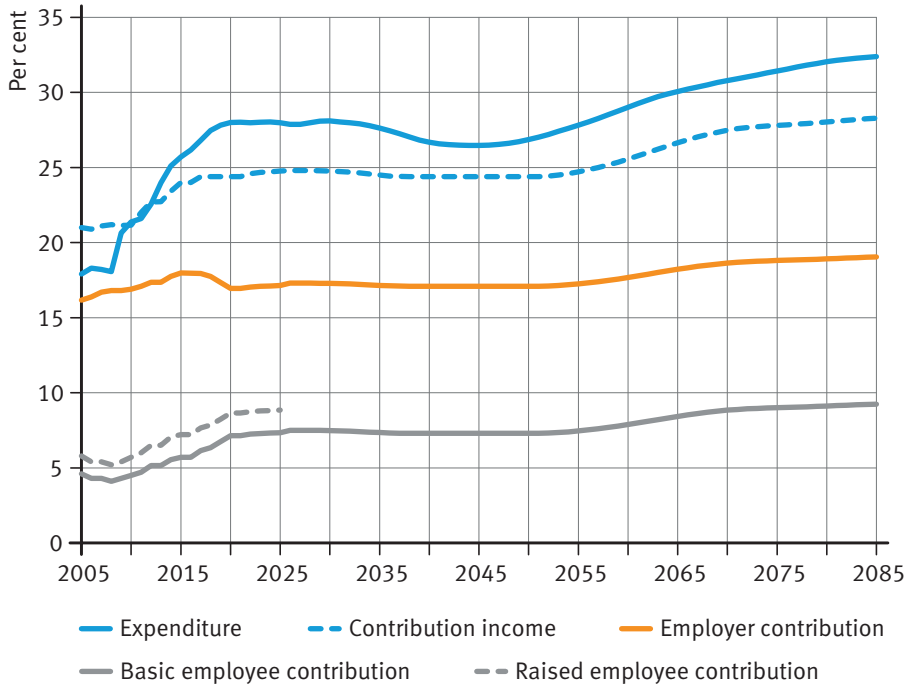


Figure 4.12.

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

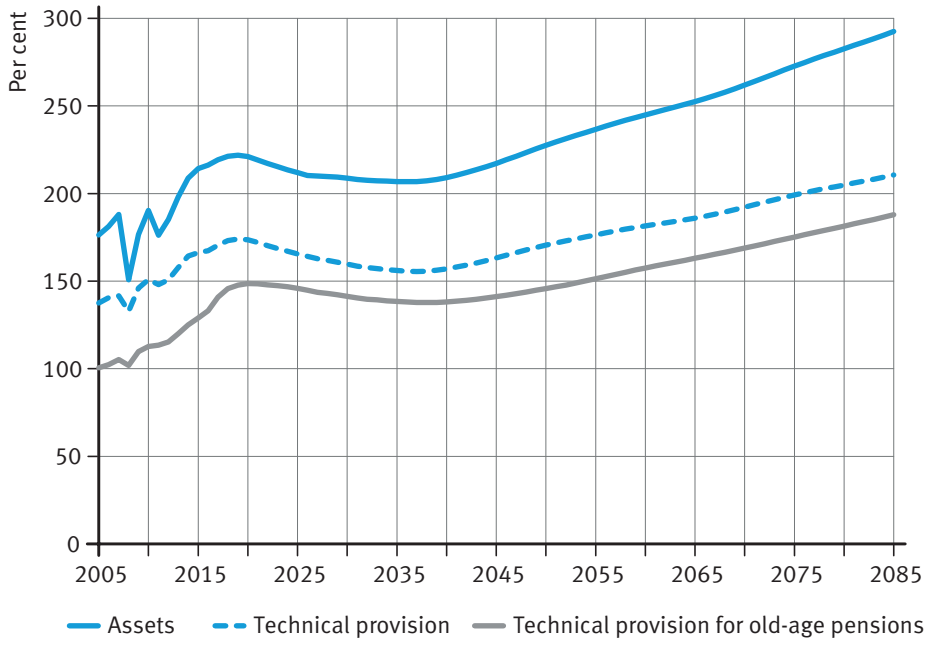
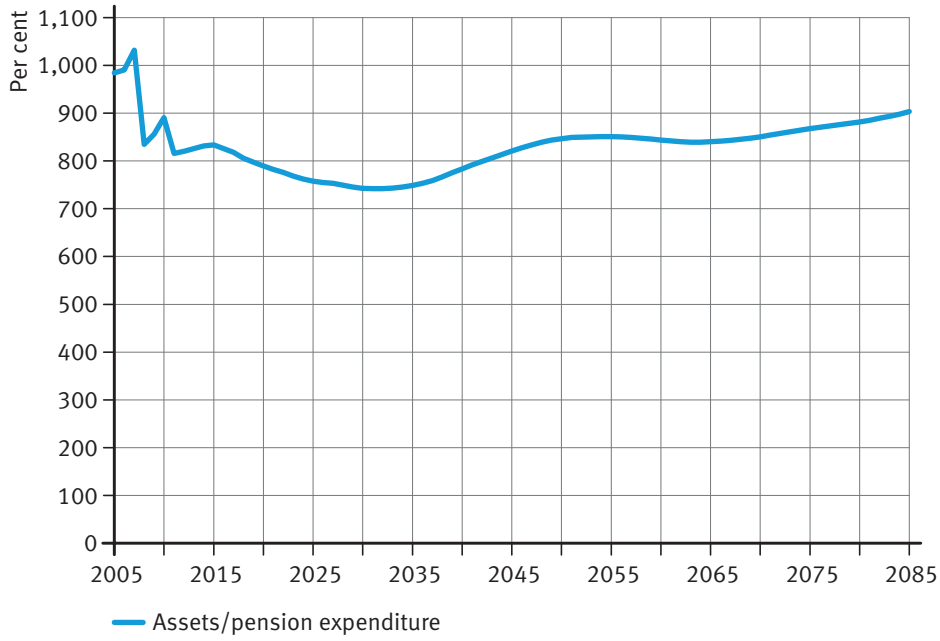


Figure 4.13.

TyEL assets relative to TyEL pension expenditure 2005–2085.



Financing of pension expenditure under YEL and MYEL

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

In 2015, the YEL contribution income amounted to 22.3 per cent of the insured sum of earned income. 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 beginning self-employed workers. As of 2013, the discount was reduced from 25 per cent to 22 per cent. As a result, the average YEL contribution rate is slightly higher than before.

In 2015, the State financed approximately seven percent of the YEL expenditure. In 2010, it financed more than 10 per cent of that expenditure. The number of persons insured under YEL increased in 2011 and 2012 due to changes in legislation.[10] As a result, the State's share of the expenditure decreased as the YEL contribution income increased.

By 2025, the share of YEL expenditure financed by the State increases to 20 per cent. It will remain at that level throughout the projection period. The State's share increases because the YEL contribution follows the TyEL contribution, but the future YEL expenditure has not been funded. In the future, an increasing share of the TyEL expenditure is financed with assets released from the funds. The corresponding proportion of YEL pensions is financed by the State. (Table 4.11 and Figure 4.14.)

10 The insurance obligation of YEL expanded at the beginning of 2011 to cover entrepreneurs who own more than 30 per cent of the company and hold a leading position in the company. Before 2011, the ownership limit was 50 per cent.

In 2015, 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 funded nearly 77 per cent of the MYEL expenditure in 2015. The State's share will remain at roughly the same level until the 2040s, after which it will decrease. However, in 2085 the State will still finance nearly 45 per cent of the MYEL expenditure. The most significant reason for the high level of State financing is the unfavourable ratio of active farmers to 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 2015–2085.

4.11.1 YEL cash flows, % of earned income sum (€ million, at 2015 prices)

€ million	2015	2020	2025	2030	2045	2065	2085
Sum of earned income	4,782	4,901	5,391	5,933	7,732	10,382	13,863
Pension contribution	1,065	1,112	1,241	1,365	1,754	2,571	3,643
State's share	84	251	309	388	481	752	1,021
Pension expenditure	-1,097	-1,292	-1,472	-1,666	-2,125	-3,178	-4,478
Operating costs	-67	-70	-78	-87	-109	-145	-186
% of sum of earned income							
Pension contribution	22.3	22.7	23.0	23.0	22.7	24.8	26.3
State's share	1.8	5.1	5.7	6.5	6.2	7.2	7.4
Pension expenditure	-22.9	-26.4	-27.3	-28.1	-27.5	-30.6	-32.3
Operating costs	-1.4	-1.4	-1.4	-1.5	-1.4	-1.4	-1.3

4.11.2 MYEL cash flows (€ million, at 2015 prices and % of sum of earned income)

€ million	2015	2020	2025	2030	2045	2065	2085
Sum of earned income	1,378	1,201	1,144	1,109	1,181	1,689	2,254
Pension contribution	188	170	167	165	183	300	425
State's share	620	659	669	667	511	331	353
Pension expenditure	-786	-815	-824	-821	-683	-619	-764
Operating costs	-17	-14	-13	-12	-10	-12	-15
% of sum of earned income							
Pension contribution	13.7	14.1	14.6	14.9	15.5	17.8	18.9
State's share	45.0	54.9	58.5	60.2	43.3	19.6	15.7
Pension expenditure	-57.1	-67.9	-72.1	-74.0	-57.9	-36.6	-33.9
Operating costs	-1.2	-1.2	-1.1	-1.1	-0.9	-0.7	-0.6

Figure 4.14.

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

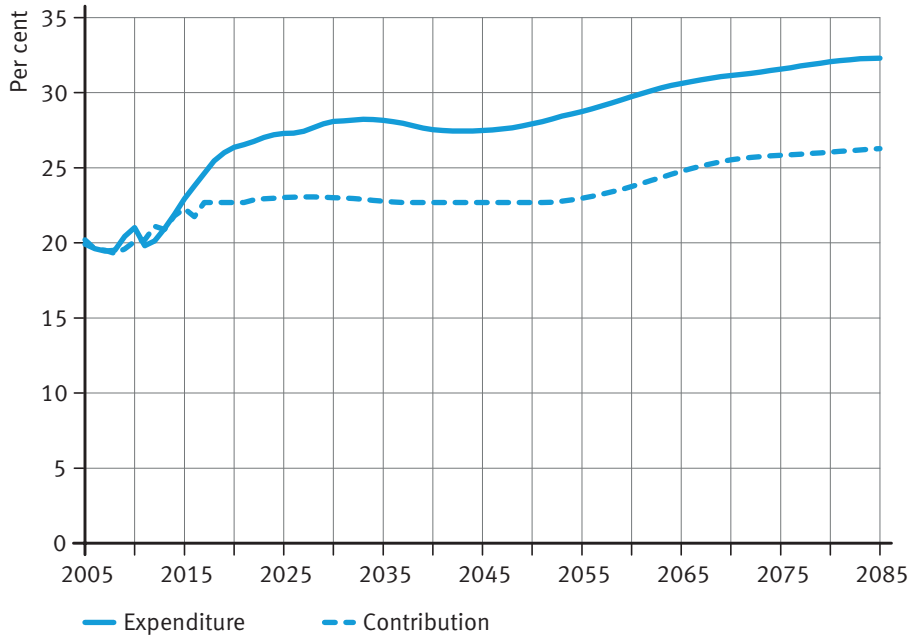
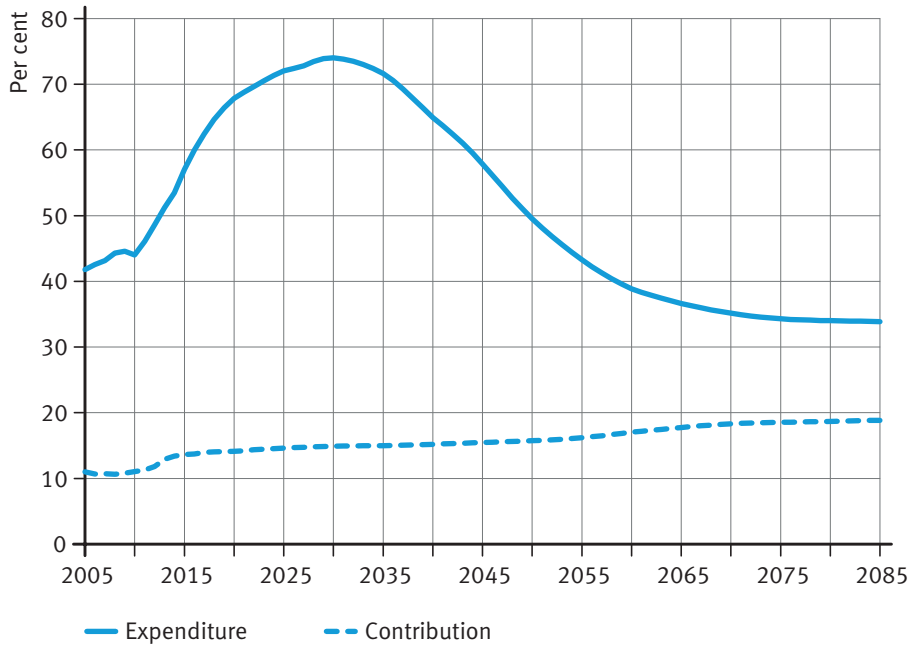


Figure 4.15.

MYEL expenditure and contribution relative to 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 the economic and demographic development. Sensitivity analyses have been made to investigate changes in

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

For each assumption, a low assumption and a high assumption projections have been made. In addition to analyses of the individual assumptions, the earnings, employment and return of pension assets are combined into a *pessimistic* 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 the pension levels and the financing of the pension system.

5.1 Mortality

The alternative projections with high and low mortality rates have been chosen to roughly correspond to the 50 per cent confidence interval that Alho and Spencer (2005) estimate for mortality given a forecast horizon of 50 years.

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, mortality rates are lowered by shifting the mortality function by one year at 15-year intervals. The mortality rates for the intervening years are interpolated. The shifts are done to the mortality rates of those who have turned 50 years. Using this technique means that high mortality is not too heavily concentrated within a short age interval. If the alternative with low mortality had been done in an analogous way to the alternative with high mortality, over the years, the high mortality rates would have concentrated heavily on those who are between 90 and 100 years old.

The mortality assumption has been changed in both alternatives as of 2016.

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 alternative with high mortality rates. In 2035, life expectancy at age 63 is 25.7 years in the projection with low mortality rates, 24.5 years in the baseline projection and 23.9 years in the projection with high mortality rates. In 2085, the comparable figures are 33.1, 28.7 and 27.3 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 alternative with low mortality rates. In the alternative with high mortality rates, it will be six months lower than in the baseline projection. In the alternative with a low mortality rate, the retirement age will exceed 70 years, the age at which the insurance obligation ends, in the last few years of the projection period. 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 0.833 in the projection with low mortality rates, 0.861 in the baseline projection, and 0.881 in the projection with high mortality rates.

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 the retirement age and, on the other hand, postponing retirement past the retirement age becomes less common (Table 5.2).

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
1955	63 yrs 3 mo	63 yrs 3 mo	63 yrs 3 mo	0.962	0.962	0.962
1960	64 yrs 6 mo	64 yrs 6 mo	64 yrs 6 mo	0.935	0.929	0.939
1965	65 yrs 2 mo	65 yrs 2 mo	65 yrs 1 mo	0.915	0.901	0.922
1970	65 yrs 8 mo	65 yrs 11 mo	65 yrs 6 mo	0.905	0.889	0.915
1975	66 yrs 2 mo	66 yrs 7 mo	65 yrs 11 mo	0.896	0.877	0.909
1980	66 yrs 7 mo	67 yrs 3 mo	66 yrs 3 mo	0.888	0.867	0.902
1985	67 yrs	67 yrs 11 mo	66 yrs 7 mo	0.880	0.858	0.896
1990	67 yrs 5 mo	68 yrs 6 mo	66 yrs 11 mo	0.874	0.849	0.890
1995	67 yrs 9 mo	69 yrs	67 yrs 3 mo	0.867	0.839	0.885
2000	68 yrs 1 mo	69 yrs 7 mo	67 yrs 7 mo	0.861	0.833	0.881

The impact of the developments in mortality rates affects, on the one hand, the incidence rates of pensions via the retirement age and, on the other, the level of pensions via the life expectancy coefficient. 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 mortality becomes very low, both the life expectancy coefficient and the retirement age linked to life expectancy lose their effect as factors curbing the growth of expenditure. If the retirement age rises very much, it may result in growing pension expenditure as the projected pension component of disability pensions will rise and pension will accrue for longer unpaid periods.

Table 5.2.

Sensitivity analysis, mortality (at 2015 prices).

5.2.1 Expected effective retirement age (years)

	2015	2020	2025	2030	2045	2065	2085
Baseline	61.1	62.0	62.7	63.0	64.0	64.7	64.9
Low mortality	-	0.0	0.0	0.0	0.2	0.2	0.4
High mortality	-	0.0	0.0	-0.1	-0.2	-0.2	-0.2

5.2.2 Employed (1,000)

	2015	2020	2025	2030	2045	2065	2085
Baseline	2,261	2,301	2,348	2,389	2,456	2,436	2,408
Low mortality	-	0	1	1	12	15	24
High mortality	-	0	-1	-3	-10	-16	-16

5.2.3 Pension recipients (1,000)

	2015	2020	2025	2030	2045	2065	2085
Baseline	1,427	1,504	1,551	1,615	1,638	1,782	1,872
Low mortality	-	5	16	32	91	173	272
High mortality	-	-3	-11	-20	-50	-83	-107

5.2.4 Total pension expenditure (€ billion and relative to GDP)

		2015	2020	2025	2030	2045	2065	2085
€ billion	Baseline	28.4	31.6	34.6	37.5	43.3	61.2	85.6
	Low mortality	-	0.1	0.2	0.5	1.5	3.1	7.4
	High mortality	-	0.0	-0.2	-0.3	-0.8	-1.2	-2.3
% of GDP	Baseline	13.6	14.2	14.2	14.1	12.5	13.2	13.8
	Low mortality	-	0.0	0.1	0.2	0.4	0.6	1.1
	High mortality	-	0.0	-0.1	-0.1	-0.2	-0.2	-0.3

5.2.5 Average pension (€/month and relative to average wage)

		2015	2020	2025	2030	2045	2065	2085
€/month	Baseline	1,613	1,688	1,782	1,860	2,109	2,743	3,658
	Low mortality	-	-1	-4	-9	-35	-108	-180
	High mortality	-	1	3	7	25	73	108
% of average wage	Baseline	52.4	54.1	53.0	51.2	46.0	44.3	43.7
	Low mortality	-	0.0	-0.1	-0.3	-0.7	-1.7	-2.0
	High mortality	-	0.0	0.1	0.2	0.5	1.1	1.3

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

		2015	2020	2025	2030	2045	2065	2085
Expenditure	Baseline	25.7	28.0	28.0	28.1	26.5	30.1	32.4
	Low mortality	-	0.1	0.2	0.3	0.6	1.2	2.5
	High mortality	-	0.0	-0.1	-0.2	-0.3	-0.3	-0.6
Contribution	Baseline	24.0	24.4	24.8	24.8	24.4	26.6	28.3
	Low mortality	-	0.0	0.2	0.3	0.6	1.1	2.2
	High mortality	-	0.0	-0.1	-0.1	-0.3	-0.4	-0.6
Assets	Baseline	214.2	221.1	211.9	208.8	217.2	252.5	292.5
	Low mortality	-	-0.1	-0.2	-0.3	-1.7	-1.5	-3.0
	High mortality	-	0.1	0.3	0.7	1.4	0.5	0.5

Figure 5.1.

Statutory pension expenditure relative to GDP under different mortality assumptions.

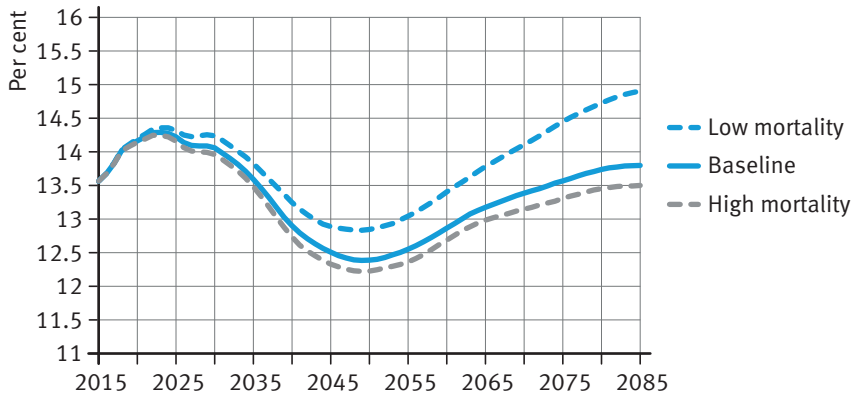


Figure 5.2.

Average pension relative to average earnings under different mortality assumptions.

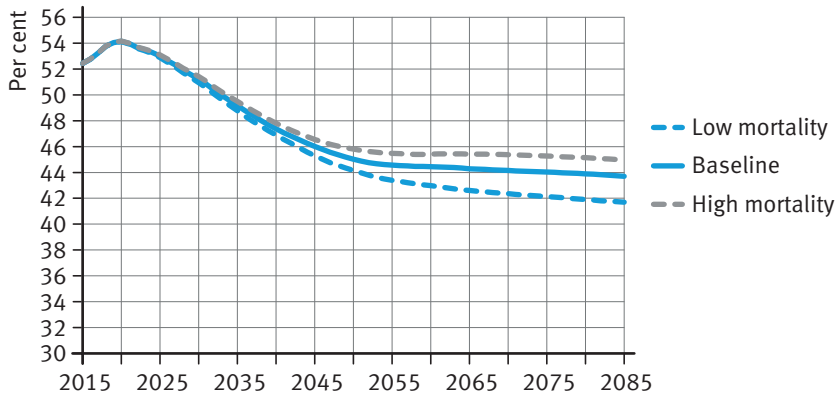
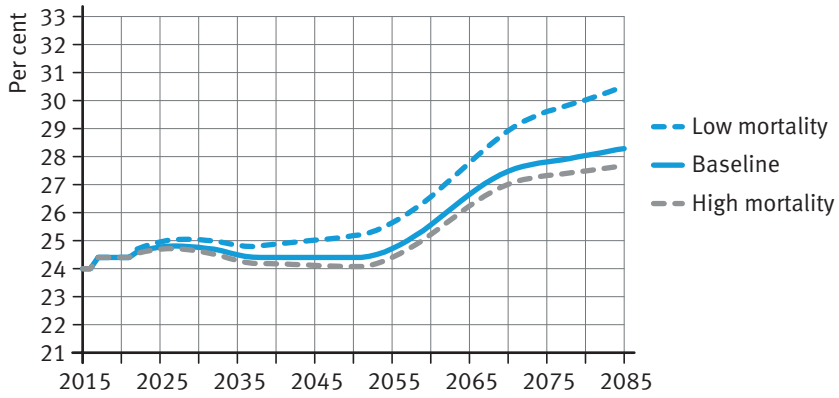


Figure 5.3.

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



5.2 Immigration

The baseline projection assumes Finland's net migration to be 17,000 persons per year. According to Statistics Finland, both immigration and emigration have increased since the beginning of the 1990s. Immigration has increased more rapidly than emigration. The assumption on the future of Statistics Finland's population forecast roughly corresponds to the realised net migration in the 2010s.

In the low immigration projection, the net migration as of 2017 is assumed to be 50 per cent lower than in the baseline projection, or 8,500 persons per year. Both immigration and emigration are lower than in the baseline projection.

In the high immigration projection, the net migration as of 2017 is assumed to be 50 per cent higher than in the baseline projection, or 25,500 persons per year. Both immigration and emigration are higher than in the baseline projection.

The age and gender distributions of the immigrants are assumed to be the same in all projections. Immigrants are mainly young working-age people and young children. The age distribution of emigrants is defined by the demography. The impact of migration on the size of the labour force is based on the assumption that the employment rate of the immigrating males is 20 per cent below the employment rate of the entire male population. The equivalent rate among the females is 30 per cent. This corresponds roughly to the gap in employment between the population with a foreign background and the total population. The gap is expected to be halved in 30 years. This long term assumption corresponds roughly to the observed employment gaps between immigrants and the original population in Sweden. Sweden has a longer history of immigration than Finland, and the integration of immigrants is more advanced there than in Finland. In 2015, the employment rate of male immigrants was 10 per cent lower than that of the other population in Sweden. The equivalent figure for women was 16 per cent.

A change in immigration assumptions immediately affects the number of employed people. Compared to the baseline projection, the number of employed in the high net migration projection grows with 58,000 persons by 2030 and with 311,000 persons by 2085 (Table 5.3). In the low net migration projection, the differences are of the same size, but reverse. Similar differences can be seen in the number of pension recipients, but they will become evident only after a delay of decades due to the immigrants' young age.

In the long run, a high immigration rate will increase the pension expenditure. However, with a higher employment rate, the wage sum and GDP will grow faster than the pension expenditure. That is why, relative to GDP, the pension expenditure is lower in the high immigration projection than in the baseline projection. In the low immigration projection, the effect is the reverse.

Table 5.3.

Sensitivity analysis, immigration (at 2015 prices).

5.3.1 Expected effective retirement age (years)

	2015	2020	2025	2030	2045	2065	2085
Baseline	61.1	62.0	62.7	63.0	64.0	64.7	64.9
Low immigration	-	-	-	-	-	-	-
High immigration	-	-	-	-	-	-	-

5.3.2 Employed (1,000)

	2015	2020	2025	2030	2045	2065	2085
Baseline	2,261	2,301	2,348	2,389	2,456	2,436	2,408
Low immigration	-	-15	-35	-58	-138	-229	-311
High immigration	-	15	35	58	138	229	311

5.3.3 Pension recipients (1,000)

	2015	2020	2025	2030	2045	2065	2085
Baseline	1,427	1,504	1,551	1,615	1,638	1,782	1,872
Low immigration	-	-1	-2	-5	-19	-85	-171
High immigration	-	1	2	5	20	86	171

5.3.4 Total pension expenditure (€ billion and relative to GDP)

		2015	2020	2025	2030	2045	2065	2085
€ billion	Baseline	28.4	31.6	34.6	37.5	43.3	61.2	85.6
	Low immigration	-	0.0	0.0	0.0	-0.2	-1.8	-5.7
	High immigration	-	0.0	0.0	0.0	0.2	1.9	5.8
% of GDP	Baseline	13.6	14.2	14.2	14.1	12.5	13.2	13.8
	Low immigration	-	0.1	0.2	0.3	0.7	0.9	1.0
	High immigration	-	-0.1	-0.2	-0.3	-0.6	-0.8	-0.7

5.3.5 Average pension (€/month and relative to average wage)

		2015	2020	2025	2030	2045	2065	2085
€/month	Baseline	1,613	1,688	1,782	1,860	2,109	2,743	3,658
	Low immigration	-	1	2	4	15	50	96
	High immigration	-	-1	-2	-4	-15	-46	-77
% of average wage	Baseline	52.4	54.1	53.0	51.2	46.0	44.3	43.7
	Low immigration	-	0.0	0.0	0.1	0.3	0.8	1.1
	High immigration	-	0.0	0.0	-0.1	-0.3	-0.7	-0.9

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

		2015	2020	2025	2030	2045	2065	2085
Expenditure	Baseline	25.7	28.0	28.0	28.1	26.5	30.1	32.4
	Low immigration	-	0.2	0.4	0.7	1.5	2.2	2.4
	High immigration	-	-0.2	-0.4	-0.7	-1.3	-1.8	-1.8
Contribution	Baseline	24.0	24.4	24.8	24.8	24.4	26.6	28.3
	Low immigration	-	0.0	0.3	0.5	1.0	1.5	1.5
	High immigration	-	0.0	-0.2	-0.4	-0.9	-1.2	-1.2
Assets	Baseline	214.2	221.1	211.9	208.8	217.2	252.5	292.5
	Low immigration	-	0.9	2.5	4.4	8.8	12.5	15.9
	High immigration	-	-0.9	-2.2	-3.5	-7.4	-10.0	-11.9

Figure 5.4.

Statutory pension expenditure relative to GDP under different net migration assumptions.

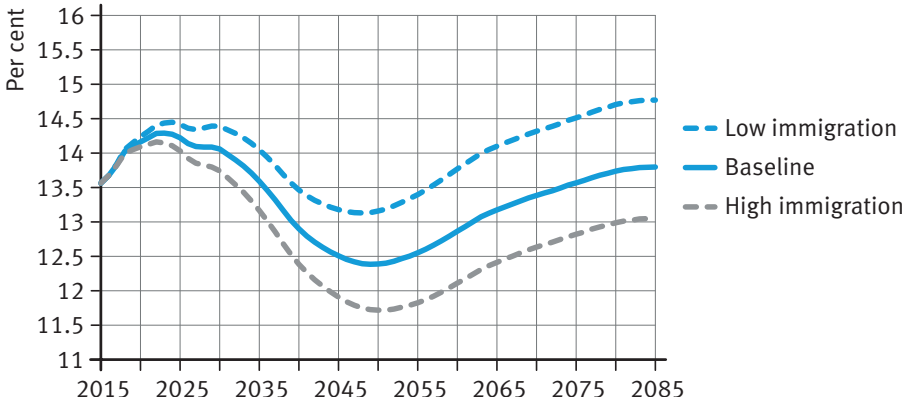


Figure 5.5.

Average pension relative to average earnings under different net migration assumptions.

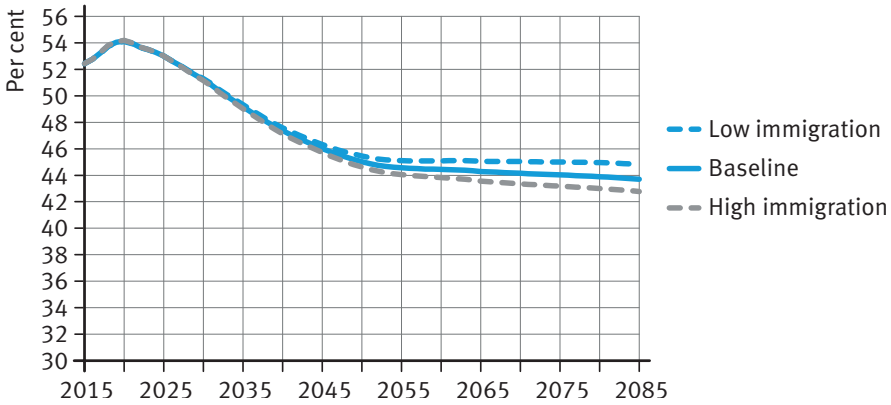
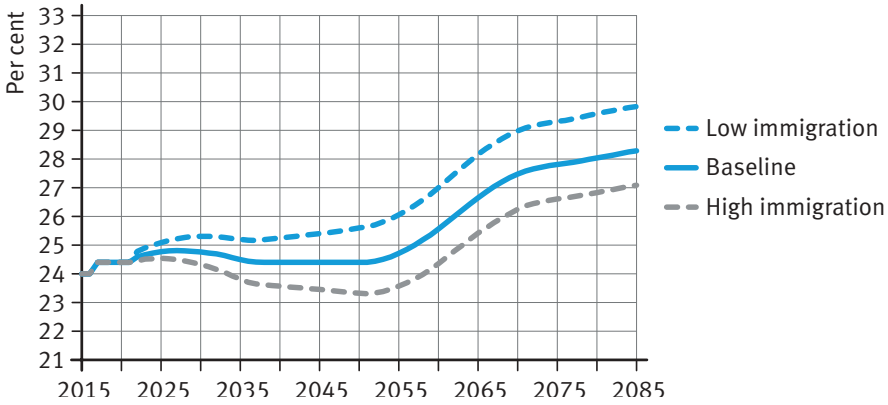


Figure 5.6.

TyEL contribution relative to TyEL wage sum under different net migration assumptions.



5.3 Growth in earnings

In the baseline projection, the annual real growth rate in earnings as of 2021 is 1.5 per cent. In 2017–2020 it is, on average, 0.3 per cent. In the slow growth projection, the real growth rate in earnings as of 2017 is 0.5 percentage points lower per year than in the baseline projection, and in the rapid growth projection, 0.5 percentage points higher.

In the baseline projection, the real earnings will nearly triple during 2015–2085. In the slow growth projection, it will double and in the rapid growth projection, it will quadruple relative to the level in 2015. 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 will increase the purchasing power of pensions. In the baseline projection, the average pension in 2085 is around 3,700 euros per month (at 2015 prices), while it is around 4,700 euros per month in the rapid growth alternative. Nevertheless, a rapid growth in earnings will reduce pensions in relation to wages since the earnings-related pension index and the wage coefficient follow the earnings only partly. The pensions paid by Kela will also lag behind the earnings since they follow the real changes in earnings only to 50 per cent in the projection. The average pension in relation to the average wage will remain approximately 3 percentage points below the baseline projection. The TyEL pension expenditure in relation to the wage sum will remain nearly 2 percentage points below the baseline projection. (Table 5.4.)

The effects of the slow growth assumption are the opposite to those 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 nearly four percentage points higher than in the baseline projection in 2085, and the TyEL pension expenditure exceeds that of the baseline projection by 2.5 percentage points.

The growth in earnings has a significantly smaller impact on the TyEL contribution rate than on the expenditure rate (Table 5.4). The contribution rate's relatively small dependency on the 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 contributions. 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, the accelerating growth in earnings would reduce the contribution and expenditure rates equally much. In a partly funded scheme, the accelerating growth in earnings may increase or reduce the required contribution level.

Table 5.4.

Sensitivity analysis, growth of earnings (at 2015 prices).

5.4.1 Expected effective retirement age (years)

	2015	2020	2025	2030	2045	2065	2085
Baseline	61.1	62.0	62.7	63.0	64.0	64.7	64.9
Slow earnings growth	-	-	-	-	-	-	-
Rapid earnings growth	-	-	-	-	-	-	-

5.4.2 Employed (1,000)

	2015	2020	2025	2030	2045	2065	2085
Baseline	2,261	2,301	2,348	2,389	2,456	2,436	2,408
Slow earnings growth	-	-	-	-	-	-	-
Rapid earnings growth	-	-	-	-	-	-	-

5.4.3 Pension recipients (1,000)

	2015	2020	2025	2030	2045	2065	2085
Baseline	1,427	1,504	1,551	1,615	1,638	1,782	1,872
Slow earnings growth	-	-	-	-	-	-	-
Rapid earnings growth	-	-	-	-	-	-	-

5.4.4 Total pension expenditure (€ billion and relative to GDP)

		2015	2020	2025	2030	2045	2065	2085
€ billion	Baseline	28.4	31.6	34.6	37.5	43.3	61.2	85.6
	Slow earnings growth	-	-0.1	-0.4	-0.9	-3.0	-9.2	-19.4
	Rapid earnings growth	-	0.1	0.4	0.9	3.3	11.0	25.4
% of GDP	Baseline	13.6	14.2	14.2	14.1	12.5	13.2	13.8
	Slow earnings growth	-	0.2	0.5	0.7	0.9	1.1	1.2
	Rapid earnings growth	-	-0.2	-0.5	-0.6	-0.8	-1.0	-1.1

5.4.5 Average pension (€/month and relative to average wage)

		2015	2020	2025	2030	2045	2065	2085
€/month	Baseline	1,613	1,688	1,782	1,860	2,109	2,743	3,658
	Slow earnings growth	-	-6	-21	-43	-149	-417	-834
	Rapid earnings growth	-	6	22	45	163	497	1,092
% of average wage	Baseline	52.4	54.1	53.0	51.2	46.0	44.3	43.7
	Slow earnings growth	-	0.9	1.8	2.4	3.3	3.6	3.7
	Rapid earnings growth	-	-0.9	-1.7	-2.3	-3.0	-3.2	-3.3

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

		2015	2020	2025	2030	2045	2065	2085
Expenditure	Baseline	25.7	28.0	28.0	28.1	26.5	30.1	32.4
	Slow earnings growth	-	0.5	0.9	1.3	1.8	2.2	2.5
	Rapid earnings growth	-	-0.4	-0.9	-1.2	-1.7	-2.0	-2.2
Contribution	Baseline	24.0	24.4	24.8	24.8	24.4	26.6	28.3
	Slow earnings growth	-	0.0	0.6	0.8	0.8	0.7	0.6
	Rapid earnings growth	-	0.0	-0.6	-0.7	-0.8	-0.7	-0.7
Assets	Baseline	214.2	221.1	211.9	208.8	217.2	252.5	292.5
	Slow earnings growth	-	3.4	7.6	11.7	19.9	29.8	39.5
	Rapid earnings growth	-	-3.4	-7.1	-10.7	-17.6	-25.1	-32.6

Figure 5.7.

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

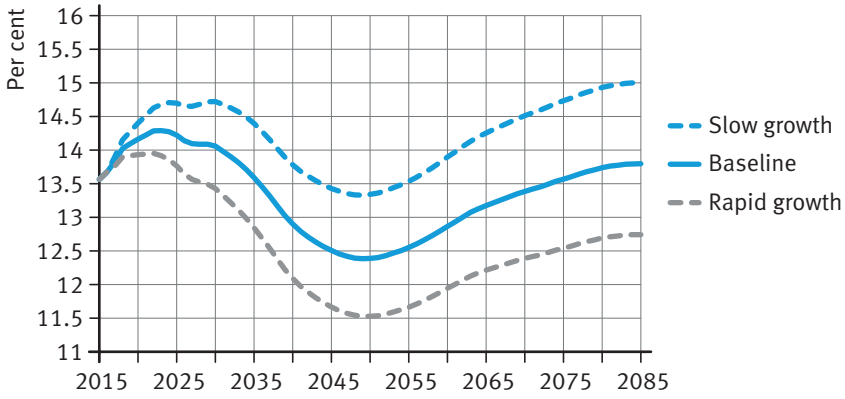


Figure 5.8.

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

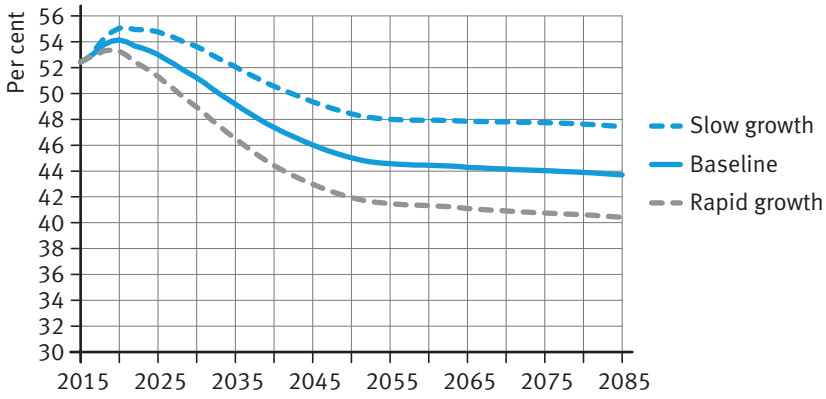
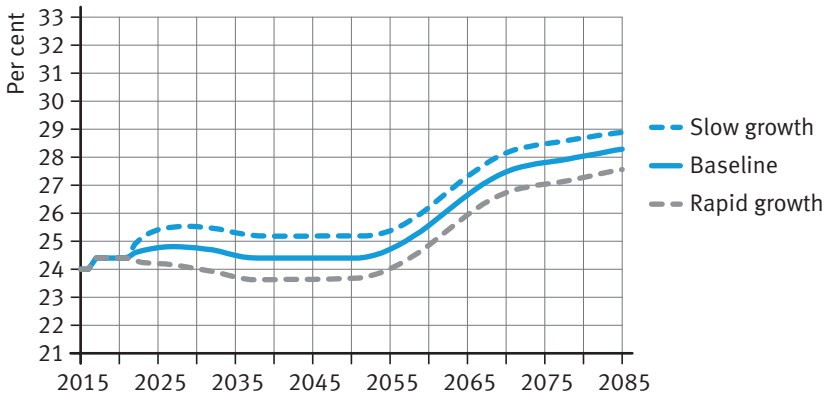


Figure 5.9.

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



5.4 Employment

In the low employment projection, the number of employed persons is three per cent lower than in the baseline projection. The number of employed will diverge from the baseline in 2017–2019. As of 2019, the employed will number 70,000 persons less per year than in the baseline projection, and the employment rate will be about two percentage points lower. *In the high employment projection, the number of employed persons is three per cent higher.* The number of employed changes at the same rate in 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.

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 2020 (Table 5.5). 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 from that in the baseline projection in 2085.

The full impact of changes in employment on pensions will be seen towards the end of the projection period. In 2085, the average pension at 2015 prices is 75 euros lower in the low employment projection than in the baseline projection. In the high employment projection, it is 84 euros higher than in the baseline projection.

Table 5.5.

Sensitivity analysis, employment (at 2015 prices).

5.5.1 Expected effective retirement age (years)

	2015	2020	2025	2030	2045	2065	2085
Baseline	61.1	62.0	62.7	63.0	64.0	64.7	64.9
Low employment	-	-	-	-	-	-	-
High employment	-	-	-	-	-	-	-

5.5.2 Employed (1,000)

	2015	2020	2025	2030	2045	2065	2085
Baseline	2,261	2,301	2,348	2,389	2,456	2,436	2,408
Low employment	-	-69	-70	-72	-74	-73	-72
High employment	-	69	70	72	74	73	72

5.5.3 Pension recipients (1,000)

	2015	2020	2025	2030	2045	2065	2085
Baseline	1,427	1,504	1,551	1,615	1,638	1,782	1,872
Low employment	-	0	0	0	-8	-11	-14
High employment	-	1	1	2	10	9	10

5.5.4 Total pension expenditure (€ billion and relative to GDP)

		2015	2020	2025	2030	2045	2065	2085
€ billion	Baseline	28.4	31.6	34.6	37.5	43.3	61.2	85.6
	Low employment	-	0.0	0.0	-0.1	-0.4	-1.4	-2.4
	High employment	-	0.0	0.0	0.1	0.4	1.4	2.4
% of GDP	Baseline	13.6	14.2	14.2	14.1	12.5	13.2	13.8
	Low employment	-	0.4	0.4	0.4	0.3	0.1	0.0
	High employment	-	-0.4	-0.4	-0.4	-0.2	-0.1	0.0

5.5.5 Average pension (€/month and relative to average wage)

		2015	2020	2025	2030	2045	2065	2085
€/month	Baseline	1,613	1,688	1,782	1,860	2,109	2,743	3,658
	Low employment	-	0	-1	-3	-10	-47	-75
	High employment	-	-1	1	2	9	51	84
% of average wage	Baseline	52.4	54.1	53.0	51.2	46.0	44.3	43.7
	Low employment	-	0.0	0.0	-0.1	-0.2	-0.8	-0.9
	High employment	-	0.0	0.0	0.0	0.2	0.8	1.0

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

		2015	2020	2025	2030	2045	2065	2085
Expenditure	Baseline	25.7	28.0	28.0	28.1	26.5	30.1	32.4
	Low employment	-	0.9	0.8	0.8	0.5	0.2	0.0
	High employment	-	-0.8	-0.8	-0.8	-0.5	-0.2	0.0
Contribution	Baseline	24.0	24.4	24.8	24.8	24.4	26.6	28.3
	Low employment	-	0.0	0.9	0.7	0.4	0.1	0.0
	High employment	-	0.0	-0.7	-0.7	-0.4	-0.1	0.0
Assets	Baseline	214.2	221.1	211.9	208.8	217.2	252.5	292.5
	Low employment	-	5.0	4.3	4.3	2.5	1.0	0.5
	High employment	-	-4.7	-3.4	-3.6	-2.1	-0.9	-0.4

Figure 5.10.

Statutory pension expenditure relative to GDP under different employment assumptions.

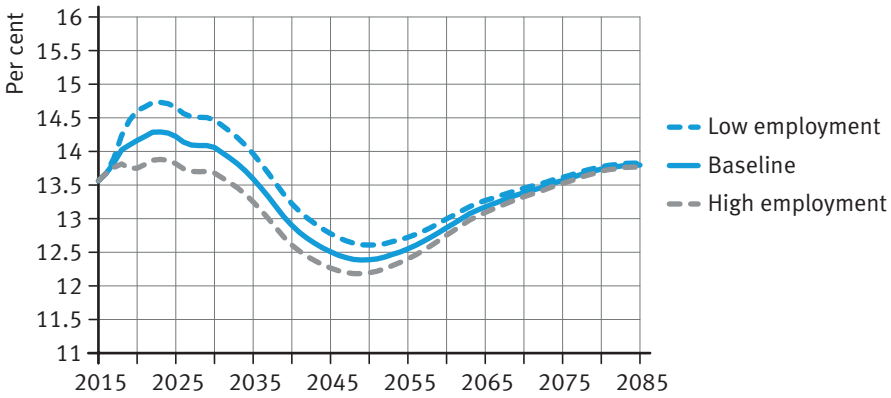


Figure 5.11.

Average pension relative to average earnings under different employment assumptions.

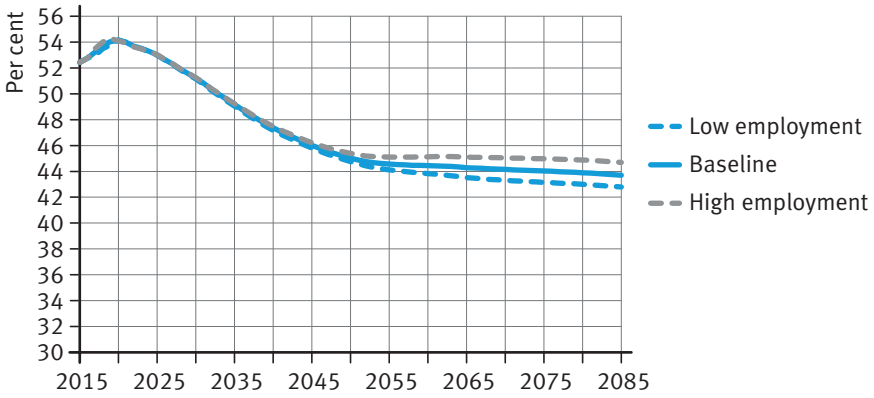
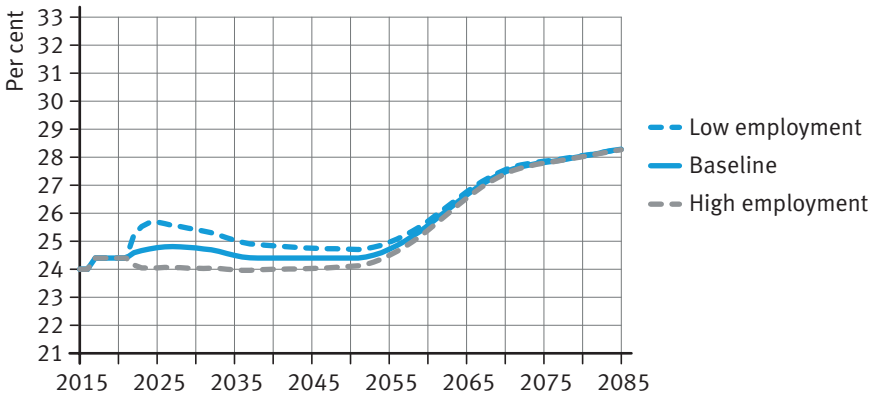


Figure 5.12.

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



5.5 Return on pension assets

In the baseline projection, the expected real return on investments for the period 2017–2026 is 3.0 per cent per year, and 3.5 per cent as of 2027. The assumptions in the alternative projections are the following:

1. *In the low return projection*, the expected real return is one percentage point lower than in the baseline projection as of 2017.
2. *In the high return projection*, the expected real return is one percentage point higher than in the baseline projection as of 2017.

The return on pension assets plays a key role in the long-term development of the TyEL contribution rate. An additional return of one percentage point would make it possible to permanently reduce the TyEL contribution rate by approximately two percentage points, assuming that the additional return was immediately used to this purpose. This is because, in the baseline projection, the amount of pension assets is approximately twice as large as the annual wage sum.

However, the return on assets affects the TyEL contribution rate with considerable delay. In the short run, the growth of pension assets is fast in the high return projection, but the impact on the contribution rate is relatively small. In the last year of the projection period, the contribution rate is three percentage points lower in the high return projection than in the baseline projection. Similarly, in the low return projection, the assets react first, but towards the end of the projection period, the TyEL contribution rises to more than 30 per cent. (Table 5.6.)

Until the end of 2016, the earnings-related pension contributions paid by employees were deducted from the earnings on which pension accrues. Because of this, changes in the TyEL contribution rate have affected pensions and pension expenditure, although the impact has been small and delayed by decades. As of 2017, the employee's pension contribution is no longer deducted from the earnings for which pension accrues. As a result, the TyEL contribution rate will no longer affect pensions and pension expenditures. The pension expenditures under different return projections do not deviate from those in the baseline projection.

Table 5.6.

Sensitivity analysis, return on investments (at 2015 prices).

5.6.1 Expected effective retirement age (years)

	2015	2020	2025	2030	2045	2065	2085
Baseline	61.1	62.0	62.7	63.0	64.0	64.7	64.9
Low return	-	-	-	-	-	-	-
High return	-	-	-	-	-	-	-

5.6.2 Employed (1,000)

	2015	2020	2025	2030	2045	2065	2085
Baseline	2,261	2,301	2,348	2,389	2,456	2,436	2,408
Low return	-	-	-	-	-	-	-
High return	-	-	-	-	-	-	-

5.6.3 Pension recipients (1,000)

	2015	2020	2025	2030	2045	2065	2085
Baseline	1,427	1,504	1,551	1,615	1,638	1,782	1,872
Low return	-	-	-	-	-	-	-
High return	-	-	-	-	-	-	-

5.6.4 Total pension expenditure (€ billion and relative to GDP)

		2015	2020	2025	2030	2045	2065	2085
€ billion	Baseline	28.4	31.6	34.6	37.5	43.3	61.2	85.6
	Low return	-	-	-	-	-	-	-
	High return	-	-	-	-	-	-	-
% of GDP	Baseline	13.6	14.2	14.2	14.1	12.5	13.2	13.8
	Low return	-	-	-	-	-	-	-
	High return	-	-	-	-	-	-	-

5.6.5 Average pension (€/month and relative to average wage)

		2015	2020	2025	2030	2045	2065	2085
€/month	Baseline	1,613	1,688	1,782	1,860	2,109	2,743	3,658
	Low return	-	-	-	-	-	-	-
	High return	-	-	-	-	-	-	-
% of average wage	Baseline	52.4	54.1	53.0	51.2	46.0	44.3	43.7
	Low return	-	-	-	-	-	-	-
	High return	-	-	-	-	-	-	-

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

		2015	2020	2025	2030	2045	2065	2085
Expenditure	Baseline	25.7	28.0	28.0	28.1	26.5	30.1	32.4
	Low return	-	-	-	-	-	-	-
	High return	-	-	-	-	-	-	-
Contribution	Baseline	24.0	24.4	24.8	24.8	24.4	26.6	28.3
	Low return	-	0.0	0.8	1.2	1.7	2.2	2.5
	High return	-	0.0	-0.9	-1.3	-2.1	-3.0	-3.7
Assets	Baseline	214.2	221.1	211.9	208.8	217.2	252.5	292.5
	Low return	-	-8.7	-16.5	-21.6	-30.8	-41.8	-54.4
	High return	-	9.0	17.8	24.4	38.5	57.0	78.6

Figure 5.13.

Statutory pension expenditure relative to GDP under different return assumptions.

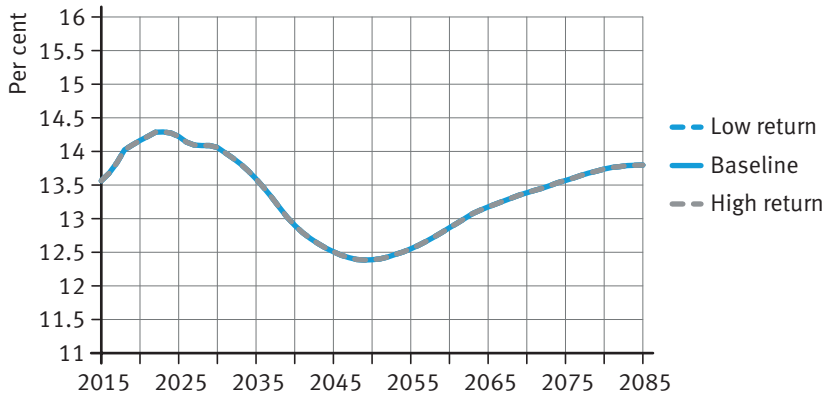


Figure 5.14.

Average pension relative to average earnings under different return assumptions.

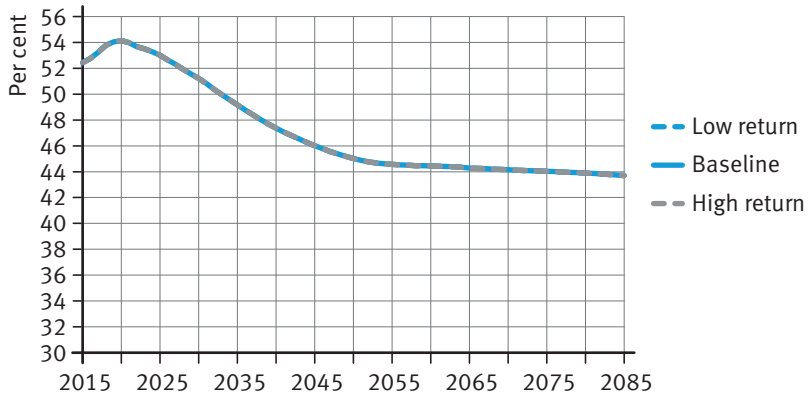
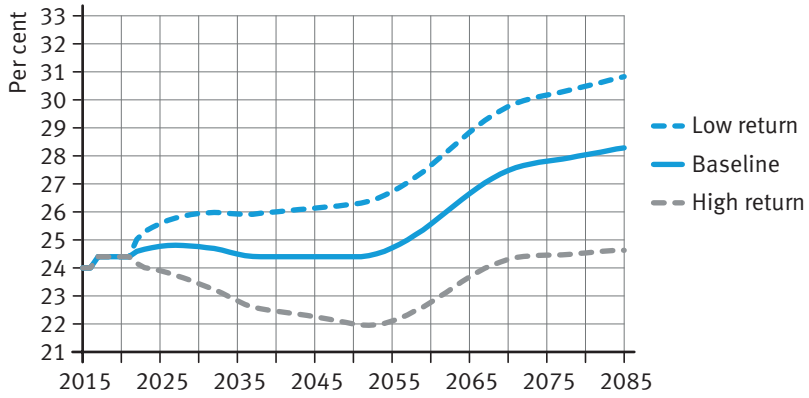


Figure 5.15.

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



5.6 Combined scenarios

The optimistic economic scenario combines the following projections discussed earlier: a rapid earnings growth, high employment and high investment returns. In the pessimistic economic scenario, a slow earnings growth, low employment and low investment returns have been combined. 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 long run, in the optimistic economic scenario, the pension expenditure relative to GDP ends up at approximately one percentage point below that of the baseline projection The TyEL contribution rate is 3–4 percentage points below the baseline projection. 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 the average earnings is slightly over two percentage points below the baseline projection because the growth rate in earnings has a bigger impact on wages than on pensions. (Table 5.7.)

In the long run, in the pessimistic economic scenario, the pension expenditure relative to GDP rises to approximately one percentage point above the baseline projection. The TyEL contribution rate rises already in the early 2020s and is approximately three percentage points higher than in 2016. In the long run, the TyEL contribution rate is 3–4 percentage points higher than in the baseline projection. The purchasing power of pensions is lower than in the baseline projection. However, the ratio of pensions relative to average earnings is higher than in the baseline projection.

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 3.7 percentage points above the baseline projection in 2085. Calculated as a sum of separate alternative projections, the contribution rate would be 3.1 percentage points above the baseline projection. The gap is due to the joint effect of the low return and slow earnings growth projections. When the pension assets are smaller due to the low return on investments, the focus in the financing of pensions shifts more to the PAYG system. This makes the growth in earnings increasingly important in the financing of pensions.

In the optimistic scenario, the TyEL contribution rate is 3.7 percentage points below the baseline projection in 2085. Calculated as a sum of separate alternative projections, the contribution rate would be 4.4 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 to the funds. In that case, the more rapid growth in earnings is not as beneficial as in the baseline projection.

Table 5.7.

Sensitivity analysis, pessimistic and optimistic economic growth (at 2015 prices).

5.7.1 Expected effective retirement age (years)

	2015	2020	2025	2030	2045	2065	2085
Baseline	61.1	62.0	62.7	63.0	64.0	64.7	64.9
Pessimistic	-	-	-	-	-	-	-
Optimistic	-	-	-	-	-	-	-

5.7.2 Employed (1,000)

	2015	2020	2025	2030	2045	2065	2085
Baseline	2,261	2,301	2,348	2,389	2,456	2,436	2,408
Pessimistic	-	-69	-70	-72	-74	-73	-72
Optimistic	-	69	70	72	74	73	72

5.7.3 Pension recipients (1,000)

	2015	2020	2025	2030	2045	2065	2085
Baseline	1,427	1,504	1,551	1,615	1,638	1,782	1,872
Pessimistic	-	0	0	0	-8	-11	-14
Optimistic	-	1	1	2	10	9	10

5.7.4 Total pension expenditure (€ billion and relative to GDP)

		2015	2020	2025	2030	2045	2065	2085
€ billion	Baseline	28.4	31.6	34.6	37.5	43.3	61.2	85.6
	Pessimistic	-	-0.1	-0.4	-0.9	-3.4	-10.4	-21.2
	Optimistic	-	0.1	0.4	1.0	3.8	12.7	28.5
% of GDP	Baseline	13.6	14.2	14.2	14.1	12.5	13.2	13.8
	Pessimistic	-	0.7	0.9	1.1	1.2	1.2	1.2
	Optimistic	-	-0.6	-0.8	-1.0	-1.1	-1.0	-1.1

5.7.5 Average pension (€/month and relative to average wage)

		2015	2020	2025	2030	2045	2065	2085
€ billion	Baseline	1,613	1,688	1,782	1,860	2,109	2,743	3,658
	Pessimistic	-	-6	-22	-46	-158	-456	-892
	Optimistic	-	5	22	46	173	558	1,202
% of average wage	Baseline	52.4	54.1	53.0	51.2	46.0	44.3	43.7
	Pessimistic	-	0.9	1.7	2.3	3.1	2.8	2.8
	Optimistic	-	-0.9	-1.7	-2.2	-2.9	-2.4	-2.3

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

		2015	2020	2025	2030	2045	2065	2085
Expenditure	Baseline	25.7	28.0	28.0	28.1	26.5	30.1	32.4
	Pessimistic	-	1.3	1.8	2.1	2.4	2.4	2.5
	Optimistic	-	-1.3	-1.6	-1.9	-2.1	-2.2	-2.3
Contribution	Baseline	24.0	24.4	24.8	24.8	24.4	26.6	28.3
	Pessimistic	-	0.0	2.5	2.7	3.1	3.4	3.8
	Optimistic	-	0.0	-2.2	-2.4	-3.0	-3.3	-3.7
Assets	Baseline	214.2	221.1	211.9	208.8	217.2	252.5	292.5
	Pessimistic	-	-0.7	-5.2	-6.4	-12.4	-18.7	-25.6
	Optimistic	-	0.7	5.3	7.7	14.0	22.1	31.6

Figure 5.16.

Statutory pension expenditure relative to GDP under different scenarios.

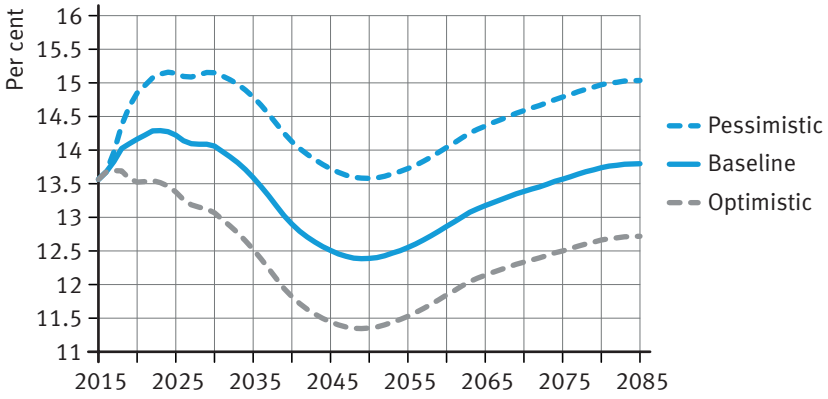


Figure 5.17.

Average pension relative to average earnings under different scenarios.

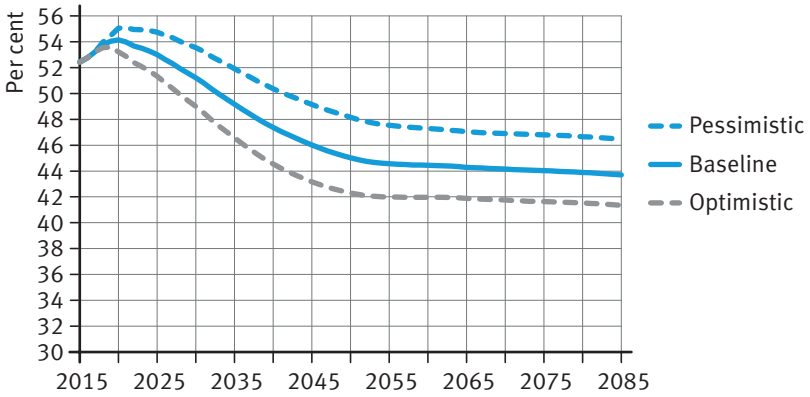
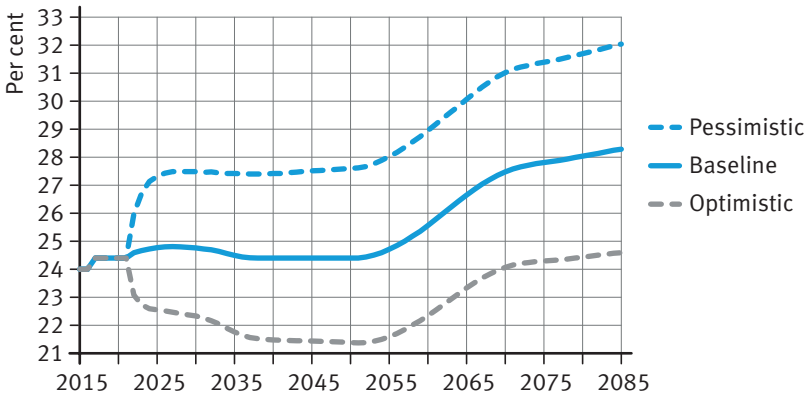


Figure 5.18.

TyEL contribution relative to TyEL wage sum under different scenarios.



6 Comparison with previous reports

In this section, we compare the results presented in Chapter 4 with those of previous projections. The main changes compared to the long-term projections published in 2013 include:

1. changes following the 2017 pension reform,
2. a new population forecast, and
3. changes to the assumptions on asset returns and the growth in earnings.

In section 6.1, we compare the central results of these projections with our long-term projections published in 2013. In sections 6.2–6.5 we compare in more detail the results of this projection to those in the report *Effects of the 2017 earnings-related pension reform: projections based on the government bill* (Reipas and Sankala 2015).

The population forecast used in this report is the population forecast of 2015 published by Statistics Finland. The 2013 and 2015 projections were both based on a previous forecast published by Statistics Finland in 2012.

6.1 Comparison to the 2013 report

In 2014, a new system of national accounts (ESA 2010) was introduced in the European Union. As a result, the definition of, for example, the gross domestic product (GDP) changed. The assessment of the development of GDP in the 2013 report has been adjusted in this report to correspond to the new definition.

Compared to the projections in the 2013 report, the statutory pension expenditure in the projections of this report is higher relative to GDP until 2025 (Figure 6.1). This is largely due to the weaker than expected economic outlook. After 2025, the ratio of pension expenditure to GDP will remain below the previously projected level for several decades (Table 6.1 and Figure 6.1). This is due to the 2017 pension reform, which is expected to extend working lives and defer retirement. Towards the end of the century, the pension reform's impact on the ratio will decrease, and the reducing number of employed persons will slow down the economic growth. By 2080, the pension expenditure relative to GDP will exceed the level of the 2013 projection. The changes in the TyEL contribution rate will follow the changes in the expenditure development (Figure 6.3).

In the new projection, the ratio of the average pension to the average earnings is higher throughout the projection period than in the previous projection (Figure 6.2). An important explanatory factor at the beginning of the projection period is the slower-than-before growth of the average wage. Towards the end of the projection period, the 2017 pension reform will raise pensions in the new projection.

Table 6.1.

Comparison to 2013 projection (at 2015 prices).

	Realised	2016 projection			2013 projection		
	2015	2030	2050	2080	2030	2050	2080
Pension expenditure, % of GDP	13.6	14.1	12.4	13.7	14.4	13.0	13.2
of which earnings-related pension expenditure	12.1	12.8	11.4	12.9	13.1	11.9	12.3
Employed (1,000)	2,261	2,389	2,455	2,417	2,369	2,452	2,509
Pensioners (1,000)	1,427	1,615	1,658	1,862	1,724	1,843	2,092
Expected effective retirement age, 25 years	61.1	63.0	64.2	64.9	61.6	62.2	62.4
Average pension, €/month	1,613	1,860	2226	3,408	1,991	2,408	3,568
% of average earnings	52.4	51.2	45.0	43.9	48.3	42.3	38.6
TyEL expenditure, % of wage sum	25.7	28.1	26.9	32.1	28.2	27.4	29.8
TyEL contribution, % of wage sum	24.0	24.8	24.4	28.0	25.3	24.8	26.5
TyEL assets, % of wage sum	214.2	208.8	227.5	282.7	204.5	211.3	219.7

Figure 6.1.

Statutory pension expenditure relative to GDP in 2016 and 2013 projections.

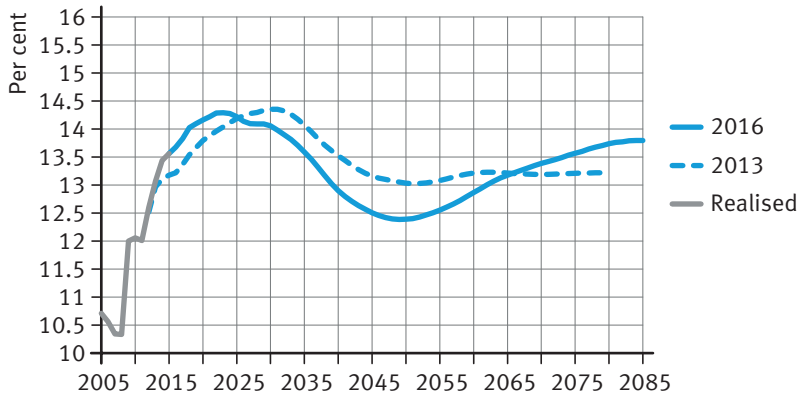


Figure 6.2.

Average pension relative to average earnings in 2016 and 2013 projections.

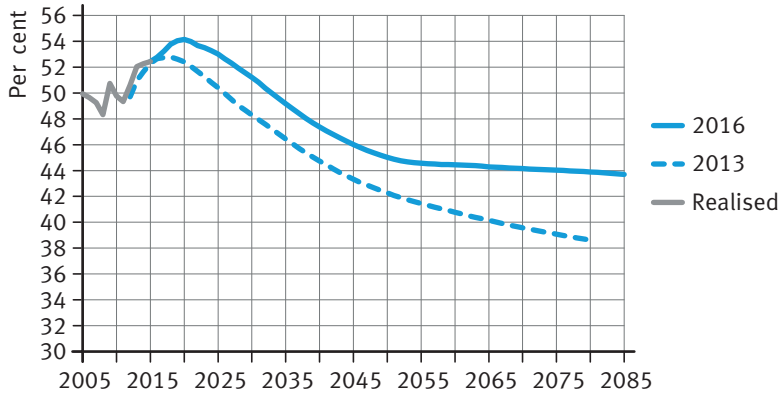
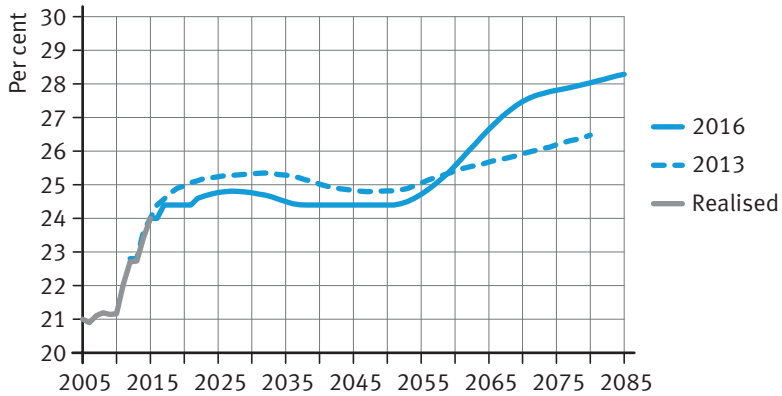


Figure 6.3.

TyEL contribution relative to wage sum in 2016 and 2013 projections.



6.2 Population forecast and life expectancy coefficient

Table 6.2.

Population forecasts in the 2016 and 2015 projections.

	Realised	2016 projection			2015 projection		
	2015	2030	2050	2080	2030	2050	2080
Total fertility rate	1.65	1.70	1.70	1.70	1.82	1.82	1.82
Net migration (1,000)	12.4	17	17	17	17	17	17
Life expectancy at age 63 (years)	21.7	23.9	26.3	28.5	24.2	26.8	28.9
Population (1,000)							
Total	5,487	5,769	5,914	6,073	5,847	6,096	6,469
15–64-year-olds	3,468	3,409	3,438	3,361	3,416	3,516	3,602
65 and over	1,123	1,479	1,612	1,873	1,495	1,639	1,906
Old-age dependency ratio, %	32.4	43.4	46.9	55.7	43.8	46.6	52.9

The main difference between the population forecast of this report and the previous one is the considerably lower fertility rate. As a result of the low fertility rate, the total population will number less than projected in 2013 in all new birth year cohorts. In both projections, the old-age dependency ratio will follow the same track until 2050. After that, the projections are different. According to the current projection, the dependency ratio will exceed that in the previous projection by nearly three percentage points by 2080. (Table 6.2.)

The slower increase in life expectancy leads to a slightly slower growth in the effective retirement age compared to the previous projection (Table 6.3) and to a higher life expectancy coefficient. The difference in retirement ages is two months at the most. The gap will narrow for those born after the year 2000. In the current projection, the life expectancy coefficient is slightly less than one percent higher than in the 2015 projection in the long run.

Table 6.3.

Retirement age and life expectancy coefficient by year of birth in 2016 and 2015 projections.

Year of birth	Retirement age		Life expectancy coefficient	
	2016 projection	2015 projection	2016 projection	2015 projection
1955	63 yrs 3 mo	63 yrs 3 mo	0.962	0.956
1960	64 yrs 6 mo	64 yrs 6 mo	0.935	0.928
1965	65 yrs 2 mo	65 yrs 2 mo	0.915	0.906
1970	65 yrs 8 mo	65 yrs 9 mo	0.905	0.897
1975	66 yrs 2 mo	66 yrs 3 mo	0.896	0.888
1980	66 yrs 7 mo	66 yrs 8 mo	0.888	0.878
1985	67 yrs	67 yrs 2 mo	0.880	0.872
1990	67 yrs 5 mo	67 yrs 7 mo	0.874	0.866
1995	67 yrs 9 mo	67 yrs 11 mo	0.867	0.858
2000	68 yrs 1 mo	68 yrs 3 mo	0.861	0.852

6.3 Employment and retirement

The employment projection of the 2015 report was prepared at the Finnish Centre for Pensions using the cohort component method developed by the OECD. The employment projection of this report is based on the same principles but is more detailed than before. The employment projection has been presented briefly in Appendix 8.

Due to a change in method, the employment rates of this and the 2015 projection are not fully comparable. In both projections, the employment rate will rise to approximately 73 per cent by 2035. In the current projections, the rise is slower at the beginning. In the long run, the employment rate in this projection will settle at 0.3 percentage points below the previous projection. (Table 6.4.)

In addition to the employment rate, the number of employed persons is affected by the number of working-age people. The working-age population will take a downward turn after the 2040s in the current projection. In the previous projection, it continued to rise until 2080. In the current projection, the working-age population will number nearly 200,000 persons less in 2080 than it did in the 2015 projection.

The expected effective retirement age depicts the level in retirement rates in different years in a similar way as life expectancy depicts mortality rates. The differences to the previous report are minor and mainly due to technical changes in the projection. The expected effective retirement age in the new projection is approximately 0.2 years higher than in the 2015 projection (Table 6.4).

Table 6.4.

Employment rate and expected effective retirement age in the 2016 and 2015 projections.[11]

	Realised	2016 projection			2015 projection		
	2015	2030	2050	2080	2030	2050	2080
Employment rate (%)	68.1	72.5	72.6	72.2	73.0	72.9	72.5
Employed (1,000)	2,261	2,389	2,455	2,417	2,411	2,520	2,599
TyEL	1,454	1,585	1,645	1,617	1,608	1,703	1,757
Private sector	1,730	1,845	1,903	1,873	1,878	1,975	2,040
Public sector	643	659	666	654	664	681	701
Expected effective retirement age, 25-year-olds	61.1	63.0	64.2	64.9	62.9	64.1	64.7

11 The number of employed in 2015 has been scaled downward in order to make it comparable with the new projection. See Appendix 8.

Figure 6.4.

Statutory pension expenditure relative to GDP 2005–2085.

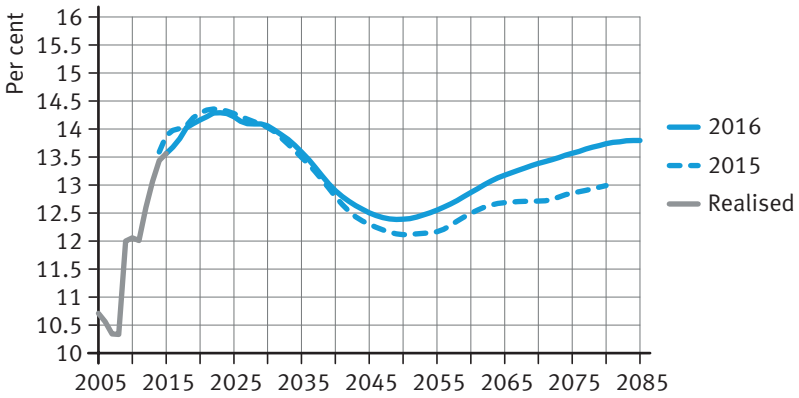


Figure 6.5.

Average pension relative to average earnings 2005–2085.

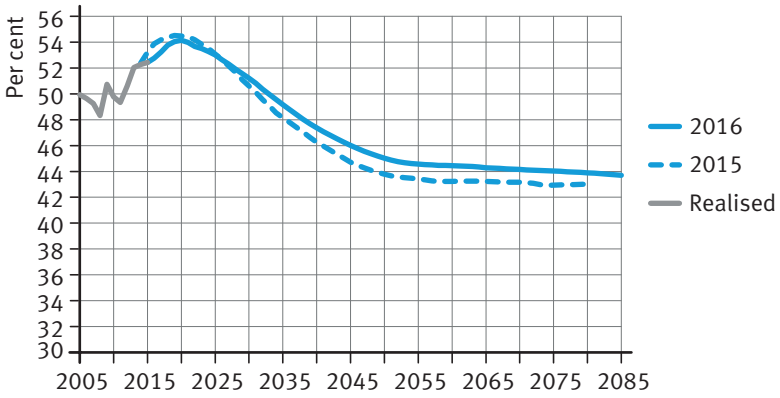
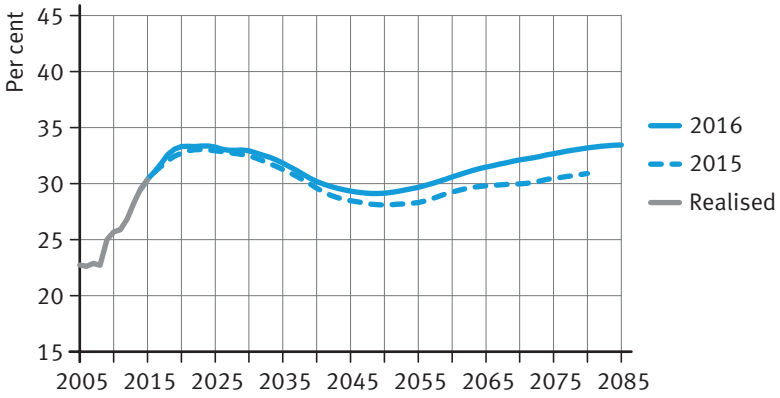


Figure 6.6.

Earnings-related pension expenditure relative to wage sum 2005–2085, all earnings-related pensions.



6.4 Pension expenditure and average benefits

The total statutory expenditure relative to GDP follows nearly the same tracks until 2040 in both the 2016 and the 2015 projections. Taking into account the realised development of GDP reduces the ratio in 2015–2017. In the new projection, the ratio will rise in 2040–2080 and exceed the previous projection by 0.7 percentage points. The difference is mainly a result of the fact that the number of employed relative to pensioners is smaller in the current projection. The slower than expected growth in earnings also contributes to a higher ratio. (Table 6.5 and Figure 6.4.)

In the 2015 projection we assumed that, as of 2017, the wage sum relative to GDP would be 41.1 per cent. This assumption was formed based on the former definition of GDP[12]. In this comparison, the assumption in the 2015 projection has been adjusted so that the ratio follows the new definition.

In the new projection, the earnings-related pension expenditure relative to the wage sum will exceed the level in the previous projection by 2.3 percentage points by 2080. In 2016–2030, the expenditure ratio is at a slightly higher level than in the previous projection due to the slower growth of the employment rate. (Table 6.5 and Figure 6.6.)

The difference in the ratio between the average pension and average earnings in the 2015 and the 2016 projections is minor. In the long run, the ratio of the average pension to the average earnings will be on a higher level than in the 2015 projection. This is partly due to the slower earnings growth and the slightly higher life expectancy coefficient, but it is partly also a question of differences in demarcation. In the 2015 projection, the recipients of the partial old-age pension were counted as pensioners. In the current projection, they are not. In the future, the average pension in the statistics of the Finnish Centre for Pensions will be calculated so that recipients of the partial old-age pension are not calculated as pensioners.

Table 6.5.

Pension expenditure relative to GDP and earnings in the 2016 and 2015 projections.

6.5.1 Pension expenditure relative to GDP (%)

	Realised	2016 projection			2015 projection		
	2015	2030	2050	2080	2030	2050	2080
Total pension expenditure	13.6	14.1	12.4	13.7	14.0	12.1	13.0
Earnings-related pensions	12.1	12.8	11.4	12.9	12.8	11.1	12.2
Kela pensions	1.2	1.0	0.8	0.6	1.0	0.8	0.6
SOLITA pensions	0.2	0.2	0.2	0.2	0.2	0.2	0.2

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

	Realised	2016 projection			2015 projection		
	2015	2030	2050	2080	2030	2050	2080
Total pension expenditure	30.4	32.9	29.1	33.2	32.5	28.1	30.9
TyEL	25.7	28.1	26.9	32.1	27.8	25.8	29.9
Private sector	26.9	28.9	27.3	32.1	28.5	26.2	29.9
Public sector	39.2	43.3	33.4	33.4	42.6	32.4	31.0

12 See section 6.1.

6.5 Financing of TyEL pensions

In this report, the TyEL pension expenditure relative to the TyEL wage sum will rise faster than before as of 2030. In 2080, it will be approximately two percentage points higher than in the 2015 projection (Figure 6.7). The difference is mainly explained by the new population and employment forecasts, according to which the number of employed will take a downward turn in mid-century.

The higher expenditure ratio will cause pressure to raise contributions in the long run by approximately three percentage points. In addition, in the new projection, the TyEL contribution must be raised temporarily as of the 2020s. According to the 2015 projection, it would have been possible to keep the contribution rate at 24.4 per cent until the latter half of the century. For the most part, the difference in the initial years follows from the lower assumption on investment returns in 2017–2026, as well as lower than expected realised returns in 2015. In the long term, the difference is due to the different development of the pension expenditure ratio and to the fact that there are fewer assets available for levelling the contribution rate than in the previous projection. (Figure 6.8.)

The amount of TyEL assets in the new projection stays at a lower level throughout the projection period compared to the previous projection. The difference is explained through the realised return in 2015 and the lower expected investment returns in the initial years. Another explanation can be found in the fact that, in the new projection, the additional funding of old-age pensions has been targeted to older age groups than before in order to even out the pressure to raise contributions. Targeting the increases to funded pensions at older age groups means that pension assets are used to a greater extent to lower the contribution rate. Consequently, the amount of pension assets is reduced. In this report, the increases to pension funds are targeted at those who have turned 70 years in 2017–2029 and to those who have turned 65 years as of 2030. In the previous report, the increases to pension funds were targeted in 2017–2029 to those who would turn 63 years, in 2030–2064 to those who would turn 18 years, and as of 2065 to those who would turn 65 years. Legislation allows for a targeting of the increases to funded old-age pensions to achieve a steady contribution rate. (Figure 6.9.)

The assumption relating to the increases to funded pensions has been changed to achieve a steady development of the TyEL contribution rate.

Figure 6.7.

TyEL expenditure relative to wage sum 2005–2085.

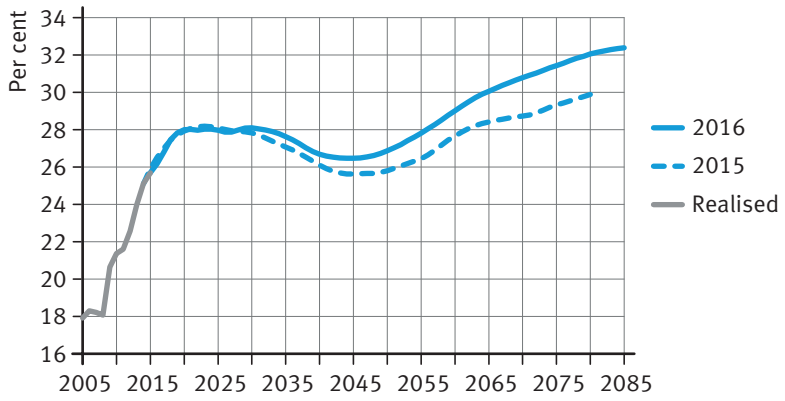


Figure 6.8.

TyEL contribution relative to wage sum 2005–2085.

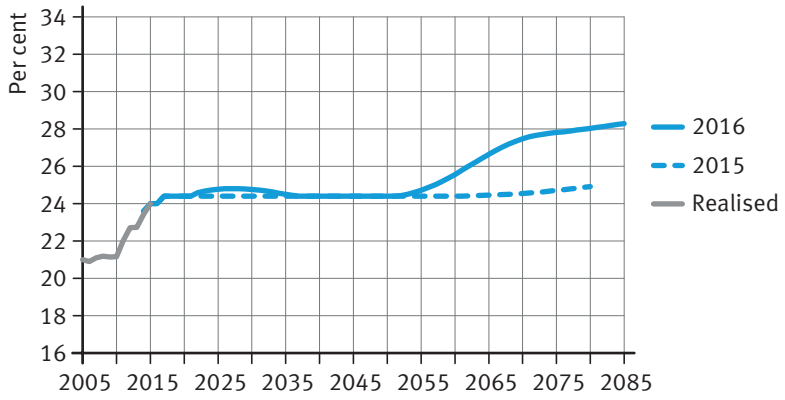
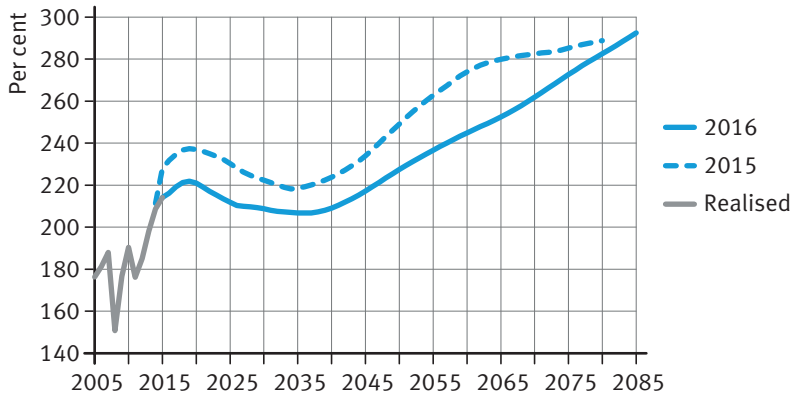


Figure 6.9.

TyEL assets and relative to wage sum 2005–2085.



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APPENDICES

Appendix 1. Indexing of Kela pensions

In the baseline projection, the pensions paid by Kela (the national pension and the guarantee pension) follow the consumer price index until 2021, apart from the cut in the national pension index included in the 2017 budget proposal. As of 2022, 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, all pensions paid by Kela are indexed to consumer prices throughout the projection period. In the second one, Kela pensions follow wage changes from 2022 onward.

Earnings-related pensions are linked to earnings through accrual rates, the wage coefficient and the pension index. Under current law, Kela pensions are in no way linked to the wage development. Instead, the earnings-related pension is deducted from the national and guarantee pensions. 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. Similarly, 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.

A.1.1.1 Pension expenditure relative to GDP (%)

	2015	2020	2025	2030	2045	2065	2085
Consumer price index	1.2	1.1	1.0	0.9	0.7	0.4	0.3
Halfway index	1.2	1.1	1.0	1.0	0.8	0.7	0.5
Wage index	1.2	1.1	1.0	1.1	1.1	1.1	1.1

A.1.1.2 Pension expenditure relative to GDP (%)

	2015	2020	2025	2030	2045	2065	2085
Consumer price index	13.6	14.2	14.2	14.0	12.3	12.9	13.5
Halfway index	13.6	14.2	14.2	14.1	12.5	13.2	13.8
Wage index	13.6	14.2	14.3	14.1	12.7	13.6	14.4

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

	2015	2020	2025	2030	2045	2065	2085
Consumer price index	52.4	54.1	52.9	51.0	45.4	43.4	42.9
Halfway index	52.4	54.1	53.0	51.2	46.0	44.3	43.7
Wage index	52.4	54.1	53.1	51.5	46.8	45.8	45.7

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

The baseline projection illustrates the future development of the TyEL contribution rate according to current regulations. An alternative way to assess the future 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, the pension expenditure relative to the wage sum is assumed to be unchanged. The pension expenditure relative to the sum of earned income is still at an increasing gradient in 2100, albeit only slightly.

A sufficient constant TyEL contribution rate would be 25.7 per cent of the TyEL wage sum (Table A2.1). In 2015, the TyEL contribution rate was 24.0 per cent. The central labour market organisations have agreed to keep the contribution rate at 24.4 per cent from 2017 to 2021 (agreement on 2017 earnings-related pension reform on 26.9.2014 and the competitiveness pact on 29.2.2016).

According to the 2013 long-term projection, a sufficient constant contribution rate would be 25.6 per cent. The 2017 pension reform reduces the sufficient constant TyEL contribution by 0.4 percentage points. The favourable investment returns in recent years have reduced the needed contribution rate. Changes in the assumptions concerning demography, economic growth and return on pension assets raise the contribution rate compared to the 2013 projection.

Correspondingly, the sufficient constant contribution rate for local government pensions under JuEL relative to the local government wage sum would be 26.0 per cent (Table L2.2). In 2015, the KuEL contribution income relative to the KuEL wage sum was 29.8 per cent (Keva 2016). Compared to the 2013 projection, the constant contribution rate of local government pensions has decreased by 0.6 percentage points. The effect of the 2017 pension reform on the ratio between the local government pension expenditure and wage sum is greater than in TyEL pensions. In addition, the pension assets of local government pensions have grown more in relative terms since 2012 than have TyEL assets.

As for state pensions, a constant contribution rate is not meaningful since the ratio between expenditure and wage sum will stabilise at a considerably lower level than at the moment. As presented in Chapter 4, the state pension expenditure relative to the wage sum will increase from slightly over 70 per cent in 2015 to nearly 90 per cent in the 2020s. After that the expenditure ratio will decrease to slightly over 30 per cent in 2085.

The constant contribution rate sufficient to finance all earnings-related pensions would be 28.1 per cent of the sum of all earned income. In 2015, the comparable figure was 28.5 per cent. The total contribution income, excluding the contribution to the Unemployment Insurance Fund, was 23.8 billion euros (Nyman and Kiviniemi 2016), and the sum of earned income 83.5 billion euros.

The assumptions used in the projection affect the estimated sufficient constant contribution. In particular, the assumed return on pension assets is significant for the

required contribution rate. In this report, the expected real return is assumed to be 3.0 per cent in 2017–2026 and 3.5 per cent as of 2027. If the return on pension assets was one percentage point higher, the TyEL contribution rate needed to finance the same pension expenditure would be 2.5 percentage points lower than presented. If the return was one percentage points lower, the contribution rate would need to be three percentage points higher. The range of the contribution for local government pensions is the same. A one percentage point higher return would reduce the contribution that covers all earnings-related pensions by 2 percentage points, while a lower return would raise it by 2.5 percentage points. The TyEL and JuEL local government pension contribution rates are more sensitive with respect to investment returns because the amount of TyEL and JuEL assets relative to TyEL and JuEL earnings is higher (Tables A2.1–A2.3).

Table A2.1.

Constant TyEL contribution rate, (wage sum € billion at 2015 prices; other quantities % of wage sum).

	2016	2020	2025	2030	2045	2065	2085	2100
Wage sum, € billion	53.8	55.9	62.2	68.8	90.7	122.3	164.3	203.6
Assets per 1 January	210.8	220.7	216.8	218.1	248.1	319.5	347.0	354.4
TyEL contribution rate	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7
Other contributions*	1.2	1.0	0.9	0.8	0.8	1.0	1.1	1.2
Return on investments	7.6	10.0	10.2	11.4	13.0	16.7	18.1	18.5
Pension expenditure	-26.2	-28.0	-28.0	-28.1	-26.5	-30.1	-32.4	-33.1
Operating costs	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7
Other costs**	-0.5	-0.5	-0.4	-0.3	-0.1	-0.1	-0.1	-0.1
Assets per 31 December	217.9	228.2	224.6	226.8	260.3	332.0	358.7	365.8

* Contributions to the Unemployment Insurance Fund and, until 2016, the supplementary pension provision under TEL.
** Supplementary pension provision under TEL, contribution losses, additional net expenses from TyEL-MEL pooling, and a transitory contribution to the State.

Table A2.2.

Constant JuEL local government contribution rate (wage sum € billion at 2015 prices; other quantities % of wage sum).

	2016	2020	2025	2030	2045	2065	2085	2100
Wage sum, € billion	17.0	17.5	19.4	21.6	28.0	37.0	48.9	60.6
Assets per 1 January	263.5	274.7	260.9	246.3	242.3	295.0	315.1	320.1
Contribution rate	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0
Other contributions*	1.2	1.0	0.9	0.8	0.8	1.0	1.1	1.2
Return on investments	9.5	12.4	12.3	12.8	12.7	15.4	16.4	16.7
Pension expenditure	-27.9	-31.3	-32.4	-32.4	-29.2	-31.0	-32.8	-33.2
Operating costs	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
Assets per 31 December	271.9	282.5	267.3	253.1	252.3	306.1	325.4	330.4

* Contributions to the Unemployment Insurance Fund.

Table A2.3.

Constant contribution rate for all earnings-related pensions (wage sum € billion at 2015 prices; other quantities % of wage sum).

	2016	2020	2025	2030	2045	2065	2085	2100
Sum of earned income, € billion	84.1	86.1	94.8	104.1	135.1	181.1	241.9	299.7
Assets per 1 January	214.2	218.1	203.6	192.9	195.7	251.9	274.3	279.8
Contribution rate	28.1	28.1	28.1	28.1	28.1	28.1	28.1	28.1
Other contributions*	1.0	0.9	0.8	0.6	0.7	0.8	0.9	1.0
Return on investments	7.7	9.8	9.6	10.0	10.3	13.2	14.3	14.6
Pension expenditure	-31.0	-33.3	-33.3	-32.9	-29.3	-31.5	-33.4	-34.0
Operating costs	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7
Assets per 31 December	219.3	222.8	208.1	198.0	204.8	261.8	283.5	288.8

* Contributions to the Unemployment Insurance Fund.

Appendix 3. Value of accrued pension rights

The annual earnings-related pension expenditure is composed of 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 would be enough to cover the future expenses from pensions accrued by that particular point in time.

When assessing the value of the accrued pensions, the return received on accumulated assets (the discount rate) must be taken into consideration. In addition, a line must be drawn to determine which components of future pensions are to be interpreted as having already accrued in the past and which components as something that will accrue in the future. A starting point for the following projection is a fictive situation 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, disability 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, the future disability pension expenditure is interpreted as a part of the accrued pensions to the extent that these pensions are 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 pension components for projected disability pensions starting in the future or part-time pensions starting in the future are not counted as already accrued pensions.[13]

The interest rate used to discount future pensions has a substantial impact on the value of accrued pensions. Table A3.1 presents the value of accrued pensions using a real discount rate of 3.0 per cent until 2026 and 3.5 per cent as of 2027. The interest rates correspond to the assumed long-term return of assets of the baseline projection.

The total value of earnings-related pensions accrued by the end of 2014 was 628.8 billion euros. That is nearly three times the amount of GDP in 2014 (205.4 billion euros). In 2015, pensions to the amount of 25.1 billion euros were paid.[14] New pensions accrued to the value of 17.6 billion euros. Over the year, the previously accrued pensions are nearing their time of payment, which means that their value will increase due to the interest factor

13 The last part-time pensions will begin on 1 January 2017.

14 The total earnings-related pension expenditure in 2015 was 25.4 billion euros (Table 4.4). The calculation of the accrued pension does not include the supplementary pension under TEL or farmers' special pensions, so the pension expenditure is 25.1 billion euros.

by 17.4 billion euros. By adding up the pensions that have accrued by the end of 2014, the new pensions that have accrued during the year, and the impact of the interest factor, and deducting the pensions paid during the year, we get the value of accrued pensions by the end of 2015, which is 638.7 billion euros[15]. The same result would be achieved by counting the present value of pensions accrued by the end of 2015.

Table A3.2 presents the same results as those in Table A3.1, with the exception that future pension expenditure has been discounted using a real interest rate of 2.5 per cent.

Table A3.1.

Value of accrued pensions and pension assets in 2014-2015 (with a real discount rate of 3.0 per cent until 2026 and 2.5 per cent as of 2027) (€ billion at current prices).

	TyEL	VaEL	KuEL	Private	Public	Total*
Pension assets per 31 Dec. 2014	109.6	17.6	42.3	110.8	62.6	173.4
Pension assets per 31 Dec. 2015	113.9	17.9	44.9	115.2	65.6	180.7
Sum of earned income in 2015	53.2	6.2	16.8	59.6	23.8	83.5
Pensions accrued by 31 Dec. 2014	363.4	88.7	119.6	409.9	215.9	628.8
Pensions paid in 2015	-13.7	-4.4	-4.6	-15.7	-9.3	-25.1
Pensions accrued in 2015	10.2	1.6	3.7	11.7	5.5	17.6
Interest**	10.1	2.4	3.3	11.4	6.0	17.4
Pensions accrued by 31 Dec. 2015	370.0	88.3	122.1	417.3	218.1	638.7
Funding ratio per 31 Dec. 2014	30.2	19.8	35.4	27.0	29.0	27.6
Funding ratio per 31 Dec. 2015	30.8	20.2	36.8	27.6	30.1	28.3
Accrued pensions/earned income	19.2	25.3	22.3	19.7	23.1	21.0

* Includes private and public sectors and VEKL; Supplementary pensions under TEL and special pensions under LUTUL are not included

** Nominal interest rate 2.8%, real interest rate 3.0% and inflation -0.2%.

Table A3.2.

Value of accrued pensions and pension assets in 2014-2015 (real discount rate 2.5 per cent, € billion at current prices).

	TyEL	VaEL	KuEL	Private	Public	Total*
Pension assets per 31 Dec. 2014	109.6	17.6	42.3	110.8	62.6	173.4
Pension assets per 31 Dec. 2015	113.9	17.9	44.9	115.2	65.6	180.7
Sum of earned income in 2015	53.2	6.2	16.8	59.6	23.8	83.5
Pensions accrued by 31 Dec. 2014	412.8	97.7	134.2	464.5	240.4	709.1
Pensions paid in 2015	-13.7	-4.4	-4.6	-15.7	-9.3	-25.1
Pensions accrued in 2015	12.8	1.9	4.6	14.6	6.7	21.8
Interest**	9.4	2.2	3.1	10.6	5.5	16.2
Pensions accrued by 31 Dec. 2015	421.3	97.4	137.3	474.0	243.2	721.9
Funding ratio per 31 Dec. 2014	26.6	18.0	31.5	23.8	26.0	24.4
Funding ratio per 31 Dec. 2015	27.0	18.3	32.7	24.3	27.0	25.0
Accrued pensions / earned income	24.0	30.1	27.1	24.5	27.9	26.1

* Includes private and public sectors and VEKL; Supplementary pensions under TEL and special pensions under LUTUL are not included

** Nominal interest rate 2.3%, real interest rate 2.5% and inflation -0.2%.

15 The value of the accrued pensions would be 612.6 billion euros if the real discount rate was 3.5 per cent throughout the projection period.

The funding ratio is the amount of pension assets divided by the value of accrued pensions. Also this parameter is heavily dependent on the assumed discount rate. At the end of 2015, the funding ratio for all earnings-related pensions is 28.3 per cent when calculated using a real discount rate of 3.0 per cent in the initial years and 3.5 per cent as of 2027.[16] If the real discount rate is 2.5 per cent, the funding ratio is 25.0 per cent.

The value of pension rights accrued during a year can be proportioned to the accrued sum of insured earnings. The resulting ratio can be compared with the contribution rate. In 2015, the value of accrued earnings-related pensions was 21.0 per cent relative to the sum of insured earnings when the real discount rate in the initial years is 3.0 per cent and 3.5 per cent as of 2027. If the discount rate is 2.5 per cent, the ratio is 26.1 per cent. In the public sector, and in particular in state pensions, the value of the accrued pensions relative to earnings is higher than in the private sector. The difference is due to the age and gender distribution of the labour force, as well as certain special state groups. (Tables A3.1 and A3.2.)

Table A3.3.

Accrued pensions and pension assets in 2015–2035 (real discount rate 3.0 per cent until 2026 and 3.5 per cent as of 2027, € billion at current prices).

	2015	2020	2025	2030	2035
Wage sum	53.2	59.3	71.7	86.2	103.4
Assets per 31 December	113.9	131.0	151.9	180.0	214.0
Accrued pensions per 31 Dec., year t-1	363.4	414.4	485.1	573.6	682.6
Pensions paid in year t	-13.7	-16.6	-20.0	-24.2	-28.6
Pensions accrued in year t	10.2	10.9	12.8	14.6	17.2
Interest	10.1	18.7	22.9	29.9	35.6
Accrued pensions per 31 Dec. year t	370.0	427.4	500.7	593.8	706.9
Funding rate	30.8	30.6	30.3	30.3	30.3
The ratio of unfunded pension rights per 31 Dec. / wage sum	481.4	500.2	486.7	479.9	476.5
Accrued pensions / wage sum	19.2	18.4	17.8	16.9	16.6

In Table A3.3, the development of accrued TyEL pension rights, pension assets and wage sums is presented until 2030. The future pension expenditure has been discounted with a real discount rate of 3.0 per cent until 2026 and 3.5 per cent as of 2027. Amounts at current prices. For 2015, the information is the same as in Table A3.1.

16 The funding rate for the end of 2015 would be 29.5 per cent if the real discount rate was 3.5 per cent throughout the projection period.

Appendix 4. Internal rate of return, TyEL

The allocation of pension contributions and benefits to different groups by birth cohort and gender can be analysed by estimating how large an internal rate of return the groups get 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 contribution that the Unemployment Insurance Fund credits to the earnings-related pension scheme. The calculation is based on statistics until 2013 and on the results of the projection as of 2014.

Previous assessments have been presented in Risku's report (2015), which also describes in more detail how the internal rate of return is calculated and which statistics have been used in the calculation.

The internal rate of return is the higher the earlier the generation is 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 after 1970, it will be approximately 2.2 per cent. After that, the internal rate of return will be around 2.2 per cent until the generation born in the year 2000. The lower internal rate of return for the younger generations is mainly due to the fact that earnings-related pensions are paid mainly through the PAYG system. The pension contributions paid by older generations have been lower than the current contributions.

In Risku's report, the internal rate of return of the younger generations settled at approximately 2.3 per cent. The lower growth in earnings and the slower decrease in mortality rate of the new projection have reduced the internal rate of return.

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 and most survivors' pensions are paid to women.

Figure A4.1.

Internal rate of return of pension contributions by birth year and gender.

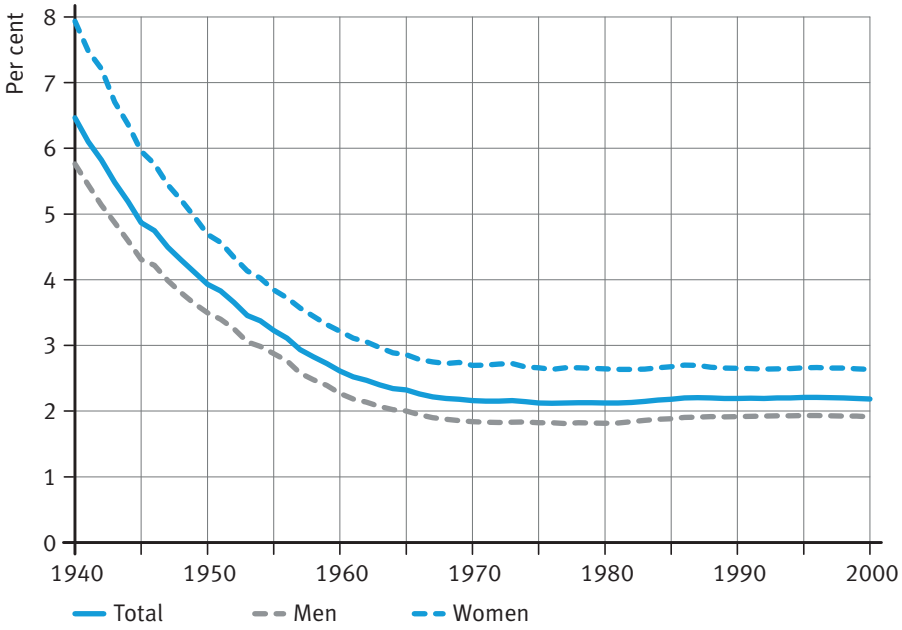


Table A4.1.

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	6.0	4.9
1950	3.5	4.7	3.9
1955	2.9	3.8	3.2
1960	2.3	3.2	2.6
1965	2.0	2.9	2.3
1970	1.8	2.7	2.2
1975	1.8	2.7	2.1
1980	1.8	2.6	2.1
1985	1.9	2.7	2.2
1990	1.9	2.6	2.2
1995	1.9	2.7	2.2
2000	1.9	2.6	2.2

Appendix 5. Earnings by age and gender in 2014

Table A5.1.

Average earnings by age and gender in 2014 (€/month).

Men

	TyEL	YEL	MYEL	VaEL	KuEL
18–19	597	749	620	297	432
20–24	1,521	1,071	1,164	1,624	1,140
25–29	2,352	1,237	1,495	2,777	2,187
30–34	3,006	1,493	1,647	3,421	2,807
35–39	3,557	1,751	1,738	3,688	3,131
40–44	3,855	1,940	1,796	4,045	3,367
45–49	3,928	2,087	1,815	4,216	3,390
50–54	3,895	2,182	1,793	4,270	3,413
55–59	3,800	2,253	1,715	4,226	3,508
60–64	3,706	2,207	1,633	4,490	3,833
65–67	3,732	2,641	1,957	5,268	3,872
18–67	3,216	1,963	1,722	3,966	3,126

Women

	TyEL	YEL	MYEL	VaEL	KuEL
18–19	478	782	409	554	770
20–24	1,127	887	949	1,353	1,564
25–29	1,722	1,003	1,337	2,229	2,089
30–34	2,086	1,206	1,388	2,641	2,174
35–39	2,446	1,369	1,453	2,829	2,430
40–44	2,790	1,568	1,535	3,268	2,724
45–49	2,917	1,735	1,544	3,558	2,742
50–54	2,920	1,856	1,464	3,583	2,784
55–59	2,784	2,035	1,385	3,611	2,782
60–64	2,689	2,041	1,337	3,694	2,824
65–67	2,421	2,732	1,739	4,147	3,044
18–67	2,255	1,663	1,444	3,379	2,543

Appendix 6. Life expectancy by age and gender

The period life expectancy is calculated using mortality rates of 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 forecast of this report, mortality decreases throughout the projection period. Consequently, period life expectancies underestimate the actual expected life spans of different generations. A more accurate estimate of the expected life span of each cohort is provided by the cohort life expectancy, which is calculated using the projected mortality rates for each cohort.

Table A6.1.

Period life expectancy in 2015–2085 by age and gender (years).

	2015	2020	2025	2030	2035	2045	2055	2065	2075	2085
Life expectancy at birth	81.3	82.3	83.3	84.2	85.1	86.7	88.1	89.4	89.9	90.5
Men	78.3	79.5	80.7	81.8	82.8	84.7	86.3	87.8	88.4	89.0
Women	84.2	85.0	85.8	86.6	87.3	88.7	89.9	91.0	91.5	91.9
Life expectancy at age 25	56.8	57.8	58.7	59.6	60.4	61.9	63.3	64.5	65.1	65.6
Men	54.0	55.1	56.2	57.2	58.1	59.9	61.5	62.9	63.6	64.2
Women	59.6	60.4	61.2	61.9	62.6	63.9	65.1	66.1	66.6	67.1
Life expectancy at age 63	21.7	22.5	23.2	23.9	24.5	25.8	26.9	27.8	28.3	28.7
Men	19.7	20.5	21.3	22.1	22.8	24.1	25.3	26.4	26.9	27.4
Women	23.5	24.2	24.9	25.6	26.2	27.3	28.3	29.2	29.6	30.0
Life expectancy at age 65	20.1	20.8	21.5	22.2	22.8	24.0	25.0	26.0	26.4	26.8
Men	18.2	19.0	19.7	20.4	21.1	22.4	23.6	24.6	25.1	25.5
Women	21.8	22.5	23.2	23.8	24.4	25.5	26.5	27.4	27.8	28.1

Table A6.2.

Cohort life expectancy in 2015–2085 by age and gender (years).

	2015	2020	2025	2030	2035	2045	2055	2065	2075	2085
Life expectancy at birth	90.3	90.6	90.9							
Men	88.7	89.1	89.5							
Women	92.0	92.3	92.5							
Life expectancy at age 25	63.8	64.3	64.7	65.1	65.4	66.0				
Men	61.9	62.5	63.0	63.4	63.9	64.6				
Women	65.9	66.2	66.6	66.9	67.1	67.6				
Life expectancy at age 63	23.8	24.5	25.2	25.9	26.4	27.4	28.1	28.6	29.0	29.4
Men	21.8	22.6	23.3	24.1	24.7	25.9	26.7	27.3	27.7	28.2
Women	25.8	26.4	27.0	27.6	28.1	29.0	29.6	30.0	30.4	30.8
Life expectancy at age 65	21.9	22.7	23.3	23.9	24.5	25.5	26.2	26.7	27.1	27.5
Men	20.0	20.8	21.5	22.2	22.8	24.0	24.8	25.3	25.8	26.2
Women	23.8	24.4	25.0	25.6	26.2	27.0	27.7	28.1	28.5	28.8

Appendix 7. Population forecast by age and gender

Table A7.1.

Population forecast for 2015–2085 by age and gender (1,000).

Men

	2015	2020	2025	2030	2035	2045	2055	2065	2075	2085
0–4	151	149	148	145	144	145	142	140	140	139
5–9	157	154	152	151	149	148	147	145	143	143
10–14	150	160	157	154	154	150	150	148	146	146
15–19	154	153	162	159	157	154	153	152	149	148
20–24	173	159	157	167	164	161	157	158	156	154
25–29	176	181	167	166	175	170	167	166	166	163
30–34	184	182	188	174	173	179	176	173	174	171
35–39	178	188	186	191	178	186	181	179	178	177
40–44	163	180	189	188	193	179	186	183	180	181
45–49	177	163	180	189	188	181	189	185	182	182
50–54	188	176	162	179	188	193	180	187	185	182
55–59	182	184	172	160	176	185	179	188	184	182
60–64	182	175	177	167	155	182	188	177	184	182
65–69	183	171	166	169	160	167	177	174	183	180
70–74	121	167	158	155	159	144	171	179	170	178
75–79	85	105	147	141	140	141	151	165	163	173
80–84	56	66	83	119	117	126	119	147	158	152
85–89	30	35	42	56	82	86	93	107	122	124
90–94	9	13	15	19	26	41	50	53	69	77
95–	1	2	3	4	5	12	15	18	23	28

Women

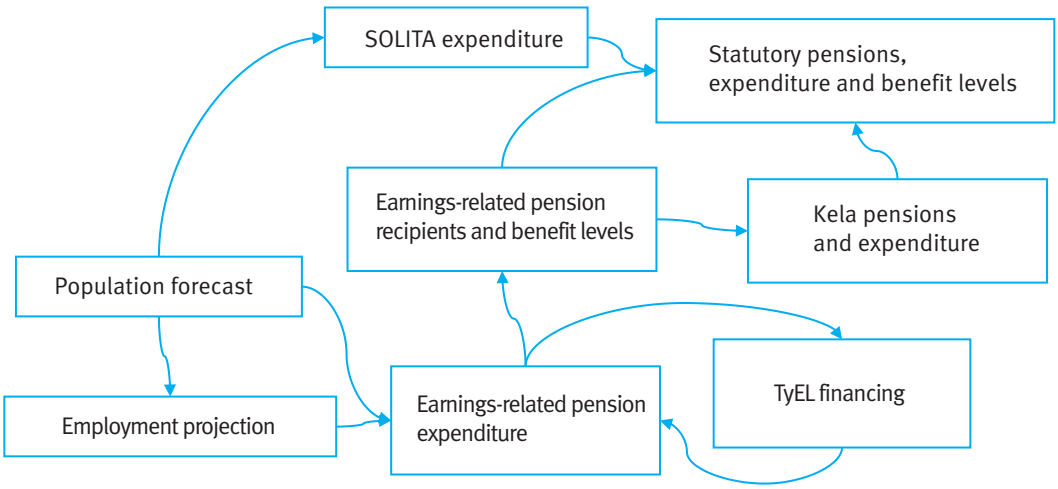
	2015	2020	2025	2030	2035	2045	2055	2065	2075	2085
0–4	145	142	142	139	138	138	136	134	134	133
5–9	150	148	145	145	142	141	140	138	137	136
10–14	144	153	150	147	147	143	144	142	140	139
15–19	147	146	155	152	150	147	146	145	143	142
20–24	166	151	150	159	156	153	149	150	148	146
25–29	167	173	159	158	166	161	158	157	157	154
30–34	173	172	178	164	163	169	166	162	163	161
35–39	168	176	175	181	167	174	170	167	166	166
40–44	155	170	178	177	183	169	174	172	168	169
45–49	173	157	172	180	179	171	178	174	171	170
50–54	186	174	157	172	180	185	171	177	174	171
55–59	186	185	173	157	172	179	172	179	175	173
60–64	190	183	182	170	155	178	183	170	176	174
65–69	198	185	178	178	167	167	175	169	176	173
70–74	140	189	178	172	173	149	172	178	167	173
75–79	112	130	177	168	164	157	159	169	164	172
80–84	88	97	114	158	152	153	136	160	168	158
85–89	64	64	73	88	124	123	124	132	144	142
90–94	28	33	34	40	51	75	83	80	99	107
95–	7	9	11	12	15	28	33	38	43	50

Appendix 8. Projection model

The results concerning employment, pension expenditure, financing and average pensions have been calculated using the long-term projection (LTP) model of the Finnish Centre for Pensions. The model simulates the Finnish pension scheme and can be used to make projections for planning and forecasting purposes. Unless otherwise stated, pension acts and other regulations governing the scheme 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 has been made using the cohort component method developed by the OECD (Burniaux et al. 2004). The model we have used is more detailed than the original in that we take into account both flows to and from the labour force. The benefit with OECD's model is that it can be used without age-specific labour force entry and exit rates. In Finland, this information can be estimated through the registers of the earnings-related pension system. Using that data makes 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 per age for men and women. The participation rates have been projected so that the latest observations on labour force participation have been projected into the future according to entry and exit rates that have been estimated based on register data. The lowering trend in the exit rates of the elderly since the 1980s has been extended in the projection until 2020.

In addition, the impact of the 2017 pension reform on the labour force participation rates of the elderly has been taken into account.

The development of the unemployment rate is based on the notion of equilibrium unemployment. When equilibrium unemployment prevails, the employee's wage demands and the firm's pricing decisions, taking into account the market conditions and production costs, are compatible with a stable rate of inflation. The level of the 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 seven per cent. In the adjustment process, the age and gender-specific unemployment rates change in such a way that, if the retirement age would remain at 63 years, an equilibrium unemployment rate would be achieved. However, the rising retirement age will increase unemployment among the elderly which, in turn, will raise the unemployment rate to slightly over eight per cent around mid-century.

The definition of being employed differs from that used in the 2013 report. In order to count a person as employed, they must not only have a valid employment relationship but also earnings at the end of the year. The previous version of the model did not have the latter requirement. Because of this, the number of employed in the source data of the new projection is 0.6 per cent smaller.

In the earnings-related pension expenditure module, the earnings-related pension expenditure is calculated separately for each pension act. The expenditure under the Public Sector Pensions Act (JuEL) is calculated separately for state employees, local government employees and other public sector 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
- 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.

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

Employed persons are those who are active or who receive a part-time pension, as well as 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 on the basis of these earnings. The unemployed are split into three different states. Those receiving an earnings-related unemployment allowance payable for 500 days are placed in the state of the unemployed. Those entitled to additional days of the earnings-related unemployment

allowance are in their own state, and the rest of the unemployed (who receive a labour market subsidy or a basic unemployment allowance) are in the inactive state. The inactive state also includes persons who transfer from work covered by the act under examination to work covered by some other act, as well as those who exit the labour force. Thus, the inactive have accrued a pension under the reviewed act but are no longer in employment covered by this act and are not drawing a pension.

New employed persons are added annually to the active state based on the population and employment forecasts. In addition, persons die over the course of the year in each state, and a part of these deaths result in the granting of a survivors' pension 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 included in the model:

- 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, when age and gender are given, a high pension is associated with low mortality.
- Pension accruals for those dying under the age of 63 are lower than for the insured on average.

The TyEL financing model is used to calculate the development of the TyEL contribution rate, technical provisions and assets. It contains a detailed description of the legislation and the actuarial principles pertaining to TyEL financing. The financing module is linked to the TyEL expenditure module via a two-way connection. The 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, a funded and a remaining 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. The technical provisions are dissolved to finance the funded components of annually paid pensions. 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 from all pension acts 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 acts. 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 forecast 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 remain unchanged.

The SOLITA module is a simplified description of the development of SOLITA expenditure based on the population forecast. The starting point for the projection is the current SOLITA expenditure, grouped by age and sex. 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 or a survivors' pension.

The projection model requires the following data for the starting year, specified by pension act as well as by the age and sex of the insured:

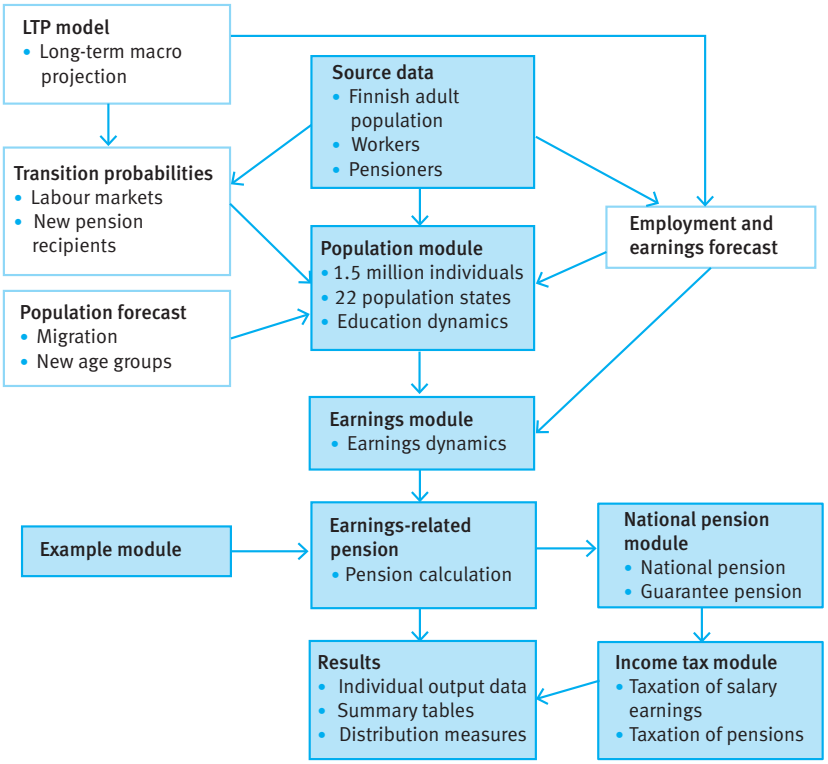
- population distribution over different acts and different states under the acts
- wages of the insured and other earnings for which a pension accrues
- amount of accrued pensions
- technical provision and the amount of pension assets
- the size of pensions in payment
- transition probabilities between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

The data used to set the initial values for the projection come from the Finnish Centre for Pensions' employment and pension registers, the earnings and accrual register, the joint statistics of Kela and the Finnish Centre for Pensions, as well as from Keva.

Appendix 9. ELSI microsimulation model

ELSI is a longitudinal microsimulation model with dynamic aging. It has a modular structure. The model includes modules for the source data, population, earnings, earnings-related pensions, national 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 population of Finland. The source data includes a sample of 1,500,000 persons (32%) of the adult population with social security insurance in 2012. The source data has been compiled from the registers of the earnings-related pension scheme. The data has been supplemented with Statistics Finland's statistics on educational levels.

In the model, the individuals transfer from one population status to another based on transition probabilities by status, 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, upper secondary education, post-secondary non-tertiary education and higher academic 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 transfer to retirement in the simulation, their earnings-related pension is calculated based on a 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 have been done based on TyEL.

Based on the projected earnings-related pension, a national or a guarantee pension is calculated for the individual. Survivors' pensions are not projected 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.

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, the key figures 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 key results of the ELSI model have been aligned to be compatible with the results of the LTP model. For a more detailed description of the ELSI model, see Tikanmäki et al. 2014 and Sihvonen 2015.

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

02
2017

FINNISH CENTRE FOR PENSIONS,
REPORTS

Statutory pensions in Finland – Long-term projections 2016

The report presents the Finnish Centre for Pensions' long-term projections regarding the development of statutory pensions from 2016 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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