Statutory pensions in Finland – long-term projections 2011

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ELÄKETURVAKESKUS

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TO THE READER

Statutory pensions in Finland include earnings-related and national pensions, the guarantee pension, as well as military accident, motor liability and workers' compensation pensions. This report presents projections of the long-term development of statutory pensions for the years 2011–2080.

The previous corresponding report of the Finnish Centre for Pensions was published in 2009[1]. As a result of the 2008 financial crisis, the economy's expectations for the next few years were cautious. Contrary to expectations, the investment returns developed favourably and the retirement rate decreased in 2009 and 2010. However, the crisis that began in 2008 is far from over. The economic outlook remains uncertain and, during the autumn of 2011, the expectations for the future became increasingly pessimistic.

The projections presented in this report have been calculated using the long-term projection model of the Finnish Centre for Pensions. The projections are presented in a new way which offers more detailed information for the reader about the assumptions and the results. Sergei Lahti prepared the population projection and the life expectancy coefficient calculation. Risto Vaittinen compiled the employment forecast, Tapio Klaavo the national pension projections and Ismo Risku the earnings-related pension projections. Hannu Sihvonen and Tapio Klaavo were responsible for the compiling and editing of the register data used in the projections. Kalle Elo prepared the near-future economic forecast and the projection on the required period of work to compensate the effects of the life expectancy coefficient. Ismo Risku wrote the report in Finnish. Suvi Pohjoisaho prepared the publication for printing. The report was translated into English by Lena Koski in cooperation with the authors and Mikko Sankala. We also wish to thank Mikko Sankala, Christina Lindell, Hannu Uusitalo, and Mikko Kautto for their invaluable advice and comments on the original manuscript.

Helsinki -- May 2012

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ABSTRACT

This report presents projections of the development of statutory pension expenditure and the average benefit level, as well as of the financing of private-sector earnings-related pensions from 2011 to 2080.

The population of Finland will increase throughout the projection period, mainly because the number of persons aged 65 years and above constantly grows. By 2080, the old-age dependency ratio (the ratio of 65-year-olds to 15–64-year-olds) will double from the current level of 26.5 per cent. The change will occur most rapidly between the years 2010–2030.

The earnings-related pension expenditure for the whole economy was 25.6 per cent of the wage sum in 2010. The expenditure ratio will continue to grow until 2030, when it will be 34 per cent. From then on, it will decrease to approximately 31 per cent of the wage sum.

Total statutory pension expenditure corresponded to 12.5 per cent of GDP in 2010. At its highest, the share is projected to increase to 15.5 per cent in the 2030s, after which it will decrease to an ample 14 per cent as of the late 2040s.

Over the projection period, the purchasing power of the average pension will more than double. However, relative to the average wage, the pension level will begin to decrease at the end of the 2010s. The most important reason for this decline is an extended life expectancy and the life expectancy coefficient, which adjusts the benefit level to correspond to changes in life expectancy.

The contribution rate under the Employees Pensions Act (TyEL contribution) will rise from the current level of 21 per cent to approximately 25 per cent during the current decade. As of the 2030s, the contribution rate will settle at an ample 26 per cent.

The effect of various assumptions on the results can be examined with sensitivity analyses. By combining optimistic and pessimistic assumptions with respect to retirement rates, growth in earnings and the return on pension assets, an optimistic and a pessimistic scenario can be drawn up. In the optimistic scenario, long-term statutory pension expenditure will stabilise at 13 per cent of GDP, while the equivalent figure in the pessimistic scenario is approximately 15.5 per cent. Respectively, the long-term range of the TyEL contribution will be 23–30 per cent of the wage sum.

ABSTRAKTI

Raportti sisältää laskelmat lakisääteisen eläkemenon ja keskimääräisen etuustason kehityksestä sekä yksityisalojen työeläkkeiden rahoituksesta vuoteen 2080.

Suomen väestön määrä kasvaa koko ennustekauden ajan pääosin siksi, että 65 vuotta täyttäneiden määrä kasvaa jatkuvasti. Vanhushuoltosuhde (65 täyttäneet suhteessa 15–64 -vuotiaisiin) kaksinkertaistuu vuoden 2010 tasosta (26,5 %) vuoteen 2080 mennessä. Muutos on nopeinta vuosina 2010–2030.

Vuonna 2010 koko talouden työeläkemenot olivat 25,6 prosenttia työtulosummasta. Suhde kasvaa vuoteen 2030 saakka, jolloin se on 34 prosenttia. Tämän jälkeen menot alenevat noin 31 prosenttiin työtulosummasta.

Lakisääteiset kokonaiseläkemenot olivat vuonna 2010 12,5 prosenttia bruttokansantuotteesta. Korkeimmillaan osuus nousee 15,5 prosenttiin 2030-luvulla. Osuus alenee tämän jälkeen ollen 2040-luvun loppupuolelta lähtien runsas 14 prosenttia.

Laskentajakson aikana keskimääräisen eläkkeen ostovoima yli kaksinkertaistuu. Suhteessa yleiseen ansiotasoon eläkkeiden taso kääntyy kuitenkin laskuun 2010-luvun lopulla. Tärkein syy suhteellisen eläketason alenemiselle on pidentyvä elinajanodote ja elinaikakerroin, joka sopeuttaa etuustason vastaamaan muutoksia elinajanodotteessa.

TyEL-maksu nousee vuoden 2010 runsaasta 21 prosentista noin 25 prosenttiin kuluvan vuosikymmenen aikana. 2030-luvulta eteenpäin maksu asettuu runsaaseen 26 prosenttiin.

Herkkyyslaskelmien avulla voidaan tutkia eri oletusten vaikusta tuloksiin. Yhdistämällä eläkealkavuuksia, ansiotason kasvua ja sijoitustuottoa koskevat optimistiset ja pessimistiset oletukset luodaan optimistinen ja pessimistinen skenaario. Optimistisessa skenaariossa lakisääteiset eläkemenot asettuvat pitkällä aikavälillä 13 prosenttiin BKT:sta ja pessimistisessä skenaariossa noin 15,5 prosenttiin. Vastaavasti TyEL-maksun vaihteluväliksi pitkällä aikavälillä muodostuu 23–30 prosenttia palkkasummasta.

EXECUTIVE SUMMARY

This report presents the long-term projections of the Finnish Centre for Pensions for 2011 regarding the development of statutory pension expenditure and the average benefit level. Regarding the earnings-related pensions acts of the private sector, the report also contains financing projections in which the main results are the development of the TyEL contribution and assets.

The demographic development follows Statistics Finland's 2009 population projection, taking into account the demographic development realized by the end of 2010. The annual changes in mortality, birth rate and migration levels are equal to those in the 2009 projection published by Statistics Finland.

According to the projection, the population growth in Finland is set to continue. By the end of 2010, the population numbered 5.38 million and is projected to grow to 6.4 million by 2080. The population growth is mainly due to the rise in the number of persons aged 65 and above. The working-age population will decrease until the 2030s, after which it will begin to increase again. In 2010 and 2080, the working-age population (15–64-year-olds) will be equally large, amounting to 3.55 million.

The old-age dependency ratio (the ratio of 65-year-olds to 15–64-year-olds) will continue to grow until 2080. The change will be most rapid between 2010 and 2030. In 2010, the old-age dependency ratio was 26.5 per cent. It is projected to rise to 54 per cent in 2080. The constant weakening of the old-age dependency ratio is a consequence of the constantly extending life expectancy. According to the projection, the life expectancy of the newly born will rise from 80 years observed in 2010 to nearly 91 years in 2080.

In 2010, the employment rate was just short of 68 per cent. By 2020, it is expected to increase slightly, settling at approximately 71 per cent from 2020 onwards. The growth in employment is due to an increase in the labour force participation rate, a decrease in unemployment and a rise in the effective retirement age. The expected effective retirement age is projected to rise from the current level of 60.4 years to 61.2 years in 2025 and 62.1 years in 2080. In the baseline projection, the annual growth rate of the earnings level is 1.6 per cent, while the average annual real return on pension assets is 3.5 per cent.

Using the life expectancy coefficient, the amount of the old-age pension is adjusted to the change in life expectancy for those over 62 years. In 2025, the life expectancy coefficient is 0.91, and in 2080 it is 0.75.

In 2010, the earnings-related pension expenditure for the whole economy was 25.6 per cent in relation to the wage sum. The growth in pension expenditure ratio will continue until 2030, when the earnings-related pension expenditure will account for 34 per cent of the wage sum. After that, the pension expenditure ratio will decrease and account for approximately 31 per cent of the wage sum as of the year 2050. The increase in pension expenditure is a consequence of the growth in old-age pension expenditure. Total statutory pension expenditure corresponded to 12.5 per cent of GDP in 2010. At its highest, the share is projected to increase to approximately 15 per cent in the 2030s. Towards the end of the 2040s, the share will stabilize at slightly less than 14 per cent.

Over the projection period, the purchasing power of the average pension will increase from EUR 1,370 to EUR 3,300. Relative to the average wage, the average pension will increase slightly in the next few years due to the maturing of the earnings-related pension scheme. However, the relative pension level will begin to decrease towards the end of the 2010s. The most important reason for this decline is an extended life expectancy and the life expectancy coefficient, which adjusts the benefit level to correspond to changes in life expectancy.

The TyEL contribution will rise from the current level of 21 per cent to approximately 25 per cent during the ongoing decade. Following this, the pension contribution rate will have to be increased to 26–27 per cent as of the 2030s. The rising contribution rate is a result of the increase in pension expenditure. During the next 20 years, the TyEL expenditure is projected to grow by 8 percentage points in relation to the wage sum, while the contribution rate will increase by approximately 5 percentage points.

A sufficient constant level for the TyEL contribution from the beginning of 2012 would be 25.9 per cent. This contribution rate would be sufficient to ensure a stable financing of the foreseeable pension expenditure.

The sensitivity of the baseline projection in relation to essential assumptions is examined in this report.

An *increase of the effective retirement age* to 62.4 years by 2025 would reduce the pension expenditure ratio of GDP by approximately half a percentage point. Simultaneously, the pension level in relation to the average earnings of the economy would increase by nearly one percentage point. The need to raise the TyEL contribution rate would be reduced by roughly one percentage point.

If the *old-age retirement rates and disability incidence rates* remained at the level observed in 2010, it would mean that the pension expenditure in relation to GDP would exceed the baseline projection by 0.4 percentage points in 2025. At the same time, the pension level would remain lower than in the baseline projection. The TyEL contribution should be raised by approximately 0.6 percentage points above the baseline projection.

In the long term, an increase in the *earnings level growth* by half a percentage point would decrease the pension expenditure in relation to GDP by 0.7 percentage points. The purchasing power of pensions would grow significantly, but in the long term, the ratio of pensions to average earnings would decrease by roughly 2.5 percentage points. The TyEL contribution would increase in the long term by approximately 0.8 percentage points.

According to the principles of the defined benefit scheme, the *return on pension assets* mainly affects the contribution rate. A one-percentage-point increase in investment returns would reduce the TyEL contribution rate by approximately two percentage points, since the amount of pension funds is roughly double in relation to the wage sum during the projection period.

By combining the optimistic and pessimistic projections of the sensitivity analyses described above, *an optimistic and a pessimistic scenario* is drawn up. In the optimistic scenario, long-term statutory pension expenditure will stabilise at 13 per cent of GDP, while the equivalent figure in the pessimistic scenario is approximately 15.5 per cent. Respectively, the long-term range of the TyEL contribution would be 23–30 per cent of the wage sum.

The near-future economic development will determine how rapidly the pension expenditure in relation to the wage sum will grow and how quickly the TyEL contribution must be increased. However, conventional economic fluctuations have no impact on long-term development tendencies. In the alternative projection, which describes a weaker near-future economic development than that presented in the baseline projection, the wage sum and GDP would shrink from the 2011 level by approximately 2.5 per cent by 2013. The production level of 2011 would be achieved again in 2015. The return on investments in 2011 and 2012 would fall by three percentage points compared to the baseline projection. The pension expenditure in relation to GDP would grow at most by approximately one percentage point more than in the baseline projection. The TyEL contribution would react to the recession with a delay since the contribution level is fixed until the year 2014. On average, during 2016–2030, the TyEL contribution would exceed the baseline projection level by approximately one percentage point.

Abbreviations and key terms

The major pension acts in force (on 1 Jan. 2011)

KEL	National Pensions Act
KiEL	Evangelical-Lutheran Church Pensions Act
KuEL	Local Government Pensions Act
MEL	Seafarer's Pensions Act
MYEL	Farmers' Pensions Act
TEL-L	Act on supplementary pension provision under the Employees Pensions Act
TyEL	Employees Pensions Act (as of 2007, when TEL, LEL and TaEL were combined into this one single act)
VaEL	State 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

LEL	Temporary Employees' Pension Act (in force prior to 2007)
LUTUL	Act on Farmers' Early Retirement Aid
LVL	Motor Liability Insurance Act
PEL	Survivors' Pensions Act (in force prior to 2008)
REL	Front-Veterans' Pensions Act
SOLITA	Pensions paid based on SoVL, SotapL, LVL and TapVakL
SotapL	Compensation for Military Injuries Act
SoVL	Military Injuries Act
SpVL	Change of Generations Pensions Act
TaEL	Pensions Act for Performing Artists and Certain Groups of Employees (in force prior to 2007)
TapVakL	Workers' Compensation Insurance Act
TEL	Employees' Pensions Act (in force prior to 2007)

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 divided 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 employer and employee divided by insured earnings.
PAYGO	Pay-as-you-go
expected effective retirement age	The expected age of retirement. The expectation is calculated analogously to the life expectancy.

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1   Introduction

This report presents the Finnish Centre for Pensions' long-term projections for the development of statutory pension schemes for the period 2011–2080. The previous report was published in the autumn of 2009, and the following report is scheduled to be published in 2013.

Statutory pensions under review are earnings-related pensions, national pensions and the guarantee pension, as well as pensions paid based on the Military Injuries Act, the Compensation for Military Injuries Act, the Motor Liability Insurance Act and the Workers' Compensation Insurance Act (SOLITA pensions). Earnings-related pension insurance covers nearly all earnings from work of employed wage and salary earners and the self-employed. Earnings-related pensions serve to ensure that the insured and his family receive a reasonable income in relation to income earned while working in the event of old age, incapacity for work, or death. National pensions and the guarantee pension provide all citizens with a minimum income in the event of old age or incapacity for work. SOLITA pensions provide benefits in the event of certain special risks. In 2010, the statutory pension expenditure was EUR 22.5 billion, of which 87 per cent was earnings-related pensions and 11 per cent national pensions.

The projections describe the development of statutory pensions in accordance with current legislation, secondary regulations and current procedures. The main focus of the report is on projections for earnings-related pensions. Key results include developments in pension expenditure, the average pension level and the financing of private-sector earnings-related pensions. Descriptions of economic behaviour, e.g. the growth in earnings level and return on investments, constitute assumptions rather than results in the report.

The most essential legislative change since the publication of the previous report (in 2009) was the introduction of the guarantee pension in March 2011.

The economic growth, the development of employment and the pension providers' investment returns were more favourable in 2009 and 2010 than assumed in the 2009 report. The realised favourable investment returns were partly due to declining interest rates. However, the currently low interest rates indicate low return and growth expectations. These are reflected in the assumptions selected in this report.

To support the compilation of the assumptions, the Finnish Centre for Pensions arranged a seminar on 13 June 2011 in which the development of the future earnings level, employment, and investment return expectations were assessed. The speakers and participants represented pension providers, economic research institutions and ministries. The presented views differed partly from each other but, in general, future economic growth and investment return were seen as lower than in previous projections. By nature, the seminar was a forum for discussion. The compilers of the report at hand have selected and account for the assessments used.

The pension expenditure projections are based on Statistics Finland's 2009 population projection but take into account the population and mortality rates observed at the end of 2010. The annual changes in birth, mortality and migration rate assumptions during

the projection period are the same as in the 2009 population projection. In other words, the demographic trends remain unchanged compared to the population projection of the previous report, but the population and mortality rates have been updated to correspond to current available observations.

The content of the report is as follows: Chapter 2 contains the key assumptions and results, as well as a comparison to the 2009 report. Chapter 3 describes the key features of Finnish pension legislation. The assumptions of the baseline projection are presented in Chapter 4, followed by the results in Chapter 5. The sensitivity of the results with respect to various assumptions is examined in Chapter 6. The appendices include supplementing and alternative projections of pension expenditure and pension financing. The appendices also include more detailed information on the population projection and the earnings of the insured, as well as a calculation of the required prolongment of the working career to compensate for the life expectancy coefficient.

This report has been compiled in applicable parts according to the *International Actuarial Association Guidelines of Actuarial Practice for Social Security Programs* adopted by the IAA in 2002.

2   Key results and comparison with previous report

Legislation and assumptions

The pension legislation concerning disability, survivors' and part-time pensions was amended as of the beginning of 2010. The decision to implement the amendments was made in 2009, and the amendments were taken into account already in the 2009 report.

The act on the guarantee pension came into force in March 2011, raising the lowest pensions to a level of EUR 688 per month. The guarantee pension amount is reduced in full by all statutory pensions paid from Finland and corresponding benefits paid from abroad. The guarantee pension was not included in the 2009 report.

The national pension and guarantee pension index follows only consumer prices, which means that, along with economic growth, its impact would be insignificant in time. However, the national and the guarantee pensions will probably be increased through legislative amendments. In the projections, adverse increases to benefits have been forecasted by linking the national and the guarantee pension to changes in earnings level as of 2016. Until 2015, these benefits follow consumer prices.[2]

The population projection is an updated version of the population projection of the 2009 report. The starting year is 2010. The annual changes in birth, migration and mortality rate assumptions are the same as in the 2009 population projections. The most significant change in the population projections is the mortality rate level in 2010 (Table 2.1). In 2009 and 2010, the life expectancy of the population grew less than projected. The realised development also affects the life-expectancy coefficient. The new life expectancy coefficient projection is slightly higher, but the development trends are almost identical (Figure 2.1).

Finland's population grows constantly, from 5.38 million at the end of 2010 to 6.4 million by 2080. The population growth is mainly due to the rise in the number of persons aged 65 and above. The working-age population (15–64-year-olds) will decrease until the 2030s, after which it will begin to increase. In 2010 and 2080, the working-age population will be equally large, amounting to 3.55 million. The old-age dependency ratio, i.e. the ratio of persons aged 65 and above to 15–64-year olds, will grow from 26.5 per cent in 2010 to approximately 41 per cent in 2025. The population's ageing will continue until 2080, when the old-age dependency ratio is projected to be 54 per cent.

The near-future economic development will follow the economic forecast compiled by the Finnish Centre for Pensions at the end of August 2011. The employment rate will continuously increase from 67.8 per cent in 2010 to 70.5 per cent in 2015. Correspondingly, the unemployment rate will decrease from 8.5 per cent to 7.2 per cent. During 2011, the economic outlook has weakened. The report includes an alternative projection in case of a weaker economic development than that presented in the baseline projection.

In the long term, the key assumptions of economic development include growth of earnings level, return on pension assets, employment and retirement rate (Table 2.1). In the

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2   Were the national and the guarantee pension to follow consumer prices, their combined share of GDP would be reduced from 1.4 per cent in 2010 to 0.3 per cent in 2080 (Appendix 1).

baseline projection, the annual real growth rate of the earnings level is 1.6 per cent, while the average annual real return on pension assets is 3.5 per cent. The equivalent assumptions in the 2009 report were 1.75 and 4.0 per cent. The assumptions reflect the notion of a slightly waning economic growth. The low interest level lies behind the reduction of the assumed return on pension assets, while the risk premium related to risk-bearing assets or the assumption regarding the investment allocation have not been changed significantly.

The long-term assumptions concerning the effective retirement age remain essentially unchanged compared to the 2009 report. For the near future, the 2009 report projected that the weak employment development, in terms of the economic situation, would put a damper on the rise of the retirement age. Observations of this development trend were available at the beginning of 2009, but after this, the retirement rates decreased. In 2010, the effective retirement age was 60.4 years instead of the projected 59.5 years. The employment rate in 2010 was slightly higher than projected.

Table 2.1.

Summary of the long-term projection assumptions in 2011 and 2009.

	2011 projection			2009 projection		
	2010*	2025	2075	2010	2025	2075
Population						
Total fertility rate	1.87	1.85	1.85	1.85	1.85	1.85
Net migration rate (1,000)	13.7	15	15	15	15	15
Life expectancy, 63-year-olds	21.0	23.7	29.3	21.4	24.0	29.5
Old-age dependency ratio**	0.27	0.41	0.53	0.27	0.42	0.53
Economy						
Employment rate (%)	67.8	71.2	71.3	66.9	70.8	71.0
Expected effective retirement age	60.4	61.2	62.1	59.5	61.0	61.9
Real growth rate of income level (%)	1.4	1.6	1.6	1.3	1.75	1.75
Real rate of return on investments (%)	9.4	3.5	3.5	3.4	4.0	4.0

* Realised value.
** Proportion of those who have turned 65 in relation to those aged 15–64 years.

Results

As employment was reduced, the ratio of the total earnings-related pension expenditure in relation to the total earnings sum grew rapidly in 2009 and 2010. The growth in the pension expenditure ratio will continue until 2030, after which the pension expenditure ratio will decrease by approximately 3 percentage points by the end of the projection period. The increase in the expenditure ratio is a consequence of the growth in old-age pension expenditure. The later decrease in the expenditure ratio is due to the impact of the life expectancy coefficient and previous legislative amendments that have reduced, in particular, the public-sector pension accruals. The expenditure ratio is reduced also because the workforce will grow as of the 2030s.

Total statutory pension expenditure amounted to 11 per cent of GDP in 2000–2008. The rapid economic growth assisted in keeping the expenditure ratio stable. Due to the recession, the share of pension expenditure in GDP increased to 12.5 per cent in 2010. As the population ages, the share of pension expenditure in GDP will grow until the early 2030s, when it will amount to an ample 15 per cent of GDP. During the next two decades after that, the share of pension expenditure in GDP will be reduced by an ample percentage point.

The share of pension expenditure in GDP will develop in a very similar manner according to the 2009 and 2011 projections. The major differences lie at the beginning and end of the projection periods: according to the new projection, the share of pension expenditure in GDP is 0.5 percentage points lower in the 2011 than in the 2009 projection. In 2075, it will be 0.4 percentage points higher. In the new projection, the long-term economic growth is slower as labour productivity and the real income level will grow by 1.6 per cent. The equivalent growth rate in the 2009 projection was 1.75 per cent. This change will increase the share of pension expenditure in GDP. On the other hand, the employment rate and the expected effective retirement age are higher in the 2011 projection, thus reducing the share of pension expenditure in GDP.

Average pension

In 2010, the average pension of persons resident in Finland and receiving a pension in their own right was EUR 1,370/month. By 2025, the average pension, at 2010 prices, will rise to EUR 1,730/month, and by 2080 to EUR 3,300/month. The purchasing power of pensions will increase since the earnings-related pension is determined on the basis of the insured's earned income from work. In relation to the average wage, the average pension will increase slightly as the earnings-related pension scheme matures. Starting pensions are based on the complete working career. In contrast, terminating pensions are based on an incomplete working career since the careers started before the pension acts came into force. However, the life expectancy coefficient will reduce the size of the starting pensions. The reduction of public-sector accrual rates in the 1990s and the increasing impact of the employee's pension contribution will also reduce pension levels.

The average pension in relation to the average wage develops in the same direction in the 2011 and 2009 projections. The difference in the starting level (3.1 percentage points in 2010) is mainly due to a change in the method used to calculate the average earnings.[3] In the long term, the relation of pensions to the earnings level will be reduced in the 2011 projection at a lower pace than in the 2009 projection because the growth rate of the earnings-level is lower. The slightly higher employment rate, the life expectancy coefficient and the expected effective retirement age will have a similar impact.

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3   The fact that one person may be insured under several pension acts at the same time was not taken into consideration in the 2009 projection. In the 2011 calculations, any overlaps have been removed, which results in a higher calculatory average earning. This reduces the number of employed people by approximately 5 per cent (Table 4.4), which means that the impact in relation to the benefit level is approximately 2.5 percentage points.

Figure 2.1.
Life expectancy coefficient for 63-year-olds 2010–2080.
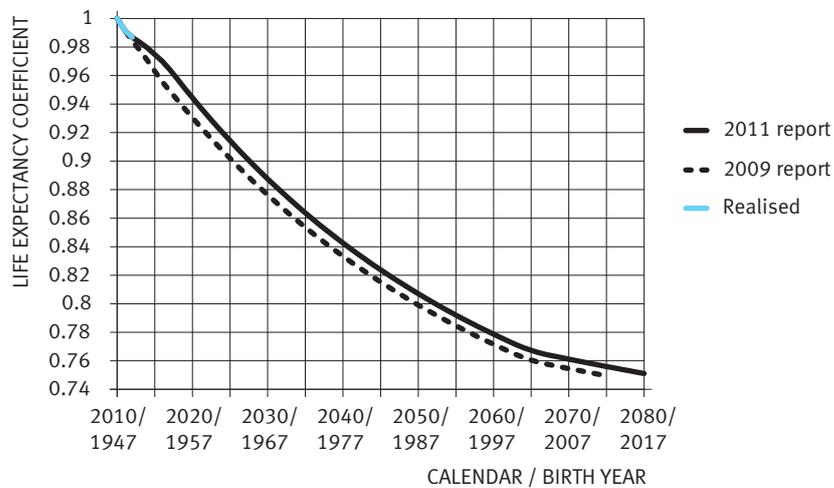
Figure 2.2.
Total statutory earnings-related pension expenditure 2000–2080, per cent of GDP.
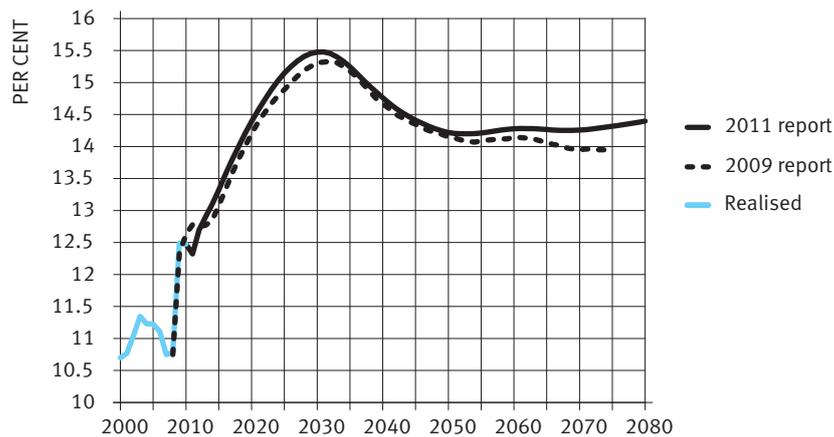
Figure 2.3.
Average pension 2000–2080, per cent of average wage. (The difference in the 2010 levels are related to the calculation of the average wage, see footnote 3).
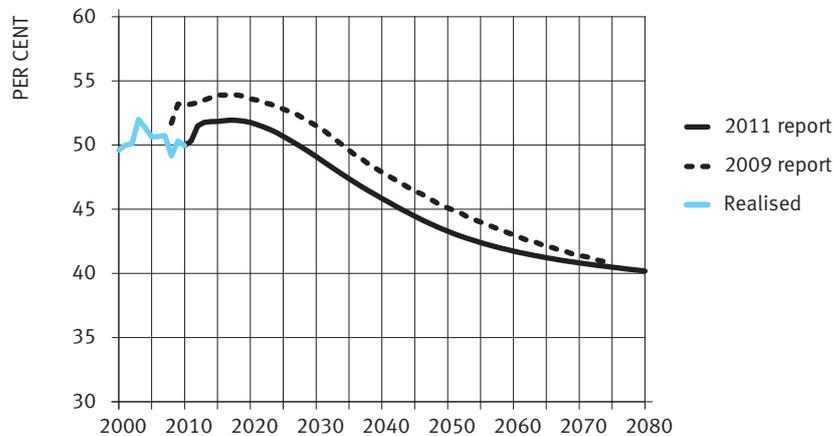
TyEL expenditure, contribution and assets

Due to the recession, the TyEL pension expenditure ratio rose rapidly in 2009 and 2010. Due to the ageing of the population, the expenditure ratio will continue to grow until the early 2030s, when the TyEL expenditure will amount to nearly 30 per cent of the wage sum. Although the ageing of the population will continue after the 2030s, the expenditure ratio will no longer rise. On the one hand, the life expectancy coefficient will eliminate the effects of the expenditure relating to the ageing of the population in so far as the ageing is due to the increase in life expectancy. On the other hand, the size of the work force will grow slowly from the 2030s towards the end of the projection period.

The difference in the TyEL expenditure ratio between the 2011 and the 2009 projections is comparatively minor (Figure 2.4). The rate will be at its highest in 2011: in 2009, the level was projected at 23.0 per cent, while it is 21.7 per cent in the 2011 projection. For 2025 and 2075, the most recent projection foresees an expenditure ratio that exceeds the one in the 2009 projection by 0.6 percentage points. Lowering the expected growth rate of the earnings-level from 1.75 per cent to 1.6 per cent will raise the TyEL expenditure ratio by 0.6 percentage points (Chapter 6). On the other hand, a higher employment rate and a lower retirement rate will reduce the pension expenditure ratio.

The TyEL contribution in relation to the wage sum will increase from 21.4 per cent in 2010 to an ample 26 per cent in the 2020s. No essential changes in the contribution level will take place after that.

Compared to the 2009 report, the contribution level is lower at the end of the 2010s and in the 2020s in the new projection. As of the 2030s, the contribution level in the 2011 projection is higher. Up to 2014, there are only minor differences in the contribution development as the central labour market organisations decided in 2009 on the main principles of the TyEL contribution until the year 2014. However, the realized client bonus level may affect the final contribution level also in the next few years.

The realised return on investments and differences in the investment return account for the main differences in wage sum shares of the contributions and assets in the 2009 and 2011 projections. The realised return in 2009 and 2010 clearly exceeded the assumed return level presented in the 2009 projection. However, the return level as of 2011 will remain lower than presented in the 2009 projection. The real long-term return assumption in the 2009 projection was 4.0 per cent, while it is 3.5 per cent in the 2011 projection (Table 2.2, Figures 2.5 and 2.6).

Table 2.2.

Real return on investments of pension assets (TyEL) in 2009 and 2010 and the assumptions in the 2009 and 2011 reports, per cent.

Year	2009	2010	2011	2012	2013	2014	2015	2016->
Realised	13.9	9.4						
2011 report			-6.7	3.5	3.5	3.5	3.5	3.5
2009 report	6.5	3.4	3.5	3.6	3.7	3.8	3.9	4.0

A sufficient constant level for the TyEL contribution from the beginning of 2012 from the point of view of financing future pension expenditure would be 25.9 per cent. Compared to

the average contribution level realised in 2010 (21.4 per cent), the immediately required raise of the contribution level would be 4.5 percentage points. According to the 2009 projection, a sufficient contribution level from the year 2010 onwards would have been 25.4 per cent.

Figure 2.4.
TyEL/TEL, LEL and TaEL expenditure 2000-2080, per cent of wage sum.
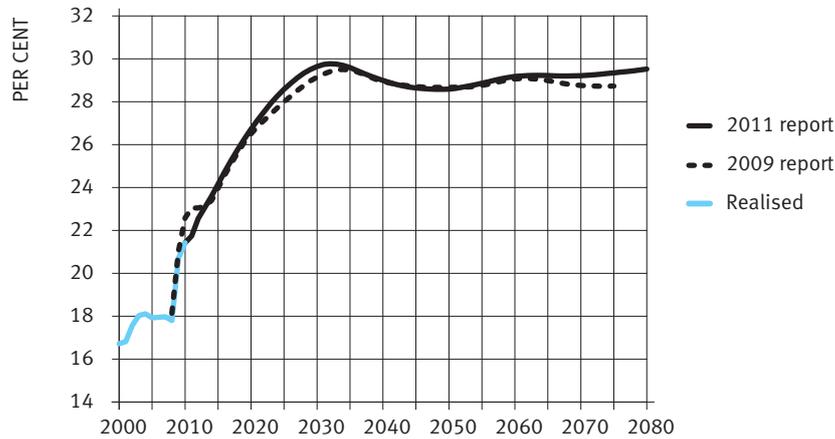
Figure 2.5.
TyEL/TEL contribution 2000-2080, per cent of wage sum.
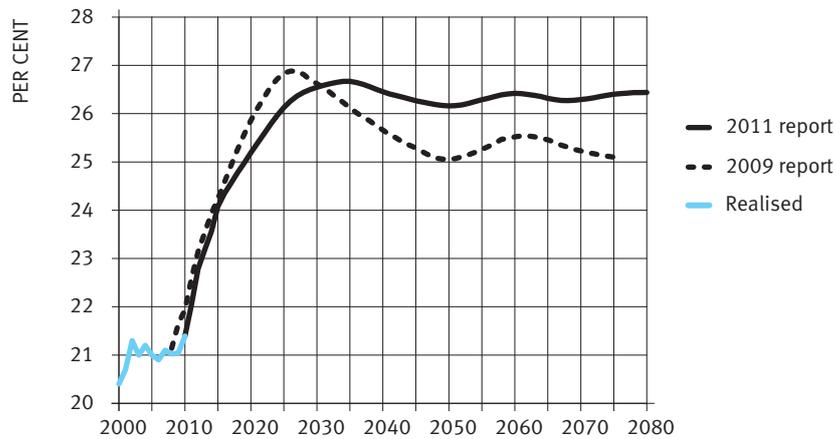
Figure 2.6.
TyEL/TEL assets 2000-2080, per cent of wage sum.
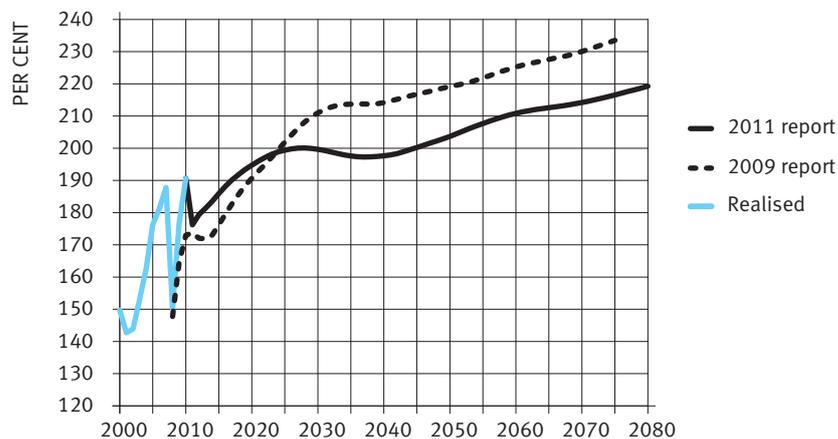
3 Statutory pension benefits and pension financing

3.1 Pension acts included in the report

The earnings-related pension scheme consists of several pension acts, which together cover the different sectors of the economy. In practice, all work carried out by wage and salary earners or self-employed citizens between 18 and 67 years of age is insured under one of the pension acts. The national pension and the guarantee pension, which came into force in March 2011, guarantee an income for the pensioner if the earnings-related pension is small. The following earnings-related pension acts are included in the projections.

Private sector acts:
1. Employees Pensions Act (TyEL)
2. Seafarer's Pensions Act (MEL)
3. Self-Employed Persons' Pensions Act (YEL)
4. Farmers' Pensions Act (MYEL)
5. Act on Farmers' Early Retirement Aid (LUTUL) and the Change of Generations Pensions Act (SpVL)
6. Act on supplementary pension provision under the Employees Pensions Act (TEL-L)

Public-sector pension acts and regulations:
1. State Employees' Pensions Act (VaEL)
2. Local Government Pensions Act (KuEL)
3. Evangelical-Lutheran Church Pensions Act (KiEL)
4. Pension regulations for the employees and officials of the Social Insurance Institution of Finland, the Bank of Finland and the regional government of Åland.

The projections also include the Act on Compensation for Pension Accrual from State Funds for Periods of Childcare and Periods of Study (VEKL). However, the pension expenditure under this act is not part of the private- or public sector pension expenditure. Instead, the VEKL expenditure is incorporated in the earnings-related pension expenditure for the entire economy.

For private-sector pension acts TyEL, YEL and MYEL, both expenditure and financing projections are provided, whereas only the expenditure projection is provided for public-sector pension acts.

Earnings-related pensions are based on the defined benefit principle. In other words, the size of pension expenditure determines the contribution level and the need for other financing. Therefore, an investigation of pension expenditures is followed by an examination of the financing of these expenditures.

The national pension and guarantee pension projections are combined and include benefits under the following acts:
1. National Pensions Act (KEL)

2. Front-Veterans' Pensions Act (REL)
3. Act on Guarantee Pensions.

The Survivors' Pensions Act (PEL), which was included in the national pension insurance, was abolished as of the beginning of 2008, and the equivalent benefits were incorporated into the National Pensions Act.

Statutory pensions or life annuities may also be based on the following acts:
1. Motor Liability Insurance Act (LVL)
2. Workers' Compensation Insurance Act (TapVakL)
3. Military Injuries Act (SoVL), and
4. Compensation for Military Injuries Act (SotapL).

These four so-called SOLITA pensions have been included in this projection only in general terms.

3.2 Determination and types of benefits

Earnings-related pension

Earnings-related pension accrues from wage and salary income earned between the ages of 18 and 67 in accordance with the accrual rate shown in Table 3.1. Persons under the age of 18 and persons aged 68 or above do not accrue a pension, nor do they fall under the insurance obligation. Apart from under the Seafarer's Pensions Act, for wage and salary earners the income that accrues a pension equals the salary from which the employee's pension contribution has been deducted. For the self-employed, farmers and seafarers, pension is accrued from the total sum of insured income.

Table 3.1.
Earnings-related pension accrual rates.

Basis for accrual	Accrual rate
Earnings, 18–52-year-olds	1.5
Earnings, 53–62-year-olds	1.9
Earnings, 63–67-year-olds	4.5
Earnings, employment during retirement	1.5
Earnings for projected pensionable service*	1.5
Social security benefit periods**	1.5

* The accrual for the projected pensionable service is calculated from the time of the pension contingency to the time of turning 63 years.
** The basis for the accrual is a per-benefit-specified share of the earnings prior to the benefit period.

According to the earnings-related pension acts, pension accrues for people between 18 and 62 years during the following social benefit periods: earnings-related unemployment allowance periods and parallel training periods, parenthood allowance, sickness allowance and alternating leave periods. Earnings-related pension also accrues from a few other benefit periods that are less significant from the point of view of pension expenditure.

Regardless of age, the accrual rate for social benefit periods is 1.5 per cent per year. The accrual is based on the same earnings that the actual benefit is based on. For the parenthood allowance, the basis for the pension is 117 per cent of earnings; for earnings-related unemployment benefits, the percentage is 75, and for other types of daily allowance, except job alternation leave, the percentage is 65. For job alternation leave, 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 the act, and as its name indicates, a benefit compensating for pension accrues for studies leading to a vocational or university-level degree, as well as for child-care at home for children under the age of three. At the 2011 level, the bases for the accrual are calculated earnings of EUR 656 per month, with an annual accrual rate of 1.5. The size of the calculated earnings for which the benefit accrues has been linked to the wage coefficient, and the benefit is paid as a supplement to all earnings-related pensions, excluding part-time pensions.

When calculating the initial pension amount, the income from different years is adjusted using the wage coefficient, which is a weighted average equal to 80 per cent of the change in the earnings index plus 20 per cent of the change in the consumer price index. Pensions in payment are adjusted using an earnings-related pension index, which is a weighted average equal to 20 per cent of the change in the earnings index plus 80 per cent of the change in the consumer price index. A one-time raise in pension is carried out for young and middle-aged disability pensioners after the pension has been paid for five years. The increase is 25 per cent for pensioners under the age of 32. For those over 32, the increase will be lowered by one percentage point for each year of age, until it ceases altogether.

Earnings-related pension benefits include disability, unemployment, part-time, old-age and survivors' pensions.

Disability pension can be granted either as a full pension or a partial pension, depending on the degree to which the work ability of the insured has decreased. Partial disability pension is equal to half of the full disability pension. The disability pension is equal to the pension accrued up to the date on which the disability occurred, plus a projected pension. The projected pension is calculated from the date on which the disability occurred until the employee turns 63. The annual accrual rate applied to the projected pension is 1.5 and the salary applied is the average salary computed over the five years preceding the occurrence of the disability. The life expectancy coefficient affects the starting amount of the disability pension as explained.

The unemployment pension may be granted to long-term unemployed persons born in 1949 or earlier, after they have reached the age of 60. Members of cohorts entitled to the unemployment pension may start receiving the earnings-related unemployment allowance

at the age of 55 and the unemployment pension thereafter. In general, the unemployment pension is converted into an old-age pension when the person turns 63 years. Apart from a few exceptions, the final unemployment pensions will be paid out in 2012.

Persons born after 1949 are not eligible to receive an unemployment pension. However, they may be entitled to additional days of the earnings-related unemployment benefit until the commencement of their old-age pension. Persons born between 1950 and 1954 may receive the earnings-related unemployment allowance until the commencement of their old-age pension if they become unemployed after turning 57. Those born after 1954 are entitled to additional days of unemployment allowance if they become unemployed after they have turned 58. After additional days of unemployment allowance, the unemployed may take out on old-age pension at the age of 62. In that case, he will receive the pension that has been accrued until the day the old-age pension commences, without a reduction for early retirement.

A part-time pension may be granted to an insured person who reduces his working hours in such a manner that the earnings decrease to 35–70 per cent of his stabilised earnings level. The age limit for a part-time pension is 58 years for those born in 1952 or earlier, and 60 years for those born after 1952. The size of the part-time pension is half of the earnings reduction caused by the decrease in working hours. Pension is accrued also for work carried out during retirement. In addition, for those born in 1952 and earlier, the accrual rate of the reduced earnings is 0.75 per cent per year. For those born after 1952, no pension is accrued for the reduced earnings.

The insured is entitled to a normal old-age pension at the age of 63 and an early old-age pension at the age of 62. However, the early old-age pension is reduced by 0.6 per cent for each month of early retirement. If the insured continues working after turning 63 and does not take out old-age pension, the pension accrual rate is 4.5 per cent per year. But for those who engage in gainful employment while receiving an old-age or a disability pension, the pension accrual rate is 1.5 per cent per year. After reaching the age of 68, the pension accrual and the insurance obligation end. If the insured does not take out his old-age pension after turning 68, an increment for deferred retirement of 0.4 per cent per month is added to the pension.

Survivors' pension is payable to the surviving spouse, children and, in some cases, former spouses to whom the deceased was liable to pay alimony. The total amount of the survivors' pension depends on the number of beneficiaries, being at its maximum when the beneficiaries include the surviving spouse and at least two children. In that case, the survivors' pension is the amount of the deceased persons' pension. If the surviving spouse is the sole beneficiary, the maximum pension is half of the deceased persons' pension. In this case, the surviving spouse's own pension income may reduce or totally nullify the surviving spouse's pension.

Using the life expectancy coefficient, the initial amount of the old-age pension is adjusted to reflect changes in the life expectancy of 62-year-olds. The size of the starting old-age pension is determined by multiplying the accrued pension with the life expectancy coefficient. For starting disability pensions, the share of accrued pension is also multiplied by the life expectancy coefficient, but the coefficient is not applied to the projected pension. Hence, the closer to the age of old-age pension the individual is when he becomes disabled,

the more extensive is the effect of the life expectancy coefficient on the size of the disability pension.

The life expectancy coefficient is defined in such a way that the actuarial present value[4] of an individual's stream of old-age pension remains unchanged, even if the mortality rate of those of a pensionable age were to change from the mortality rate observed in the years 2003–2007. The life expectancy coefficient affects the pensions of those born in 1948 and thereafter. The value of the coefficient is determined separately for each birth-year cohort.

National pension and guarantee pension

The national pension and the guarantee pension secure an income for the pension recipient in case of a small or non-existing earnings-related pension. The types of pension benefits and the entitlement criteria in the national pension scheme are nearly identical to those in the earnings-related pension scheme. The old-age retirement age for the residence-based national pension is 65 years, while it is 63–68 years for the earnings-related pension. Partial disability pensions and part-time pensions are not paid from the national pension scheme. General survivors' pension can only be paid to persons under the age of 65 who do not receive national pension.

The amount of national pension depends on the size of the earnings-related pension and on the pension recipient's family relations. In 2011, the full national pension amounts to EUR 586/month for a single person and EUR 520/month for a married or cohabiting person. The amount of the national pension decreases as the earnings-related pension increases, so that half of the monthly earnings-related pension that exceeds EUR 52 is deducted from the national pension, until the national pension is eliminated completely. However, any pension accrued after the age of 63 will not lower the amount of the national pension. Furthermore, benefits accrued during periods of childcare and studies are not taken into account when determining the national pension.

The guarantee pension may be paid to a person residing in Finland who receives other statutory pension, as well as immigrants, who have turned 65 years or would be eligible for disability pension. The full guarantee pension in 2011 is EUR 688/month.

All statutory pensions paid from Finland and corresponding foreign benefits affect the size of the guarantee pension. Such pensions are deduced in full from the full guarantee pension amount.

All benefits and earnings limits of the national pension scheme, as well as the guarantee pension amount, have been linked to the cost-of-living index. A benefit once defined through the national pension scheme is not recalculated due to an index adjustment of the earnings-related pension. Instead, the national pension under payment is adjusted only by the national pension scheme index. The national pension level has been raised occasionally by a decision of parliament. The last raise took place at the beginning of 2008. However, the most recent legislative amendment that raised the level of the smallest pensions was the introduction of the guarantee pension in March 2011.

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4   A fixed two-percent interest rate is used when calculating the actuarial present value.

SOLITA pensions

Based on the Motor Liability Insurance Act (LVL), disability pension is paid in the event that a permanent injury has led to a loss of earnings. Based on the Workers' Compensation Insurance Act (TapVakL), compensation is paid for accidents at work or occupational diseases. Workers' compensation pension is paid to the injured after a period of 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 taking place before 1991. Based on the Compensation for Military Injuries Act (SotapL), military accidents and diseases incurred during military service in 1991 and thereafter are compensated.

3.3 Pension Financing

Private-sector employees

From their inception, pension acts governing private-sector employees (until 2006, TEL, LEL and TaEL; since 2007, TyEL) have applied a partially funded technique.

The payable pension is divided into a funded and a pooled component. Assets for the funded component are accumulated at the pension provider where the employee is insured. Funds for paying the pooled component are collected during the year in which the pension is paid, in accordance with the pay-as-you-go (PAYGO) principle. Pension benefits that are partly funded in advance are old-age, disability and unemployment pensions. Survivors' pensions and part-time pensions are financed according to the PAYGO principle.

The pre-funding of the old-age pension takes place between the ages of 18 and 54, while disability and unemployment pensions are funded when the pension begins. Using a common set of actuarial assumptions, each pension provider calculates the amount of technical provisions caused by various funded pension components. A three per cent discount rate is used to calculate technical provisions. Financial assets cover the technical provisions of the pension providers. Pension providers' funds exceeding the technical provisions constitute solvency capital by which providers prepare for investment risks.

In most years, the returns on pension assets exceed the three per cent discount rate used to calculate the technical provisions. Realised surplus from investments are transferred to the solvency capital of pension providers to increase their solvency. Investment returns affect the growth of old-age pension liabilities because the funded components of old-age pensions (and therefore also the technical provisions) are increased annually on the basis of the average solvency of the pension providers. Increases to funded pensions can be targeted in different amounts to various age groups in order to achieve an even contribution development. Pension providers may also make transfers from their solvency capital to client bonuses.

Pension expenditure based on the Seafarer's Pensions Act is financed by employers, employees and the State. The State finances a third of the pension expenditure, while the employers and employees have an equal financing responsibility.[5]

Self-employed persons

The pension expenditure of the self-employed and farmers is financed through annual premium income and a state contribution. The State pays the part of the pension expenditure that premium income does not cover. The YEL contribution rate roughly corresponds to the TyEL contribution rate. In 2010, the State funded approximately 12 per cent of the YEL expenditure and 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 contribution level in MYEL. The average MYEL contribution rate equals approximately half of the TyEL contribution rate.

Public-sector employees

The state and municipal pension schemes were established purely on the PAYGO system. In 1988, the Local Government Pensions Institution (now Keva) began funding pensions in order to restrain the growth of pension contributions. The State Pension Fund was established in 1990 for the purpose of accommodating future state pension expenditure. The objective of public-sector pension funds is to collect assets, by which the pension cost burden caused by the post-war baby-boomers can be eased during the peak years.

This report presents projections for financing private-sector pensions but contains only an estimate for the development of pension expenditure in the state and municipal pension schemes.

National pensions and the guarantee pension

The State finances national pensions and the guarantee pension in full according to the PAYGO scheme.

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5 Tuomikoski, Sorainen and Kilponen (2007) describe the insurance technique of the private sector earnings-related pension insurance.

4   Assumptions of baseline projection

For the projection describing the future pension expenditure and its financing, assumptions concerning the following must be made:
1. the demographic development
2. employment rates
3. the retirement rate
4. the growth in earnings levels
5. the return on pension assets
6. inflation.

In the projection, acts and other regulations governing the schemes will stay valid, apart from one exception. According to valid legislation, national pensions and the guarantee pension have been indexed to consumer prices. However, in the past, minimum national pensions have been raised based on decisions made by Parliament. Apparently, this procedure will continue in the future. Projections concerning future national pension and guarantee pension increases will be made by linking these pension benefits to the earnings development as of 2016. Until 2015, the benefits will adhere to the price level development according to valid legislation.[6]

The decreasing mortality rate is assumed to remain unchanged until 2060, after which it will slow down by half. The old-age retirement rate and the disability incidence rates are assumed to decrease until 2060, after which they will stabilise.

4.1 Population

The population projection was compiled at the Finnish Centre for Pensions in the spring of 2011. The starting year of the projection is 2010. The population rate for that year is based on realised statistics. Preliminary data on the 2010 mortality rates were available. The population forecast follows the assumptions of Statistics Finland's 2009 population projection until the year 2060:
1. the total fertility rate is 1.85
2. net migration is 15,000 persons per year
3. the decreasing mortality rate observed in 1989–2008 will continue in 2011–2060.

The population projection has been extended from 2060 according to the assumptions above, apart from the decrease in mortality rate, which is expected to be halved after 2060.

The slow-down of the mortality rate in line with the population projection means a considerable increase in longevity in the long term. The life expectancy of 63-year-old-men is projected to rise from 18.8 years in 2010 to 28 years during the next 70 years, with

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6   In the actuary report of the Social Insurance Institution of Finland, the national pension index follows the price level until 2015 and, as of 2016 in equal parts, the price level and the earnings level (The Social Security Insurance Institution of Finland [2011]).

a corresponding increase for women from 22.9 to 31 years. However, as the mortality rate decreases, these so-called periodical life expectancies will underestimate the life expectancy of each cohort, since they are calculated on the basis of the mortality rates of each calendar year. The cohort-specific life expectancies, on the other hand, are calculated from the time of the review onwards with the help of the projected mortality rates. In 2010, the cohort-specific life expectancy for men aged 63 was 21.3 years and for women 25.8 years (Appendix 4).

The old-age dependency ratio (the ratio of persons aged 65 and above to persons aged 15–64 years) will increase from the current 26.5 per cent to 44 per cent by 2030. The increase will continue after that, but at a slower pace. In 2080, the old-age dependency ratio will be 54 per cent, i.e. it will double in 70 years. Until 2030, the increase in the old-age dependency ratio is due to both the increasing number of people aged 65 and above and the decrease in size of the working-age population. After 2030, the number of working-age people will slowly increase, but the number of elderly people will grow faster than the number of working-age people (Table 4.4).

4.2 Employment and effective retirement age

The long-term employment projection for the entire population has been compiled using the cohort method. The projection is based on the observed age- and gender-specific employment shares and entry and exit rates of the workforce. The method is generally used in long-term employment projections. A short description of the method is presented in Appendix 8. The employment projection of the next few years is based on the economic outlook compiled in August 2011.

The number of employed persons will increase by approximately 47,000 people in 2010–2015. The growth stems from an increase in employment rates. In 2015–2030, the employment rate will grow slightly, but the number of employed will remain nearly unchanged as the working-age population will shrink in number. As of 2030, the employment rate will not change significantly, but the number of employed will rise slightly as the number of working-aged people will increase (Table 4.4).

The employed are assumed to be shared between the various pension acts in the same proportions as observed in 2008, with one exception. The amount of persons insured under MYEL has shrunk steadily, and the trend is assumed to continue in the future. In 2010, approximately 79,000 people were insured under MYEL. This amount will shrink by half by 2040, after which it will continue to shrink slightly. As the number of people insured under MYEL shrinks, the number of people insured under TyEL increases (Table 4.4).

The employment and unemployment rates presented in Table 4.4 have been adjusted to correspond to the 2010 figures of the Labour Force Survey by Statistics Finland. The Labour Force Survey is based on a questionnaire, while the source data of this projection is register data on the number of employed at the end of the year. According to the survey, there would be more employed and less unemployed persons than the register data would suggest.

The long-term assumptions concerning the effective retirement age remain essentially unchanged compared to the 2009 report. However, the 2009 projection assumed that the weak employment development would dampen the rise of the effective retirement age in

the near future and that the expected effective retirement age would be 59.5 years in 2010. However, despite the reduced employment rate, the observed effective retirement age in 2010 was 60.4 years.

By 2025, the effective retirement age is assumed to rise to 61.2 years due to the abolishment of unemployment pensions and the elimination of lower pension ages (excluding special groups). In addition, it is assumed that, by 2025, the old-age retirement rate will be reduced by approximately 15 per cent and the disability incidence rate by 5 per cent compared to the 2010 level. The retirement rates are assumed to reduce at an equal pace from 2025 to 2060, when the old-age retirement rate is assumed to be approximately 43 per cent and the disability incidence rate about 14 per cent lower compared to the 2010 levels. Thus, in 2060, the effective retirement age is assumed to be 62.1 years (Table 4.4).

The lower disability incidence rate reflects that, according to the demographic forecast, future generations will be clearly healthier than current ones. An increase in the education level and a change in job tasks also lead to lower disability incidence rates. Furthermore, the life expectancy coefficient will make it less attractive to retire early.

4.3 Growth in earnings level and inflation

As of 2013, the assumed annual real growth rate in income level is 1.6 per cent and the inflation 1.7 per cent. As for 2011 and 2012, the assumed growth in income level and the inflation are based on the economic forecasts compiled in 2011 (Table 4.3).

Table 4.1.
Real growth rate of earnings level index 1970–2010.

Length of period	Years	Growth rate (%)*
40 years	1971–2010	1.94
20 years	1971–1990	2.13
	1991–2010	1.76
10 years	1971–1980	1.88
	1981–1990	2.37
	1991–2000	1.29
	2001–2010	2.23

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

The assumed 1.6 per cent real growth rate of earnings level is slightly lower than the realised historical growth rate (Table 4.1). In the 2009 report, the assumed annual growth rate was 1.75 per cent, corresponding to the growth rate in Finland for the past 20 years. However, the historical economic growth has been exceptionally rapid in Finland. From 1970 to 2010, GDP per capita in Finland grew by an average of 2.3 per cent. In the EU 15 countries, the corresponding average figure was 1.8 per cent. Countries of fast growth are Ireland (3.4%), Luxemburg (3.0%) and Portugal (2.3%). The growth rate of Germany, Sweden, Italy and

France was 1.7 per cent. On average, the growth rate of the United States and Canada was 1.8 per cent, while the Japanese GDP per capita grew by 2.2 per cent (USDA Economic Research Service 2011).

Earnings in each age and gender group are expected to grow at the rate of the earnings index. However, as the number of insured under MYEL shrinks, the size of the remaining farms will increase, resulting in the average MYEL income growing more rapidly than the average earnings level. The decrease in the number of farms also increases the general earnings level since many of those insured under MYEL will be insured under TyEL, with higher earnings. The impact of the described structural changes on the earnings level is minor (Section 5.1).

The assumed inflation (1.7 per cent per year) has no major impact on the results if the real earnings growth rate and the real investment return rate are given. However, inflation has an impact on the forming and dissolving of the technical provision under TyEL since funding is partly steered by nominal quantities. For example, a nominal interest rate of 3 per cent is used in the calculation of the technical provision of pension providers.

4.4 Return on pension assets

The return on pension assets has a considerable impact on the development of TyEL contributions and assets, yet considerable uncertainty is associated with investment returns. The analysis of investment risks has been bypassed in this report, but the impact of investment returns on the funding of TyEL pensions is examined via sensitivity analyses.

Table 4.2.
Real return assumptions of pension assets per type of investment, percent.

	Share	Assumption	
	31 Dec. 2010*	Share	Return
Financial market investments	4.9	5	1.0
Bonds and mortgages	37.0	40	2.0
Real estate	12.6	10	4.0
Shares and other investments	45.5	45	5.0
Total	100.0	100	3.50

* Private-sector investment portfolio, source: The Finnish Pension Alliance.

In line with Table 4.2, the return assumptions of pension assets are derived from the return assumptions of various investment classes and their share in the investment portfolio. For comparison, Table 4.2 also includes TyEL pension providers' realised investment allocation per 31 December 2010. Compared to the 2009 report, the assumed return on investments is 0.5 percentage points lower. The lower assumed return on investments is a consequence of a reduced interest level. Other factors affecting the assumed investment returns include, for example, the very slight changes in the assumed allocation and the risk premium of shares and real estate in relation to the return on interest-bearing instruments.

Table 4.3.

Inflation, growth in income level and return on assets 1997–2080, percent.

Year	Inflation*	Growth in earnings level		Return on pension assets	
		nominal growth	real growth	nominal return	real return
1997–2010**	1.6	3.6	2.0	6.2	4.5
2005	0.9	3.9	3.0	11.5	10.5
2006	1.8	3.0	1.2	8.7	6.8
2007	2.5	3.3	0.9	5.4	2.9
2008	4.1	5.5	1.4	-15.0	-18.3
2009	0.0	4.0	4.0	13.9	13.9
2010	1.2	2.6	1.4	10.8	9.4
2011	3.4	2.9	-0.5	-3.5	-6.7
2012	2.3	3.1	0.8	5.9	3.5
2013–2080	1,7	3,3	1,6	5,3	3,5

* Change in cost-of-living index, annual mean value.

** Geometric mean. The money-weighted real average return 1997–2010 was 4.1 per cent.

Source: our own calculation, Statistics Finland and the Finnish Pension Alliance.

Table 4.4.

Population, employment and expected effective retirement age 2010–2080.

4.4.1 Life expectancy, 63-year-olds.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Total	21.0	21.9	22.8	23.7	24.5	26.0	27.3	28.5	29.0	29.5
Men	18.8	19.8	20.7	21.6	22.5	24.1	25.6	26.9	27.5	28.0
Women	22.9	23.8	24.7	25.5	26.3	27.7	29.0	30.1	30.6	31.0

The life expectancy for different cohorts are listed in Table A.4.

4.4.2 Population (thousands) and the old-age dependency ratio (persons aged 65 and above per persons aged 15–64 years, %).

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Total	5,375	5,499	5,622	5,735	5,831	5,964	6,071	6,195	6,320	6,418
0–14 yrs	888	909	938	948	942	926	947	956	951	963
15–64 yrs	3,547	3,462	3,409	3,391	3,384	3,452	3,462	3,469	3,528	3,548
65 and above	941	1,127	1,274	1,396	1,504	1,586	1,661	1,770	1,840	1,908
Old-age dependency ratio	26.5	32.6	37.4	41.2	44.4	45.9	48.0	51.0	52.2	53.8

The population is listed per age and gender in Table A.5.

4.4.3 Number of employed per act and sector (thousands).

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
TyEL	1,483	1,526	1,533	1,530	1,535	1,577	1,595	1,600	1,625	1,636
MEL	6	6	6	6	6	7	7	7	7	7
YEL	192	196	196	194	195	199	201	202	205	206
MYEL	79	68	58	51	46	39	36	35	36	36
Private	1,760	1,796	1,794	1,782	1,782	1,821	1,838	1,843	1,873	1,885
Public	668	681	680	674	673	687	692	693	704	708
Total*	2,312	2,359	2,357	2,340	2,339	2,389	2,411	2,416	2,454	2,471

* Persons insured under multiple acts have been counted only once in the total number of employed persons.

4.4.4 Employment and unemployment rates.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Employment rate 15 – 64**	67.8	70.5	71.4	71.2	71.3	71.3	71.5	71.4	71.4	71.3
Share of employed population	43.0	42.9	41.9	40.8	40.1	40.1	39.7	39.0	38.8	38.5
Unemployment rate**	8.5	7.2	6.9	6.9	6.7	6.8	6.8	6.8	6.9	6.9

** Adjusted to correspond to the observations of the 2010 Labour Force Survey by Statistics Finland.

4.4.5 Expected effective retirement age for 25-year-olds.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Expected effective retirement age, years	60.4	60.8	61.0	61.2	61.3	61.6	61.8	62.1	62.1	62.1

5   Baseline projection

The key results of the baseline projection are the following:
1. earnings-related pension expenditure
2. other statutory pension expenditure
3. the number of pension recipients and the average pension, as well as
4. the financing of TyEL, YEL and MYEL pensions.

The results are reviewed on the level of the total economy and separately for the different pension acts and sectors of the economy. The data for 2010 are partly a result of the projection and may differ slightly from the statistical values. The results are presented at 2010 price levels and in relation to the earnings sum or GDP.

5.1 Earnings-related pension expenditure

In the long term, the earnings level growth is the most significant factor raising the earnings sum of the economy. As the income grows, the earnings-related pension expenditure also increases. As a result of the real growth of earnings alone, the economy-wide earnings sum would grow from EUR 76 billion in 2010 to EUR 225 billion in 2080 (at 2010 price levels). As the number of employed increases, the total earnings sum grows to EUR 240 billion, further increasing by EUR 5 billion due to structural changes (Section 4.3), adding up to a total of EUR 245 billion. The share of TyEL earnings of the total earnings sum will increase by 2.5 percentage points to an ample 66 per cent. As the number of persons under MYEL decreases, the number of persons insured under TyEL is assumed to increase correspondingly. No changes are assumed in the private- and public-sector labour shares (Table 5.1.1).

The assessment of the development of the life expectancy coefficient is based on realised mortality rates from 2003 to 2010 and on the population projection from 2011 onwards. According to the population projection, mortality will decrease so that, for example in 2020, the life expectancy coefficient for a 63-year-old is 0.944 (Table 5.1.2). This life expectancy coefficient is used to adjust the starting old-age pension for those born in 1957 to their extended life expectancy. Appendix 7 contains additional information on the life expectancy coefficient and an assessment of the required prolonging of working career to compensate for the impact of the coefficient.

The TyEL expenditure in relation to the wage sum grew only slightly in 2000–2008 although pension expenditure increased due to the ageing of the population and the maturing of the scheme. The slow growth of the expenditure ratio was due to the favourable employment and earnings level development. During 2009 and 2010, the TyEL expenditure in relation to the wage sum increased rapidly due to the economic recession and the large number of persons retiring. In 2008, the TyEL expenditure was 17.8 per cent of the wage sum, while it had soared to 21.4 per cent in 2010. In the future, the expenditure ratio will grow most rapidly in the 2010s and continue to grow until the 2030s, when it will amount to

nearly 30 per cent of the wage sum. After this, the TyEL expenditure in relation to the wage sum will not change significantly (Table 5.1 and Figure 5.5).

MEL pension expenditure amounted to approximately 53 per cent of the wage sum in 2010. The expenditure ratio will continue to increase, reaching 59 per cent in 2025. The permanently high pension expenditure ratio under MEL is due to more generous pension benefits than those granted under other earnings-related pension acts.

MYEL pension expenditure amounted to 44 per cent of the earnings sum in 2010. For the most part, the high expenditure ratio under MYEL is due to the reduced number of persons insured under MYEL, the high average age of the active insured group and the large proportion of pensioners in relation to the group of insured. Due to the declining number of employed people, the pension expenditure in relation to the earnings sum will continue to grow until the early 2030s, when the expenditure will correspond to 60 per cent of the earnings sum. As the number of insured stabilises towards the end of the projection period (Table 4.4), the pension expenditure in relation to earnings sum will decrease but remain at approximately 38 per cent in 2080. In terms of the expenditure development, the most significant difference between the benefit rules under TyEL and MyEL is that, under MYEL, the entire insured income accrues pension, while under TyEL, the wage earner's pension contribution is deducted from the earnings that accrue pension.

Pension expenditure under YEL in relation to the earnings sum was slightly lower in 2010 than the pension expenditure ratio under TyEL. However, the YEL expenditure in relation to the earnings sum will grow faster than the TyEL expenditure, and in the long run, YEL expenditure in relation to the earnings sum will be 3–4 percentage points higher than the TyEL expenditure. The active insured group of YEL is more male-dominant but older than the active insured group of TyEL. The age structure explains part of the higher expenditure ratio, but the difference in the gender distribution has the opposite effect. As under MyEL, the entire earnings under YEL accrue pension, i.e. no employee contribution is deducted from the income. This explains the ample 2 percentage point difference between the TyEL and YEL pension expenditure ratio towards the end of the projection period.

The development of the public-sector pension expenditure differs considerably from that of the private sector. During the next 20 years, the private-sector expenditure ratio will increase by 8 percentage points to an ample 30 per cent. After that, it will not change significantly. In 2010, the public-sector earnings-related pension expenditure was 32.5 per cent of the wage sum. The expenditure ratio is assumed to increase by a further 10 percentage points during the next 20 years. After that, the expenditure ratio will slowly go down and stabilise at a level of an ample 30 per cent (Table 5.1 and Figure 5.1).

The public-sector expenditure ratio, which will remain high for decades, is the legacy of more generous benefit rules in the public compared to the private sector. Another reason is privatisation, which has resulted in the transfer of employees from the public to the private sector. In addition, public-sector employees are relatively old and thus accrue more pension than the gainfully employed in the private sector (Appendix 3). In the long term, the public- and private-sector expenditure ratios will converge at a level close to each other because, for the main part, the benefit rules are common. In the projection, the development of the number of insured is also uniform; the ratio of public-sector employees of the work force is assumed to remain at the same level throughout the entire projection period.

Table 5.1.

Earnings-related pension expenditure and earnings sums 2010–2080, at 2010 price levels.

5.1.1 Earnings sum per pension act and sector, EUR billion.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
TyEL	48.4	52.6	57.3	62.0	67.5	81.2	96.7	114.5	136.7	162.0
MEL	0.3	0.3	0.3	0.4	0.4	0.5	0.6	0.7	0.8	0.9
YEL	3.8	4.1	4.5	4.8	5.2	6.2	7.3	8.6	10.3	12.1
MYEL	1.5	1.4	1.4	1.3	1.3	1.3	1.4	1.6	1.9	2.2
Private	53.9	58.4	63.5	68.5	74.4	89.2	106.1	125.4	149.7	177.3
Public	22.1	23.4	25.4	27.3	29.5	35.1	41.3	48.5	57.5	67.7
Total	76.1	81.8	88.8	95.8	103.9	124.3	147.4	173.8	207.2	245.0

5.1.2 Life expectancy coefficient for year of 63rd birthday.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Life expectancy coefficient	1.000	0.975	0.944	0.914	0.887	0.843	0.807	0.779	0.761	0.751

For further information on the life expectancy coefficient and required prolonging of working career to compensate for the life expectancy coefficient, see Table A.7.

5.1.3 Earnings-related pension expenditure per pension act and sector, EUR billion.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
TyEL	10.4	12.7	15.3	17.7	20.0	23.5	27.7	33.4	39.9	47.8
MEL	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.4
YEL	0.8	1.0	1.2	1.4	1.7	2.0	2.4	2.8	3.4	4.0
MYEL	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8
Other*	0.3	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1
Private	12.3	14.8	17.7	20.4	22.8	26.7	31.1	37.3	44.5	53.1
Public	7.2	8.6	10.2	11.5	12.5	13.4	14.2	15.8	18.2	21.3
VEKL	0.0	0.0	0.0	0.0	0.1	0.2	0.5	1.0	1.4	1.8
Total	19.5	23.5	27.9	31.9	35.4	40.2	45.8	54.0	64.1	76.2
of which during unpaid periods**	0.0	0.1	0.2	0.3	0.5	0.9	1.4	1.9	2.5	2.9

* Farmers' special pensions and TEL supplementary provision.

** Pension expenditure accruing during earnings-related social benefit periods.

5.1.4 Earnings-related pension expenditure by sector, per cent of earnings sum.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
TyEL	21.4	24.2	26.7	28.6	29.6	29.0	28.6	29.2	29.2	29.5
MEL	52.9	57.2	59.0	59.1	57.6	49.0	42.3	40.0	39.3	39.6
YEL	21.0	24.4	27.6	30.3	32.1	32.3	32.4	33.0	32.8	32.9
MYEL	44.0	48.3	51.8	56.9	60.2	58.9	54.4	47.5	41.1	37.5
Other*	0.6	0.5	0.4	0.3	0.2	0.1	0.1	0.0	0.0	0.0
Private	22.8	25.4	27.9	29.7	30.7	29.9	29.3	29.8	29.7	29.9
Public	32.5	36.8	40.1	42.2	42.4	38.2	34.3	32.5	31.6	31.5
VEKL	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.6	0.7	0.7
Total	25.6	28.7	31.4	33.3	34.1	32.4	31.0	31.1	30.9	31.1
of which during unpaid periods **	0.0	0.1	0.2	0.4	0.5	0.7	0.9	1.1	1.2	1.2

* Farmer's special pensions and TEL supplementary provision, per cent of private-sector earnings sum.

** Pension expenditure accruing during earnings-related social benefit periods, per cent of economy-wide earnings sum.

5.1.5 Earnings-related pension expenditure per type of benefit, per cent of earnings sum, all earnings-related pension acts.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Old-age pension	19.2	23.5	26.6	28.7	29.8	28.4	27.5	28.0	28.0	28.2
Disability pension	3.2	2.6	2.3	2.1	1.9	1.9	1.9	1.8	1.8	1.7
Unemployment pension	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Part-time pension	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Survivors' pension	2.1	2.1	2.1	2.1	2.1	1.8	1.3	1.0	0.9	0.8
Farmers' special pensions	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Total	25.6	28.7	31.4	33.3	34.1	32.4	31.0	31.1	30.9	31.1

Figure 5.1.

Earnings-related pension expenditure by sector 2000–2080, per cent of earnings sum.
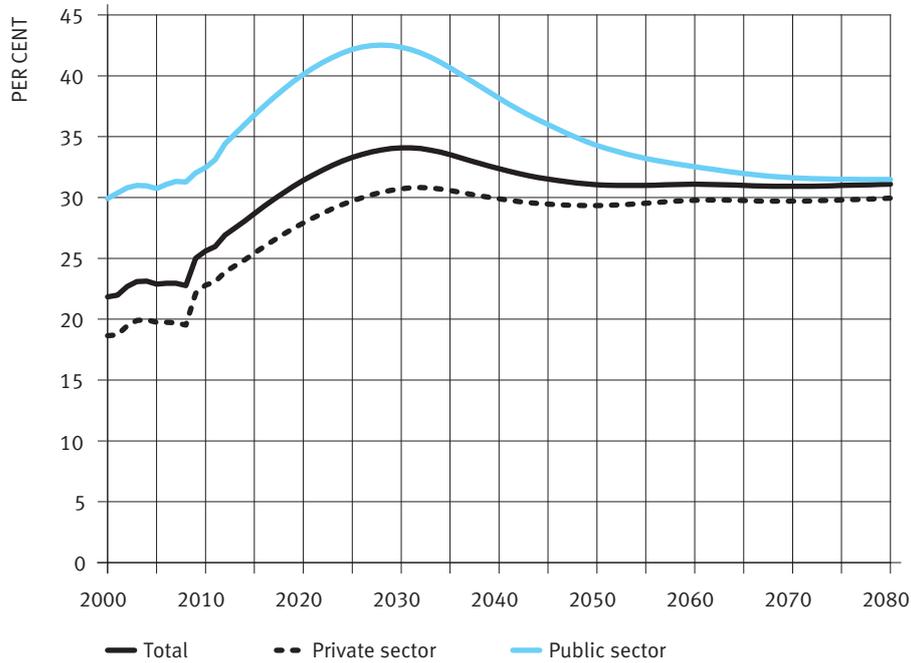
Figure 5.2.

Earnings-related pension expenditure by type of benefit 2000–2080, per cent of earnings sum[7].
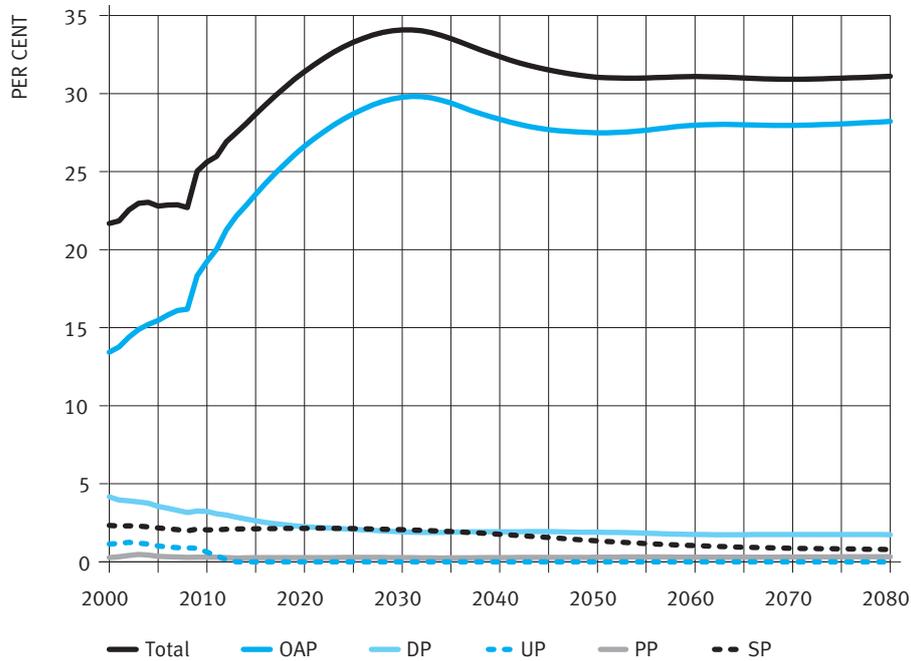
7   OAP = old-age pension; DP = disability pension; UP = unemployment pension; PP = part-time pension; SP = survivors' pension.

VEKL came into force at the beginning of 2005. The full impact of VEKL on expenditure will be realised only after decades, since benefits accrue mainly to persons at the beginning of their careers. The VEKL pension scheme will mature when the currently 30-year-olds are among the oldest of the pensioners. This will be the case in approximately 60 years, at which time the expenditure under VEKL will amount to 0.7 per cent of the total wage sum. Pension expenditure under VEKL has not been included in the private- or public-sector pension expenditure, but it is included in the economy-wide earnings-related pension expenditure (Table 5.1 and Figure 5.1).

The regulations on earnings-related pension accrual during periods of earnings-related social benefits (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.[8] Similar to the impact of VEKL, the full impact of unpaid periods on expenditure will be realised only after decades. However, the maturing is quicker since, opposed to the accrual periods of VEKL, the periods of earnings-related social benefits mainly concern older persons. The pension expenditure accrued during unpaid periods is included in the pension expenditure under each earnings-related pension act. The pension parts paid for each year and accrued during unpaid periods are divided as pension expenditure under the various pension acts in relation to the earnings sum for the year of payment (Table 5.1).

When considered by type of pension benefit, the growth in earnings-related pension expenditure is explained by the growth in old-age pension expenditure. The most important reason for the increase in old-age pension expenditure is the ageing of the population. In addition, the ongoing maturing of the scheme and the lowering of the age limit for old-age pension from 65 to 63 will increase the old-age pension expenditure in relation to the earnings sum (Table 5.1.5 and Figure 5.2).

Unemployment pensions can be granted to persons born in 1949 or earlier. For the main part, the payment of unemployment pensions will terminate during 2012 when those born in 1949 turn 63. In some cases of minor importance from the point of view of total expenditure, the unemployment pension may continue until the age of 65 (Table 5.1.5 and Figure 5.2).

The ratio of disability pension expenditure to the wage sum has shrunk during the 2000s. This trend will continue, and the ratio of the expenditure will decrease from the 3.2 per cent level in 2010 to slightly less than 2.0 per cent by 2030. The expenditure ratio is reduced by the already realised and the expected decrease in the disability incidence rate, as well as by the lowering of the termination age of the disability pension from 65 to 63 years (Table 5.1.5 and Figure 5.2).

In most cases, survivors' pension is paid after the breadwinner's old-age pension to the surviving spouse. As old-age pension expenditure increases, the termination rate of old-age pensions will also increase, in which case the number of starting survivors' pensions also increases. On the other hand, the changes in mortality patterns decrease survivors' pension expenditure. As the mortality rate decreases, the deaths occur at increasingly higher

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8   Prior to 2005, earnings-related pension was accrued during periods of earning-related unemployment benefits in the form of an increment for credited periods. The increments for credited periods are included in the accrued pension amounts for each pension act.

ages, which shortens the average lifetime spent as a widow or widower. As a result of the decreasing number of marriages and the levelling out of the differences in pension levels between the spouses, it is assumed in the projection that the annual number of starting survivors' pensions will decrease by 30 per cent by 2030. In 2010, survivors' pension expenditure amounted to 2.1 per cent of the wage sum. As a consequence of factors affecting in different directions, the relative level of survivors' pension expenditure will remain virtually unchanged until the 2030s, after which its ratio to the earned earnings sum will decline (Table 5.1.5 and Figure 5.2).

5.2 Total pension expenditure, number of pension recipients and average pension

The development of all statutory pension expenditures is analysed in terms of the following components:

1. earnings-related pensions
2. national pension and guarantee pension
3. SOLITA pensions.

The total pension expenditure for earnings-related pensions follows the expenditure development described above in section 5.1.

The pension expenditure for the national pension and the guarantee pension is assessed based on the earnings-related pension amounts and the population projection. In the baseline projection, these pensions are increased until 2015 in line with changes in price level. As of 2016, national pensions and the guarantee pension in payment will be increased according to the development of the earnings level. The full national pension and the guarantee pension, with the help of which the size of beginning national pensions is calculated, are also adjusted according to the development of the earnings level. Tying the national pension and the guarantee pension to the level of earnings as of 2016 anticipates future legislative amendments, with which the continuous lagging behind of smaller pensions in relation to the general earnings level will be prevented. The pension expenditure projection in Appendix 1 has been calculated so that the indexation of the national pension and the guarantee pension follows only consumer prices.

For SOLITA pensions, the projection does not aim for elaborateness but for an approximate estimate based on the given demographic and economic development. The starting point is the reigning pension expenditure according to age and gender. After that, SOLITA benefits for persons of an active age develop in line with the earnings level. From the age of 63 onward, the average SOLITA benefit will follow the earnings-related pension index.

Total statutory pension expenditure in 2000–2008 was approximately 11 per cent of GDP. The rapid economic growth kept the expenditure ratio at a stable level. In 2010, the share of expenditure increased to 12.5 per cent of GDP due to the shrinking GDP and increasing pension expenditure. The share of pension expenditure of GDP will continue to grow until the 2030s, at which time it will amount to an ample 15 per cent. After this, the share of

pension expenditure in GDP will be reduced by approximately one percentage point. The rise in the share of pension expenditure in GDP leading up to the 2030s is due primarily to the ageing of the population. However, the ageing of the population will continue also after the 2030s, while the share of pension expenditure of GDP will decrease. This decrease is due primarily to the life expectancy coefficient, which limits the growth of earnings-related pension expenditure (Table 5.2 and Figure 5.3).

At the end of 2010, the number of earnings-related pension recipients was 1.36 million, and when including those receiving only a national pension, the total number of pensioners was 1.46 million. These figures include, among others, pensioners who live abroad and those who receive only a survivors' pension. In this report, the projected number of pensioners includes persons resident in Finland and receiving a pension in their own right, excluding part-time pensioners. In 2010, approximately 1.32 million persons fitted this definition. An average pension for this group is also projected (Table 5.2).

Demographic development and the retirement rates are the key factors affecting the number of pension recipients. The number of pension recipients will grow to 1.7 million by 2030 and to 2.1 million by the end of the projection period. The number of persons aged 65 and above will grow at an even faster rate: from 0.9 million in 2010 to 1.9 million by the end of the projection period. The ratio of pension recipients to gainfully employed will grow so that in 2010, the number of pension recipients per one hundred gainfully employed was 57, while it will be 74 in 2030 and 84 in 2080 (Tables 4.4 and 5.2).

The purchasing power of the average pension during the projection period will grow 2.4-fold, i.e. from slightly over EUR 1,370 to EUR 3,300 per month (Table 5.2). The growth in the purchasing power of pensions is a result of the increase in earnings level: earnings-related pensions are tied to the earnings level via accrual rates and indexing.

In 2010, the average pension was half of the average earnings of the insured.[9] The ratio of earnings-related pensions to the earnings level will continue to grow due to the maturing of the earnings-related pension scheme. As of the 2020s, the growth of pension levels will lag behind the growth of earnings levels, mainly due to the life expectancy coefficient. In addition, the removal of the higher accruals in the public compared to the private sector in the 1990s and an increase in employee pension contributions will lower the ratio of pensions to earnings level (Table 5.2 and Figure 5.4).

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9   The average earnings are the economy-wide earnings divided by the number of employed persons. Gross pensions are compared to gross earnings. Were income transfers and differences in household size taken into consideration, the relative income of pension recipients would be higher.

Table 5.2.

Total statutory pension expenditure and average benefit level 2010–2080, at 2010 price levels.

5.2.1 GDP, earnings sum, employed and average earnings.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
GDP, EUR bn	180.3	198.9	216.0	232.9	252.5	302.2	358.3	422.6	503.7	595.6
Earnings sum, EUR bn	76.1	81.8	88.8	95.8	103.9	124.3	147.4	173.8	207.2	245.0
Employed (thousand)	2,312	2,359	2,357	2,340	2,339	2,390	2,411	2,416	2,454	2,471
Average earnings, EUR/month	2,741	2,890	3,142	3,412	3,700	4,335	5,096	5,996	7,034	8,264

5.2.2 Pension expenditure, EUR bn.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Total pension expenditure	22.5	26.5	31.1	35.3	39.1	44.6	50.9	60.3	71.8	85.8
Earnings-related pensions	19.5	23.5	27.9	31.9	35.4	40.2	45.8	54.0	64.1	76.2
National pensions and the guarantee pension	2.5	2.5	2.6	2.7	2.9	3.5	4.1	5.0	6.1	7.6
SOLITA pensions	0.5	0.5	0.6	0.7	0.7	0.9	1.1	1.3	1.6	1.9

5.2.3 Pension expenditure, percent of GDP.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Total pension expenditure	12.5	13.3	14.4	15.1	15.5	14.8	14.2	14.3	14.3	14.4
Earnings-related pensions	10.8	11.8	12.9	13.7	14.0	13.3	12.8	12.8	12.7	12.8
National pensions and the guarantee pension	1.4	1.3	1.2	1.2	1.2	1.2	1.1	1.2	1.2	1.3
SOLITA pensions	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3

5.2.4 Pension recipients (residing in Finland and receiving a pension in their own right, excluding recipients of part-time pensions) and average pension.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Pension recipients (thousand)	1,323	1,433	1,549	1,651	1,739	1,809	1,862	1,947	2,018	2,083
Total average pension, EUR/month	1,370	1,498	1,626	1,729	1,817	1,987	2,206	2,503	2,872	3,321
of which earnings-related pension EUR/month	1,201	1,341	1,475	1,578	1,661	1,810	2,002	2,265	2,589	2,984
% of average wage	50.0	51.8	51.8	50.7	49.1	45.8	43.3	41.7	40.8	40.2

Figure 5.3.

Total statutory pension expenditure 2000–2080, per cent of GDP[10].

Total — — Earnings-related pension — National and guarantee pensions — — SOLITA
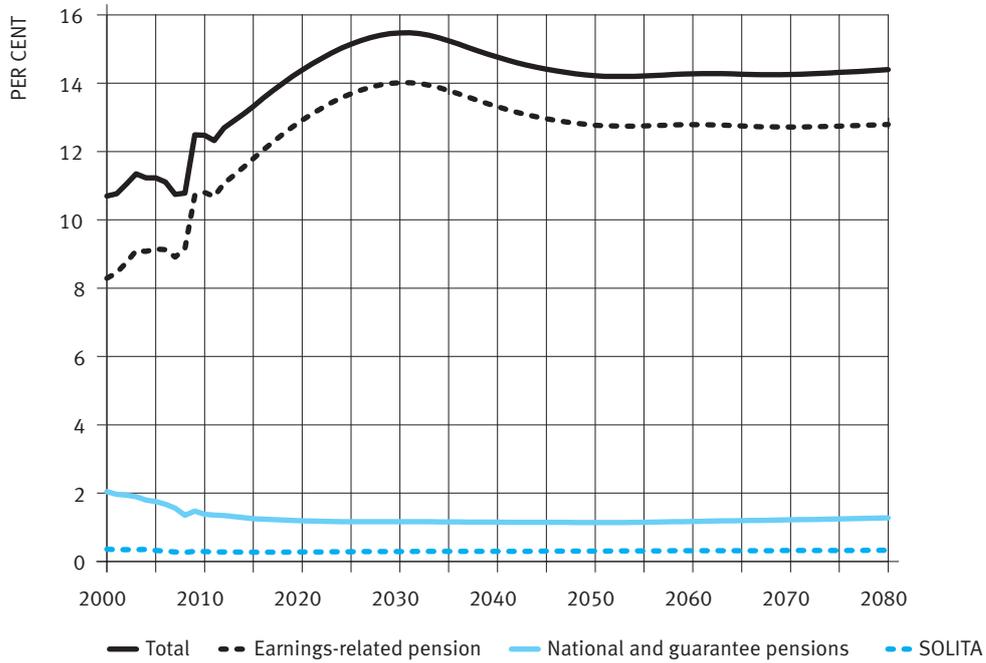
Figure 5.4.

Average pension 2000–2080, per cent of average wage.

Total pension — — of which earnings-related pension

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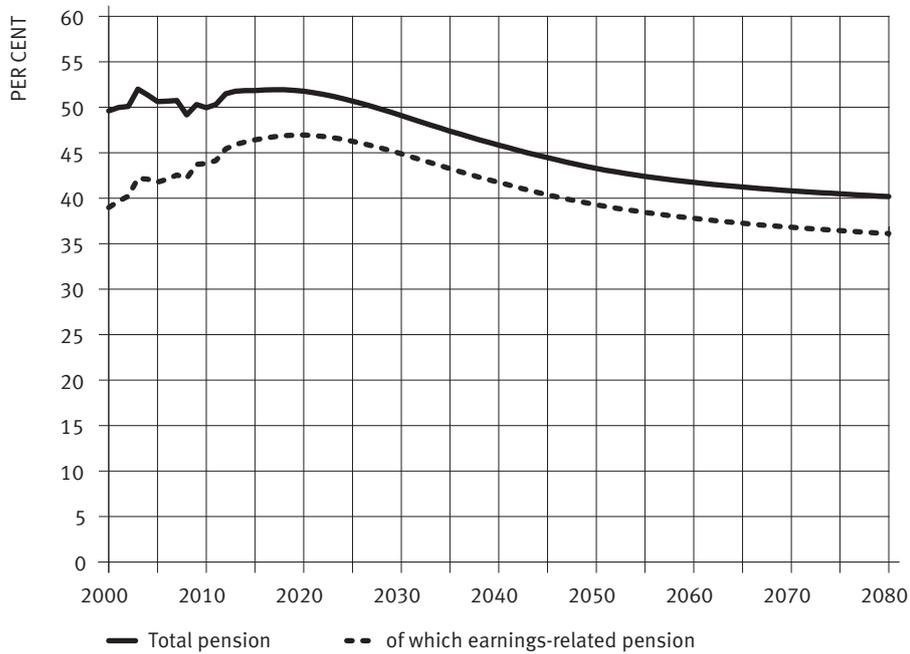
10   In 2008, the compilation of statistics on national pensions was changed so that national pension expenditure no longer includes pensioners' housing and care allowances.

5.3 Financing of private-sector earnings-related pensions

Financing of pension expenditure under the Employees Pensions Act (TyEL)

The results of the financing projection for TyEL are presented in Table 5.3 at 2010 price levels. The equivalent figures in relation to the wage sum are presented in Table 5.4

Excluding a few recession years in the 1990s, the private-sector pension contribution has exceeded the pension expenditure throughout the history of the earnings-related pension scheme. This will change in the early 2010s. In 2010, the expenditure and the contribution income were of equal size, 21.4 per cent of the wage sum. Until 2015, the TyEL contribution and expenditure will be equally high, an ample 24 per cent of the wage sum. After that, expenditure will surpass the contribution level permanently. The difference will be financed with pension asset returns.

The TyEL contribution rate will continue to increase until the early 2030s, when it will settle at a level of 26.5 per cent of wages. After 2030, the contribution level will not change significantly. For the main part, the increase in the contribution level is due to the increase in the pooled component with which the PAYGO share of the annual pension expenditure is financed. The funded component of the contribution in relation to the wage sum will also increase slightly as the old-age pension contribution will increase due to the prolonged life expectancy.

According to the Employees Pensions Act, increases to the funded components of old-age pensions on the basis of investment returns may be allocated in different amounts to different generations in order to achieve an even contribution development. The older the generations are that the amounts are allocated to, the faster the funded pensions are dissolved to lower the contribution level. In the projections of this report, all increases to the funded components are allocated to those aged 55 and above until 2014, after which the increases are allocated to those aged 65 and above.[11]

In Table 5.3, the amounts are at 2010 price levels. Pension asset returns are also presented at fixed 2010 price levels. As of 2012, the nominal return is 5.3 per cent, inflation 1.7 and the real return 3.5 per cent (Figure 4). In the projection, it is assumed that all payments take place at mid-year. The funded contribution component includes the funded old-age, disability and unemployment pension contributions. Correspondingly, the funded expenditure component includes the funded components of old-age, disability and unemployment pension expenditure.

The ratio of pension assets in relation to the wage sum has varied greatly, mainly due to the fluctuation in investment returns. However, despite the fact that the expenditure surpasses the contribution income, the ratio of assets to wage sum will increase slightly during the projection period (Table 5.4 and Figure 5.6).

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11   The same allocation rule was applied in the baseline projection of the 2009 report.

Table 5.3.

TyEL financing 2010–2080, EUR million, at 2010 price levels.

5.3.1 TyEL wage sum and contribution income, EUR million.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Wage sum	48,373	52,589	57,311	62,042	67,501	81,185	96,741	114,463	136,685	161,952
Employer	8,055	9,454	10,612	11,775	12,950	15,527	18,354	21,861	25,999	30,907
Employee aged under 53	1,738	2,413	2,872	3,364	3,790	4,425	5,081	6,139	7,097	8,375
Employee aged 53 and above	555	796	954	1,071	1,180	1,526	1,874	2,242	2,842	3,537
Total	10,349	12,664	14,438	16,210	17,919	21,478	25,309	30,242	35,939	42,819
of which funded	2,064	2,263	2,464	2,675	2,958	3,568	4,237	5,106	6,169	7,360

5.3.2 TyEL expenditure, EUR million.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Old-age pension	7,460	10,284	12,828	15,083	17,247	20,403	24,321	29,934	36,013	43,299
Disability pension	1,554	1,305	1,220	1,249	1,270	1,518	1,762	1,917	2,282	2,676
Unemployment pension	383	0	0	0	0	0	0	0	0	0
Survivors' pension	866	1,015	1,157	1,268	1,354	1,445	1,346	1,265	1,279	1,377
Part-time pension	98	102	112	130	137	174	228	281	359	459
Total	10,360	12,706	15,317	17,730	20,009	23,540	27,658	33,397	39,933	47,812
of which funded	2,310	2,634	3,157	3,803	4,615	6,006	7,005	8,279	10,068	12,299

5.3.3 Cash flows and assets, EUR million.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Assets per 1 Jan.	83,594	93,169	107,197	119,369	130,419	154,761	189,785	232,674	282,382	342,590
TyEL contribution income	10,349	12,664	14,438	16,210	17,919	21,478	25,309	30,242	35,939	42,819
Other contribution income*	466	433	410	370	397	490	584	687	846	1030
Return on investment	8,850	4,893	5,607	6,230	6,796	8,078	9,913	12,147	14,739	17,879
TyEL pension expenditure	-10,360	-12,706	-15,317	-17,730	-20,009	-23,540	-27,658	-33,397	-39,933	-47,812
Other expenditure**	-318	-300	-290	-271	-249	-199	-169	-171	-197	-233
Administrative expenses	-353	-384	-418	-453	-493	-593	-706	-836	-998	-1,182
Assets per 31 Dec.	92,228	97,769	111,628	123,726	134,781	160,476	197,059	241,347	292,778	355,092

* Contribution from the Unemployment Insurance Fund and TEL supplementary provision.

** Supplementary provision under TEL, contribution losses, net expense caused by MEL in the TyEL-MEL pooling and a transition contribution to the State.

5.3.4 Assets and technical provision, per 31 Dec, EUR million.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Old-age pension	54,622	60,308	66,750	75,342	85,415	106,392	129,122	158,753	196,394	241,298
Total technical provision	74,349	81,242	90,821	99,341	107,577	128,216	158,197	193,891	235,001	284,144
Solvency capital***	17,879	16,527	20,807	24,385	27,204	32,260	38,862	47,456	57,777	70,948
Assets	92,228	97,769	111,628	123,726	134,781	160,476	197,059	241,347	292,778	355,092

*** Excluding the component of the provision for pooled claims comparable to the solvency capital in accordance with the so-called temporary act (853/2008).

Table 5.4.
TyEL financing 2010–2080, per cent of wage sum.

5.4.1 TyEL wage sum, EUR million, and contribution income, per cent of wage sum.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Wage sum	48,373	52,589	57,311	62,042	67,501	81,185	96,741	114,463	136,685	161952
Employer	16.7	18.0	18.5	19.0	19.2	19.1	19.0	19.1	19.0	19.1
Employee under age 53	4.5	5.8	6.3	6.8	7.0	6.9	6.8	6.9	6.8	6.9
Employee aged 53 and above	5.7	7.3	8.0	8.6	8.9	8.8	8.6	8.8	8.7	8.7
Total	21.4	24.1	25.2	26.1	26.5	26.5	26.2	26.4	26.3	26.4
of which funded	4.3	4.3	4.3	4.3	4.4	4.4	4.4	4.5	4.5	4.5

5.4.2 TyEL expenditure, per cent of wage sum.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Old-age pension	15.4	19.6	22.4	24.3	25.6	25.1	25.1	26.2	26.3	26.7
Disability pension	3.2	2.5	2.1	2.0	1.9	1.9	1.8	1.7	1.7	1.7
Unemployment pension	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Survivors' pension	1.8	1.9	2.0	2.0	2.0	1.8	1.4	1.1	0.9	0.9
Part-time pension	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3
Total	21.4	24.2	26.7	28.6	29.6	29.0	28.6	29.2	29.2	29.5
of which funded	4.8	5.0	5.5	6.1	6.8	7.4	7.2	7.2	7.4	7.6

5.4.2 Cash flows and assets, per cent of wage sum.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Assets 1 Jan.	172.8	177.2	187.0	192.4	193.2	190.6	196.2	203.3	206.6	211.5
TyEL contribution income	21.4	24.1	25.2	26.1	26.5	26.5	26.2	26.4	26.3	26.4
Other contribution income*	1.0	0.8	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Return on investment	18.3	9.3	9.8	10.0	10.1	10.0	10.2	10.6	10.8	11.0
TyEL pension expenditure	-21.4	-24.2	-26.7	-28.6	-29.6	-29.0	-28.6	-29.2	-29.2	-29.5
Other expenditure**	-0.7	-0.6	-0.5	-0.4	-0.4	-0.2	-0.2	-0.1	-0.1	-0.1
Administrative expenses	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7
Assets per 31 Dec.	190.7	185.9	194.8	199.4	199.7	197.7	203.7	210.9	214.2	219.3

* Contribution from the Unemployment Insurance Fund and TEL supplementary provision.

** Supplementary provision under TEL, contribution losses, net expense caused by MEL in the TyEL-MEL pooling and a transition contribution to the State.

5.4.4 Assets and technical provision, per 31 Dec., per cent of wage sum.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Old-age pension	113	115	117	121	127	131	134	139	144	149
Total technical provision	154	155	159	160	159	158	164	169	172	175
Solvency capital***	37	31	36	39	40	40	40	42	42	44
Assets	191	186	195	199	200	198	204	211	214	219

*** Excluding the component of the provision for pooled claims comparable to the solvency capital in accordance with the so-called temporary act (853/2008).

Figure 5.5.
TyEL expenditure and contribution 2000–2080, per cent of wage sum.

- —— Expenditure
- ● ● Total contribution
- —— Contribution, employer
- —— Contribution, 53 yrs and above
- ● ● Contribution, under 53 yrs
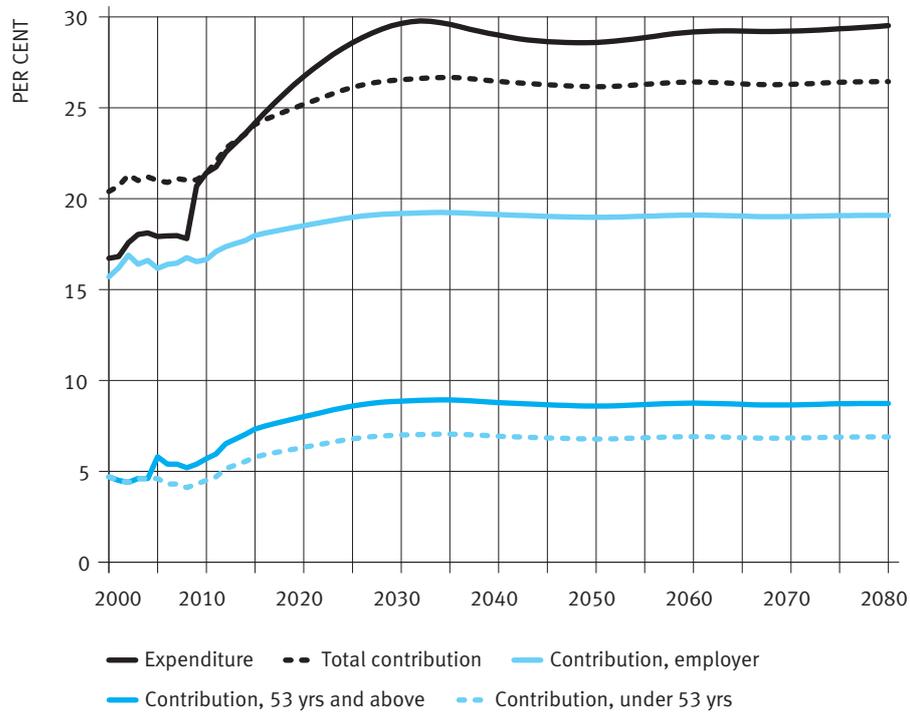
Figure 5.6.
TyEL assets and technical provision 2000–2080, per cent of wage sum.

- —— Assets
- ● ● Technical provision
- —— Old-age pension liability
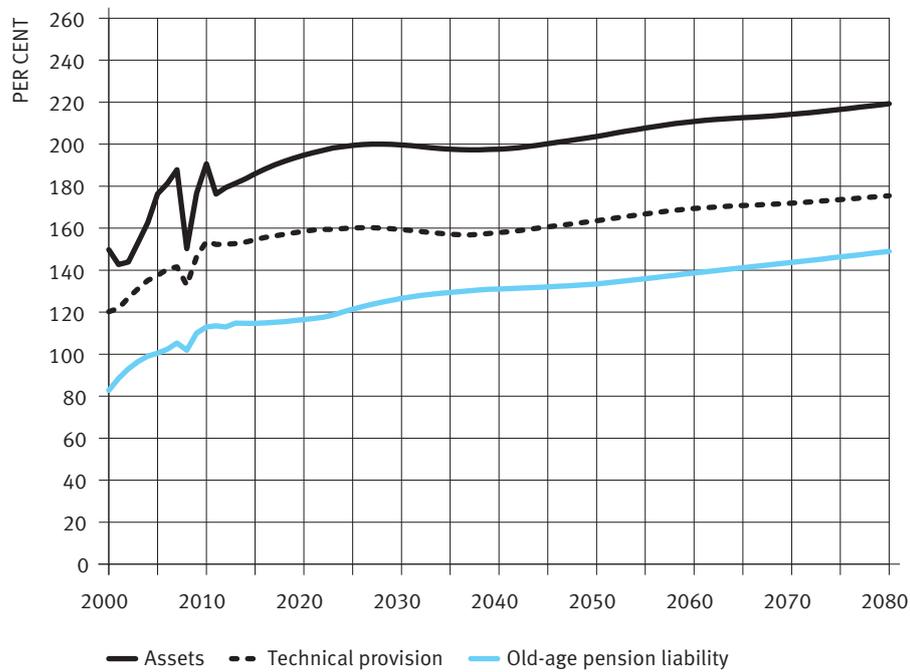
Financing of expenditure under YEL and MYEL

YEL and MYEL expenditure is financed based on the PAYGO principle in such a way that the State pays the share of the expenditure that the contribution income does not cover.

In 2010, YEL contribution income amounted to 20.1 per cent of the insured earnings sum. The contribution level is 94 per cent of the realised TyEL contribution level. The YEL contribution is lower than the TyEL contribution due to contribution reduction for a new self-employed person. The ratio of YEL to TyEL contribution rates is assumed to remain at the 2010 level also in the future. In 2010, the State's share amounted to 12 per cent of the pension expenditure. By 2025, it will increase to 25 per cent and, in the long-term, to 30 per cent. The State's share increases because the YEL contribution follows the TyEL contribution, but future YEL expenditures have not been funded. In the future, the increasing share of TyEL expenditure will be financed by assets released from funds. The corresponding share of YEL pensions will be financed by the State's share (Table 5.5 and Figure 5.7).

In 2010, the MYEL contribution income amounted to 11 per cent of the insured earnings sum. This corresponds to 51 per cent of the realised TyEL contribution level. In this projection, it is assumed that the ratio will grow slightly (from 52 per cent in 2035 to 53 per cent in 2080) as the size of the farms grows when the number of farms decreases. In 2010, the State's share of the MYEL pension expenditure was 79 per cent. The State's relative share in the financing of the expenditure remains at nearly the same level until 2030, after which it will decrease. Nevertheless, the State's share in the financing of MYEL expenditure will amount to 65 per cent in 2080. The most significant reason for the high share of the State is the unfavourable ratio of active farmers to pension recipients. The low contribution level also increases the State's share (Table 5.5 and Figure 5.8).

Table 5.5.

YEL and MYEL financing 2010–2080.

5.5.1 YEL cash flows, EUR million, at 2010 price levels, per cent of wage sum.

EUR million	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Earnings sum	3,836	4,118	4,454	4,790	5,191	6,217	7,347	8,642	10,291	12,135
Contribution income	770	931	1,053	1,175	1,293	1,543	1,804	2,143	2,539	3,011
State's share	97	138	249	355	460	570	695	845	997	1,172
Pension expenditure	-807	-1,004	-1,229	-1,450	-1,665	-2,010	-2,378	-2,848	-3,373	-3,995
Administrative expenses	-59	-65	-72	-80	-88	-104	-120	-140	-163	-188
Per cent of earnings sum										
Contribution income	20.1	22.6	23.6	24.5	24.9	24.8	24.5	24.8	24.7	24.8
State's share	2.5	3.3	5.6	7.4	8.9	9.2	9.5	9.8	9.7	9.7
Pension expenditure	-21.0	-24.4	-27.6	-30.3	-32.1	-32.3	-32.4	-33.0	-32.8	-32.9
Administrative expenses	-1.5	-1.6	-1.6	-1.7	-1.7	-1.7	-1.6	-1.6	-1.6	-1.5

5.5.2 MYEL cash flows, EUR million, at 2010 price levels, per cent of wage sum.

EUR million	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Earnings sum	1,452	1,386	1,367	1,301	1,269	1,297	1,404	1,606	1,908	2,250
Contribution income	159	172	178	176	175	180	194	226	267	316
State's share	505	515	546	579	604	599	584	554	535	548
Pension expenditure	-638	-670	-708	-740	-764	-764	-763	-763	-783	-844
Administrative expenses	-18	-17	-16	-15	-15	-14	-15	-16	-18	-21
Per cent of earnings sum										
Contribution income	11.0	12.4	13.0	13.5	13.8	13.9	13.8	14.1	14.0	14.1
State's share	34.8	37.1	40.0	44.5	47.6	46.2	41.6	34.5	28.0	24.3
Pension expenditure	-44.0	-48.3	-51.8	-56.9	-60.2	-58.9	-54.4	-47.5	-41.1	-37.5
Administrative expenses	-1.2	-1.2	-1.1	-1.2	-1.1	-1.1	-1.0	-1.0	-0.9	-0.9

Figure 5.7.
YEL expenditure and contribution 2000–2080, per cent of earnings sum.
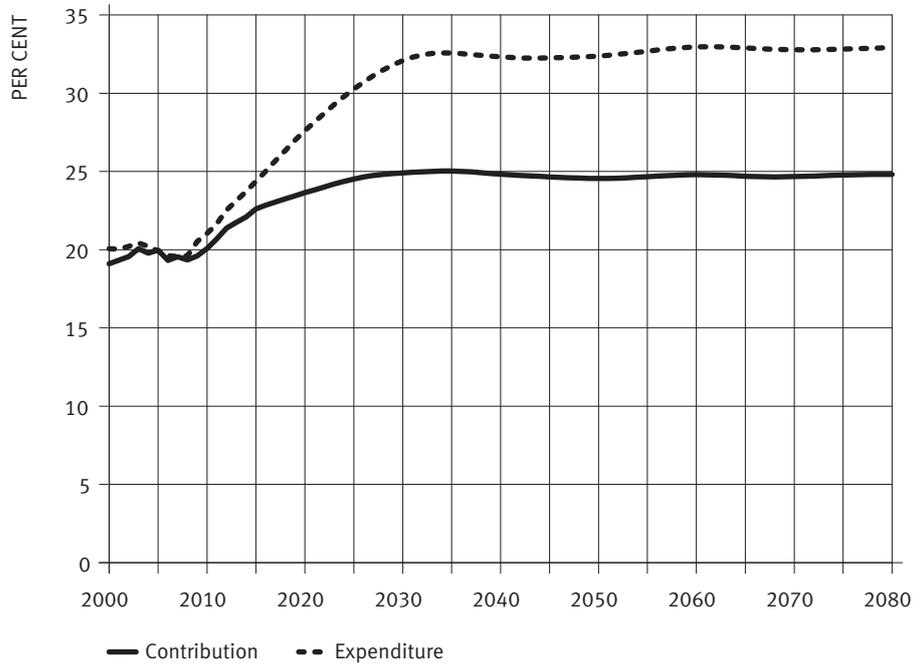
Figure 5.8.
MYEL expenditure and contribution 2000–2080, per cent of earnings sum.
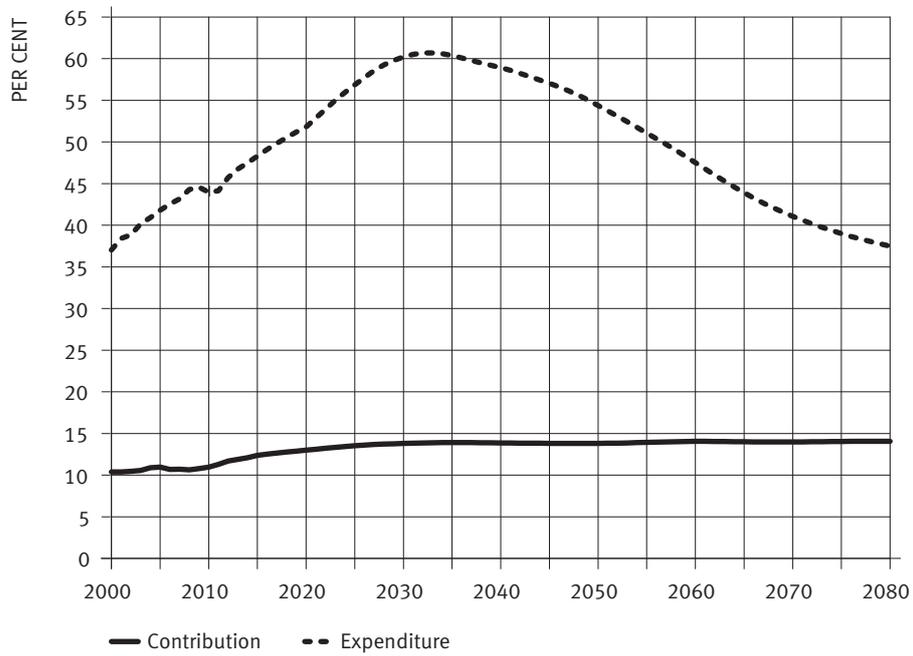
6   Sensitivity analysis

In this chapter, the sensitivity of the results of the baseline projection in relation to assumptions concerning changes in the economic development is analysed. The sensitivity analysis strives to be clear and understandable, which is why some compromises concerning the realism of the alternatives may have had to be made.

Sensitivity analyses have been made in terms of the following:
1. pension retirement rate
2. growth rate of earnings levels
3. return on pension assets
4. near-future economic outlook.

A more optimistic and a more pessimistic long-term development compared to the baseline projection are presented of alternatives 1–3. Combined optimistic and pessimistic scenarios of these alternatives are also presented. In the optimistic scenario, low retirement rates and a rapid growth rate of earnings are combined with high investment returns. In the pessimistic scenario, on the other hand, high retirement rates and a slow growth rate of earnings are combined with low investment returns. It is unlikely that all external factors will develop in a favourable or an unfavourable manner. Nevertheless, the combined projections provide a notion of what could happen if several external factors were to develop more or less favourably than assumed in the baseline projection. The pessimistic and the optimistic scenarios are not extreme alternatives. First of all, the factors under review may deviate from the baseline projection to a higher degree than presented. Second, the demographic and the general employment development affect the financing and level of pensions.

The baseline projection assumptions of the near-future economic development are based on the forecast compiled in August 2011 on data available at that time. During the autumn, the uncertainty on the financial markets has risen and the risk of an unfavourable economic development has increased. A weaker than assumed economic outlook is described in the alternative projection, in which employment, the economic and earnings growth and investment returns are weaker in the next few years than in the baseline projection. However, in this alternative projection, the long-term development will converge to the baseline projection.

6.1 Pension retirement rate

In the baseline projection, the disability pension incidence rate will decrease from its current level by 5 per cent by 2025 and by 14 per cent by 2060. Correspondingly, the old-age pension retirement rate will decrease from the 2010 level by 15 per cent by 2025 and by 43 per cent by 2060. The retirement rates will not change after 2060.

The decreasing retirement rates reflect the population's improved health, higher educational level and changes in work tasks by which the share of physically strenuous jobs

will decrease. Furthermore, the increase in life expectancy will reduce the attractiveness of early retirement due to the life expectancy coefficient.

In the projection with a low retirement rate, the old-age retirement rate and the disability incidence rate will be reduced so that the expected effective retirement age will be 62.4 years in 2025. This will be achieved if the disability incidence rate is 33 per cent below and the old-age retirement rate is 40 per cent below the observed level in 2010. As of 2025, the changes in retirement rate are in line with the baseline projection.

In the projection with a high retirement rate, the old-age retirement rate and the disability incidence rate will remain at the 2010 level throughout the projection period. As legislated, unemployment pensions will be abolished in 2012, as will old-age pensions for under 63-year-olds related to the private-sector registered supplementary pension.

The changes in retirement rates will be reflected in the number of persons in the work force, although the effect of the retirement rates is greater on the number of pension recipients than on the number of persons in the work force. In the alternative projections, the retirement rates have been changed in the same way regardless of whether the persons are in employment or not. However, changes in the retirement rate affect employment only for those who retire directly from employment (Tables 6.1 and 6.2).

A reduction in the retirement rate will reduce pension expenditure and increase the average pension level and wage sum. As a result, the pension expenditure in relation to GDP and the pension contribution level will be reduced. The disability pension incidence rate affects the benefit level only to a minor degree.[12] A lower retirement rate due to disability than that in the baseline projection will lead to a smaller number of pension recipients and a larger wage sum. This, in turn, means that the pension expenditure ratio and the contribution rates will be permanently reduced. In the long term, due to the accelerated pension accrual rate of 4.5 per cent, the old-age retirement rate affects the pension expenditure only slightly. Instead, a low old-age retirement rate will increase while a high old-age retirement rate will reduce the average benefit level (Tables 6.1 and 6.2, Figures 6.1–6.3).

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12   The earnings-related pension includes a component for the projected pensionable service, which compensates the loss of benefit caused by disability. The national pension and the guarantee pension also compensate lost pension accrual due to disability.

Table 6.1.

Sensitivity analysis, low retirement rate, at 2010 prices.

6.1.1 The employed, pension recipients and the expected effective retirement age for 25-year-olds.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Employed (thousand)	2,312	2,370	2,383	2,381	2,388	2,440	2,463	2,468	2,507	2,526
Pension recipients (thousand)	1,323	1,420	1,513	1,591	1,667	1,734	1,783	1,870	1,942	2,004
Expected effective retirement age, years	60.4	61.2	61.8	62.4	62.6	62.8	63.1	63.3	63.3	63.3

6.1.2 Statutory pension expenditure.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Total pension expenditure, EUR bn	22.5	26.3	30.5	34.4	38.2	43.9	50.2	59.6	71.0	84.6
% of GDP	12.5	13.2	14.0	14.5	14.8	14.3	13.7	13.8	13.8	13.9

6.1.3 Average pension.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
EUR/month	1,370	1,498	1,633	1,749	1,850	2,039	2,268	2,571	2,944	3,401
% of average wage	50.0	51.9	52.0	51.3	50.0	47.1	44.6	42.9	41.9	41.2

6.1.4 TyEL wage sum, expenditure, contribution and assets.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Wage sum, EUR bn	48.4	52.8	57.8	62.9	68.6	82.6	98.6	116.7	139.4	165.4
Expenditure, % of wages	21.4	23.9	26.0	27.5	28.5	28.0	27.7	28.4	28.5	28.7
Contribution, % of wages	21.4	23.9	24.5	25.1	25.4	25.6	25.4	25.7	25.6	25.7
Assets, % of wages	191	186	193	197	196	194	200	207	210	215

Differences compared to baseline projection:

6.1.5 The employed, pension recipients and the expected effective retirement age for 25-year-olds.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Employed (thousand)	0	11	26	42	49	51	53	52	52	56
Pension recipients (thousand)	0	-13	-36	-60	-72	-75	-79	-77	-77	-79
Expected effective retirement age, years	0	0.4	0.8	1.2	1.3	1.3	1.2	1.2	1.2	1.2

6.1.6 Statutory pension expenditure.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Total pension expenditure, EUR bn	0	-0.2	-0.5	-0.8	-0.9	-0.7	-0.7	-0.7	-0.9	-1.1
% of GDP	0	-0.2	-0.4	-0.6	-0.6	-0.5	-0.5	-0.4	-0.4	-0.5

6.1.7 Average pension.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
EUR/month	0	0	7	19	33	51	62	68	73	80
% of average wage	0	0.0	0.2	0.6	0.9	1.2	1.3	1.2	1.1	1.0

6.1.8 TyEL wage sum, expenditure, contribution and assets.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Wage sum, EUR bn	0	0.2	0.5	0.9	1.1	1.5	1.8	2.2	2.7	3.5
Expenditure, % of wages	0	-0.3	-0.7	-1.1	-1.2	-0.9	-0.9	-0.8	-0.8	-0.8
Contribution, % of wages	0	-0.2	-0.7	-1.1	-1.1	-0.9	-0.8	-0.7	-0.7	-0.7
Assets, % of wages	0	-0.1	-1.4	-2.7	-3.4	-3.8	-4.0	-4.0	-4.2	-4.3

Table 6.2.

Sensitivity analysis, high retirement rate, at 2010 prices.

6.2.1 The employed, pension recipients and the expected effective retirement age for 25-year-olds.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Employed (thousand)	2,312	2,354	2,342	2,317	2,311	2,352	2,360	2,356	2,391	2,402
Pension recipients (thousand)	1,323	1,440	1,567	1,680	1,776	1,860	1,932	2,031	2,106	2,175
Expected effective retirement age, years	60.4	60.6	60.7	60.7	60.7	60.7	60.8	60.8	60.8	60.8

6.2.2 Statutory pension expenditure.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Total pension expenditure, EUR bn	22.5	26.6	31.3	35.6	39.4	45.1	51.6	61.1	72.4	86.3
% of GDP	12.5	13.4	14.5	15.4	15.8	15.1	14.7	14.8	14.7	14.9

6.2.3 Average pension.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
EUR/month	1,370	1,496	1,619	1,715	1,797	1,955	2,157	2,433	2,780	3,208
% of average wage	50.0	51.7	51.4	50.1	48.4	44.9	42.2	40.4	39.4	38.7

6.2.4 TyEL wage sum, expenditure, contribution and assets.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Wage sum, EUR bn	48.4	52.5	57.2	61.8	67.1	80.4	95.4	112.3	133.9	158.4
Expenditure, % of wages	21.4	24.2	27.0	28.9	30.1	29.6	29.3	30.0	29.9	30.1
Contribution, % of wages	21.4	24.1	25.4	26.5	27.0	26.9	26.8	27.1	26.9	27.1
Assets, % of wages	190.7	186.0	195.2	200.3	201.0	199.7	205.7	212.9	216.4	222.2

Differences compared to baseline projection:

6.2.5 The employed, pension recipients and the expected effective retirement age for 25-year-olds.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Employed (thousand)	0	-6	-15	-23	-28	-38	-50	-61	-64	-68
Pension recipients (thousand)	0	6	18	29	37	51	70	84	88	92
Expected effective retirement age, years	0	-0.2	-0.3	-0.5	-0.6	-0.8	-1.1	-1.3	-1.3	-1.3

6.2.6 Statutory pension expenditure.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Total pension expenditure, EUR bn	0	0.1	0.2	0.3	0.4	0.4	0.7	0.8	0.6	0.6
% of GDP	0	0.1	0.1	0.2	0.3	0.3	0.4	0.5	0.5	0.5

6.2.7 Average pension.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
EUR/month	0	-2	-7	-14	-20	-32	-49	-69	-91	-113
% of average wage	0	-0.1	-0.4	-0.6	-0.7	-0.9	-1.1	-1.3	-1.4	-1.5

6.2.8 TyEL wage sum, expenditure, contribution and assets.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Wage sum, EUR bn	0	0.0	-0.2	-0.3	-0.4	-0.8	-1.4	-2.1	-2.7	-3.6
Expenditure, % of wages	0	0.1	0.2	0.4	0.5	0.6	0.7	0.8	0.7	0.6
Contribution, % of wages	0	0.1	0.2	0.4	0.5	0.5	0.6	0.7	0.6	0.6
Assets, % of wages	0	0.1	0.4	0.8	1.3	2.0	2.0	2.0	2.2	2.9

Figure 6.1.

Statutory pension expenditure under different retirement rate assumptions 2010–2080, per cent of GDP.
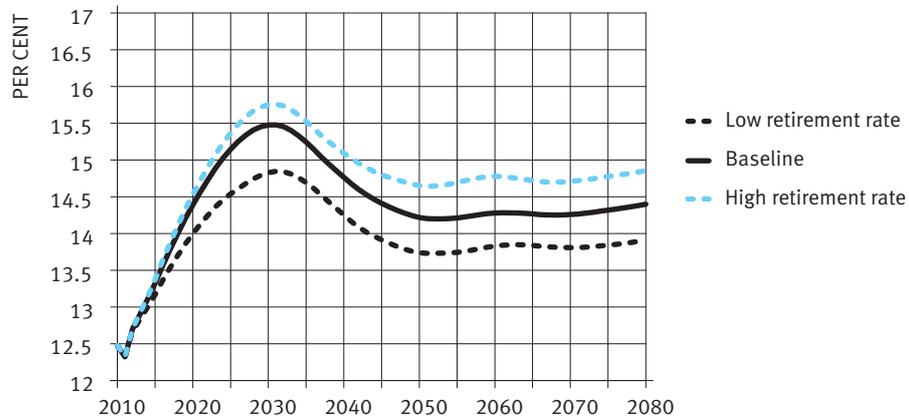
Figure 6.2.

Average pension under different retirement rate assumptions 2010–2080, per cent of average wage.
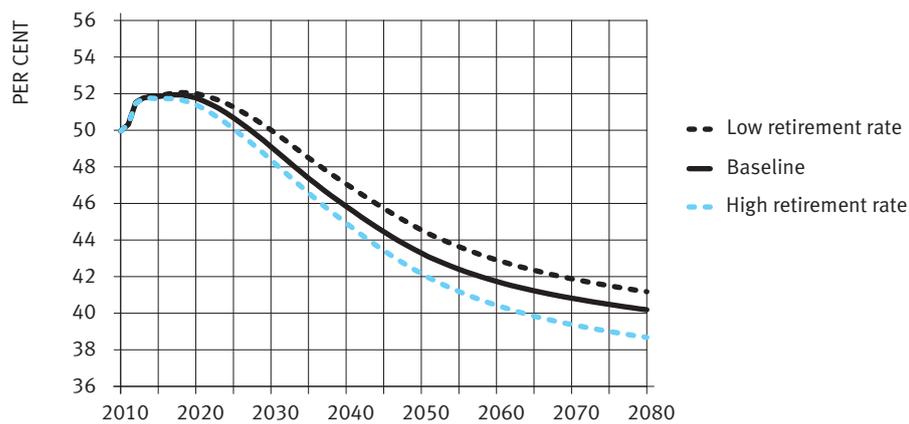
Figure 6.3.

TyEL contribution rate under different retirement rate assumptions 2010–2080, per cent of wage sum.
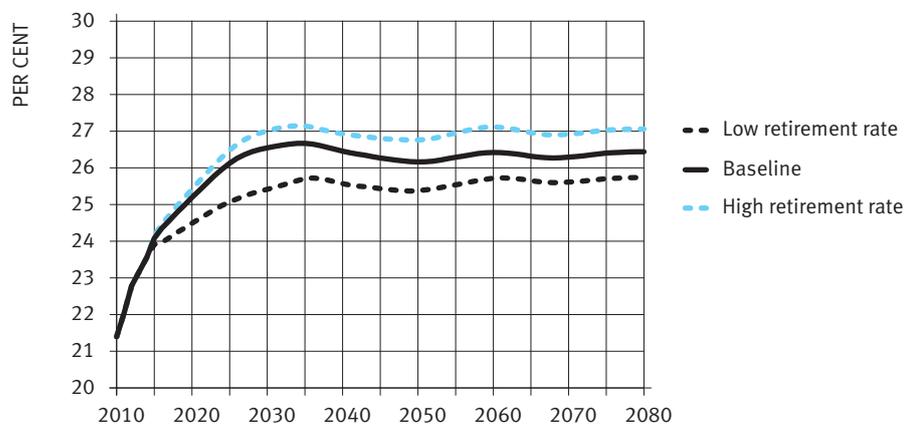
6.2 Growth in earnings level

In the baseline projection, the annual real growth rate in earnings as of 2013 is 1.6 per cent. In 2011 and 2012, the real earnings will grow by a total of 0.3 per cent. In the alternative projections, the expected growth rate of the baseline projection is applied until the end of 2012. After this, the projections go as follows:

1. In the *rapid growth* projection, the annual real growth rate of the earnings level is 2.1 per cent.
2. In the *slow growth* projection, the annual real growth rate of the earnings level is 1.1 per cent.

In the baseline projection, the earnings level will triple during 2010–2080. Compared to the starting level, the earnings level will more than double in the slow growth alternative, while it will grow more than four-fold in the rapid growth alternative. The differences in earnings levels explain the differences in wage sums between the various alternatives (Tables 6.3 and 6.4). The GDP share of earnings is equal in all growth alternatives.

A rapid growth of earnings increases the purchasing power of pensions. In the baseline projection, the average pension in 2080 is EUR 3,300/month (at 2010 prices), while it is EUR 4,300/month in the rapid growth alternative. Nevertheless, a rapid growth in earnings level reduces the pension levels in relation to the wage level and the pension expenditure in relation to the wage sum since the earnings related pension index and the wage coefficient only partly follow the earnings level.[13] The average pension in relation to the average wage falls 2.5 percentage points below the baseline projection. Similarly, the TyEL pension expenditure in relation to the wage sum falls nearly 2 percentage points below the baseline projection (Table 6.3 and Figures 6.4–6.6).

The growth in earnings level has a significantly smaller impact on the TyEL contribution rate than on the expenditure ratio (Tables 6.3 and 6.4). The contribution rate's relatively small dependency on the growth rate of earnings is related to the amount of pension assets, the investment return level and the growth rate of the earnings level. The part of the return on pension assets that exceeds the growth of the wage sum can be used permanently to finance pensions. Thus, as the earnings growth rate increases, a decreasing amount of investment returns are left to be used for the reduction of contributions. Therefore, if the TyEL scheme were fully funded, a faster growth of the earnings level would increase the required contribution level. In a purely PAYGO scheme, on the other hand, a faster growth in earnings would reduce the contribution rate and the expenditure ratio equally. In a partly funded scheme, a faster growth in earnings may increase or reduce the required contribution level.

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13   The national pensions and the guarantee pension follow consumer prices until 2015. As of 2016, they will follow the earnings level in full.

Table 6.3.

Sensitivity analysis, real growth of earnings level 2.1 per cent, at 2010 price levels.

6.3.1 The employed, pension recipients and the expected effective retirement age for 25-year-olds.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Employed (thousand)	2,312	2,359	2,357	2,340	2,339	2390	2,411	2,416	2,454	2,471
Pension recipients (thousand)	1,323	1,433	1,549	1,651	1,739	1,809	1,862	1,947	2,018	2,083
Expected effective retirement age, years	60.4	60.8	61.0	61.2	61.3	61.6	61.8	62.1	62.1	62.1

6.3.2 Statutory pension expenditure.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Total pension expenditure, EUR bn	22.5	26.6	31.5	36.2	40.7	48.2	57.7	71.7	89.5	112.2
% of GDP	12.5	13.2	14.0	14.6	14.8	13.9	13.4	13.4	13.4	13.5

6.3.3 Average pension.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
EUR/month	1,370	1,502	1,648	1,775	1,894	2,150	2,499	2,977	3,581	4,349
% of average wage	50.0	51.2	50.4	48.8	46.8	43.2	40.7	39.2	38.3	37.7

6.3.4 TyEL wage sum, expenditure, contribution and assets.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Wage sum, EUR bn	48.4	53.4	59.6	66.1	73.7	93.1	116.6	144.9	181.7	226.1
Expenditure, % of wages	21.4	23.9	26.0	27.5	28.2	27.3	26.8	27.3	27.3	27.6
Contribution, % of wages	21.4	23.9	24.8	25.5	25.8	25.7	25.4	25.6	25.5	25.6
Assets, % of wages	190.7	183.6	188.8	190.3	188.0	182.9	187.5	192.8	194.3	197.2

Differences compared to baseline projection:

6.3.5 The employed, pension recipients and the expected effective retirement age for 25-year-olds.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Employed (thousand)	0	0	0	0	0	0	0	0	0	0
Pension recipients (thousand)	0	0	0	0	0	0	0	0	0	0
Expected effective retirement age, years	0	0	0	0	0	0	0	0	0	0

6.3.6 Statutory pension expenditure.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Total pension expenditure, EUR bn	0	0.1	0.4	0.9	1.6	3.6	6.7	11.4	17.7	26.4
% of GDP	0	-0.2	-0.4	-0.6	-0.7	-0.9	-0.9	-0.9	-0.9	-0.9

6.3.7 Average pension.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
EUR/month	0	4	21	46	77	162	294	474	710	1028
% of average wage	0	-0.6	-1.3	-1.9	-2.3	-2.6	-2.6	-2.5	-2.5	-2.5

6.3.8 TyEL wage sum, expenditure, contribution and assets.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Wage sum, EUR bn	0	0.8	2.3	4.1	6.2	12.0	19.8	30.4	45.0	64.2
Expenditure, % of wages	0	-0.3	-0.7	-1.1	-1.4	-1.7	-1.8	-1.9	-1.9	-1.9
Contribution, % of wages	0	-0.20	-0.40	-0.60	-0.80	-0.80	-0.80	-0.80	-0.80	-0.80
Assets, % of wages	0	-2.3	-5.9	-9.1	-11.7	-14.7	-16.2	-18.0	-19.9	-22.1

Table 6.4.

Sensitivity analysis, real growth of earnings level 1.1 per cent, at 2010 price levels.

6.4.1 The employed, pension recipients and the expected effective retirement age for 25-year-olds.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Employed (thousand)	2,312	2,359	2,357	2,340	2,339	2,390	2,411	2,416	2,454	2,471
Pension recipients (thousand)	1,323	1,433	1,549	1,651	1,739	1,809	1,862	1,947	2,018	2,083
Expected effective retirement age, years	60.4	60.8	61.0	61.2	61.3	61.6	61.8	62.1	62.1	62.1

6.4.2 Statutory pension expenditure.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Total pension expenditure, EUR bn	22.5	26.4	30.7	34.4	37.5	41.3	45.0	50.8	57.7	65.6
% of GDP	12.5	13.5	14.8	15.7	16.2	15.7	15.2	15.2	15.2	15.4

6.4.3 Average pension.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
EUR/month	1,370	1,495	1,605	1,685	1,744	1,839	1,948	2,106	2,304	2,538
% of average wage	50.0	52.5	53.2	52.7	51.5	48.7	46.1	44.5	43.6	43.0

6.4.4 TyEL wage sum, expenditure, contribution and assets.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Wage sum, EUR bn	48.4	51.8	55.1	58.2	61.8	70.7	80.2	90.3	102.7	115.8
Expenditure, % of wages	21.4	24.5	27.5	29.7	31.2	30.9	30.6	31.2	31.4	31.7
Contribution, % of wages	21.4	24.3	25.6	26.8	27.4	27.3	26.9	27.2	27.1	27.2
Assets, % of wages	190.7	188.2	201.0	209.4	212.9	215.4	223.1	232.2	237.4	244.8

Differences compared to baseline projection:

6.4.5 The employed, pension recipients and the expected effective retirement age for 25-year-olds.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Employed (thousand)	0	0	0	0	0	0	0	0	0	0
Pension recipients (thousand)	0	0	0	0	0	0	0	0	0	0
Expected effective retirement age, years	0	0	0	0	0	0	0	0	0	0

6.4.6 Statutory pension expenditure.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Total pension expenditure, EUR bn	0	-0.1	-0.4	-0.9	-1.6	-3.3	-5.9	-9.5	-14.1	-20.2
% of GDP	0	0.2	0.4	0.6	0.8	0.9	0.9	1.0	1.0	1.0

6.4.7 Average pension.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
EUR/month	0	-4	-21	-44	-73	-149	-257	-397	-567	-783
% of average wage	0	0.7	1.4	2.0	2.4	2.8	2.8	2.8	2.8	2.8

6.4.8 TyEL wage sum, expenditure, contribution and assets.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Wage sum, EUR bn	0	-0.8	-2.2	-3.9	-5.7	-10.5	-16.5	-24.1	-34.0	-46.2
Expenditure, % of wages	0	0.3	0.7	1.2	1.5	1.9	2.0	2.1	2.1	2.2
Contribution, % of wages	0	0.2	0.4	0.7	0.9	0.8	0.7	0.8	0.8	0.8
Assets, % of wages	0	2.3	6.3	9.9	13.2	17.7	19.4	21.3	23.2	25.6

Figure 6.4.
Statutory pension expenditure at different growth rate assumptions 2010–2080, per cent of GDP.
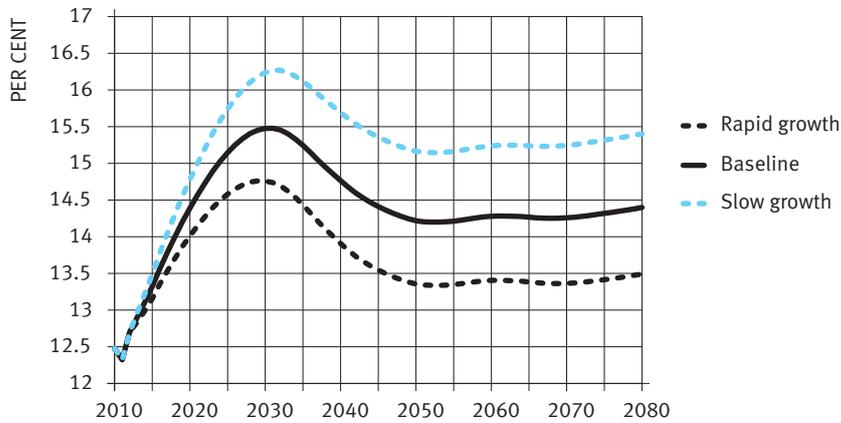
Figure 6.5.
Average pension under different growth rate assumptions 2010–2080, per cent of average wage.
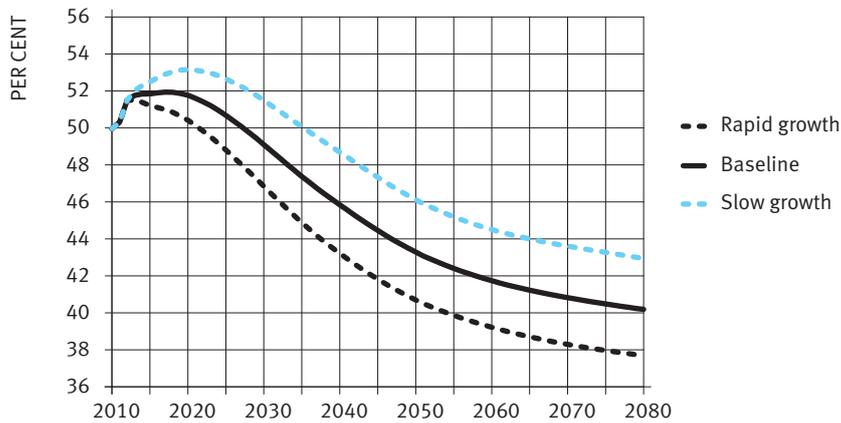
Figure 6.6.
TyEL expenditure under different growth rate assumptions 2010–2080, per cent of wage sum.
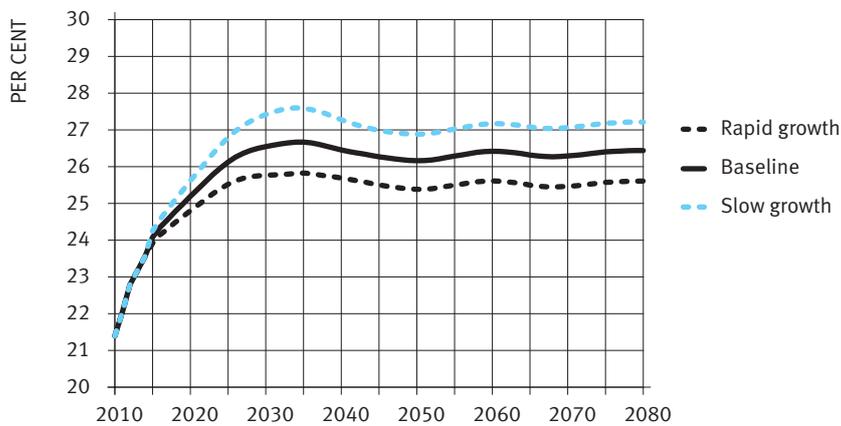
6.3 Return on pension assets

In the baseline projection, the expected real return on investments for 2011 is -6.7 per cent (nominal return -3.5 per cent). As of 2012, the assumed annual return is 3.5 per cent. In the alternative projections, the assumptions are as follows:

1. in the *low return* alternative, the expected return as of 2012 is 2.5 per cent
2. in the *high return* alternative, the expected return as of 2012 is 4.5 per cent.

The return on pension assets plays an important role in the long-term development of the TyEL contribution. A one-percentage-point additional return offers the possibility to reduce the TyEL contribution permanently by approximately two percentage points, while a one-percentage-point reduction in the return compared to the baseline projection would increase the pressure to raise the contribution rate by two percentage points. A one-percentage-point change in the returns affects the contribution rate by two percentage points because the amount of pension assets is approximately double compared to the wage sum (Tables 6.5 and 6.6).

The return on investments affects the pension expenditure and benefit level via the wage earner's pension contribution. High investment returns imply lower employee earnings-related pension contributions than presented in the baseline projection. This contribution is reduced from the employees' earnings that accrue pension. Thus, high investment returns indirectly increase pension expenditure. However, the impact of investment returns on expenditure and benefits is small. A one-percentage-point difference in investment returns affects the TyEL expenditure ratio in 2030 by +/- 0.1 percentage points. In 2080, the impact is +/- 0.3 percentage points (Tables 6.5 and 6.6 and Figures 6.7–6.9).

In all alternative return projections, the old-age pension liability supplements (see section 3.3) through investment returns are allocated until 2014 to those aged 55 and above and as of 2015 to those aged 65 and above.

Table 6.5.

Sensitivity analysis, real return on investments 4.5 per cent, at 2010 price levels.

6.5.1 The employed, pension recipients and the expected effective retirement age for 25-year-olds.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Employed (thousand)	2,312	2,359	2,357	2,340	2,339	2,390	2,411	2,416	2,454	2,471
Pension recipients (thousand)	1,323	1,433	1,549	1,651	1,739	1,809	1,862	1,947	2,018	2,083
Expected effective retirement age, years	60.4	60.8	61.0	61.2	61.3	61.6	61.8	62.1	62.1	62.1

6.5.2 Statutory pension expenditure.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Total pension expenditure, EUR bn	22.5	26.5	31.1	35.3	39.2	44.8	51.3	60.8	72.4	86.5
% of GDP	12.5	13.3	14.4	15.2	15.5	14.8	14.3	14.4	14.4	14.5

6.5.3 Average pension.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
EUR/month	1,370	1,498	1,627	1,732	1,822	1,998	2,222	2,524	2,898	3,352
% of average wage	50.0	51.8	51.8	50.8	49.2	46.1	43.6	42.1	41.2	40.6

6.5.4 TyEL wage sum, expenditure, contribution and assets.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Wage sum, EUR bn	48.4	52.6	57.3	62.0	67.5	81.2	96.7	114.5	136.7	162.0
Expenditure, % of wages	21.4	24.2	26.7	28.6	29.7	29.2	28.8	29.5	29.6	29.9
Contribution, % of wages	21.4	24.0	24.6	25.1	25.1	24.2	23.9	24.1	24.0	24.1
Assets, % of wages	190.7	191.2	208.6	220.6	226.6	229.3	236.7	246.0	251.7	260.4

Differences compared to baseline projection:

6.5.5 The employed, pension recipients and the expected effective retirement age for 25-year-olds.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Employed (thousand)	0	0	0	0	0	0	0	0	0	0
Pension recipients (thousand)	0	0	0	0	0	0	0	0	0	0
Expected effective retirement age, years	0	0	0	0	0	0	0	0	0	0

6.5.6 Statutory pension expenditure.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Total pension expenditure, EUR bn	0	0.0	0.0	0.1	0.1	0.2	0.4	0.5	0.6	0.8
% of GDP	0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1

6.5.7 Average pension.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
EUR/month	0	0	1	3	5	11	16	22	26	31
% of average wage	0	0.0	0.0	0.1	0.1	0.2	0.3	0.4	0.4	0.4

6.5.8 TyEL wage sum, expenditure, contribution and assets.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Wage sum, EUR bn	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditure, % of wages	0	0.0	0.0	0.0	0.1	0.2	0.3	0.3	0.3	0.3
Contribution, % of wages	0	-0.1	-0.6	-1.0	-1.5	-2.3	-2.3	-2.3	-2.3	-2.3
Assets, % of wages	0	5.3	13.8	21.2	27.0	31.6	33.0	35.2	37.5	41.1

Table 6.6.

Sensitivity analysis, real return on investments 2.5 per cent, at 2010 price levels.

6.6.1 The employed, pension recipients and the expected effective retirement age for 25-year-olds.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Employed (thousand)	2,312	2,359	2,357	2,340	2,339	2,390	2,411	2,416	2,454	2,471
Pension recipients (thousand)	1,323	1,433	1,549	1,651	1,739	1,809	1,862	1,947	2,018	2,083
Expected effective retirement age, years	60.4	60.8	61.0	61.2	61.3	61.6	61.8	62.1	62.1	62.1

6.6.2 Statutory pension expenditure.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Total pension expenditure, EUR bn	22.5	26.5	31.1	35.2	39.0	44.4	50.7	59.9	71.3	85.2
% of GDP	12.5	13.3	14.4	15.1	15.4	14.7	14.1	14.2	14.2	14.3

6.6.3 Average pension.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
EUR/month	1,370	1,498	1,625	1,727	1,813	1,979	2,193	2,486	2,851	3,298
% of average wage	50.0	51.8	51.7	50.6	49.0	45.6	43.0	41.5	40.5	39.9

6.6.4 TyEL wage sum, expenditure, contribution and assets.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Wage sum, EUR bn	48.4	52.6	57.3	62.0	67.5	81.2	96.7	114.5	136.7	162.0
Expenditure, % of wages	21.4	24.2	26.7	28.5	29.6	28.8	28.4	28.9	29.0	29.3
Contribution, % of wages	21.4	24.2	25.7	27.0	27.9	28.3	27.9	28.2	28.1	28.2
Assets, % of wages	190.7	180.7	181.8	180.2	176.3	172.3	177.4	183.1	184.9	187.9

Differences compared to baseline projection:

6.6.5 The employed, pension recipients and the expected effective retirement age for 25-year-olds.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Employed (thousand)	0	0	0	0	0	0	0	0	0	0
Pension recipients (thousand)	0	0	0	0	0	0	0	0	0	0
Expected effective retirement age, years	0	0	0	0	0	0	0	0	0	0

6.6.6 Statutory pension expenditure.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Total pension expenditure, EUR bn	0	0.0	0.0	0.0	-0.1	-0.2	-0.3	-0.4	-0.5	-0.6
% of GDP	0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.1

6.6.7 Average pension.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
EUR/month	0	0	-1	-3	-4	-9	-13	-17	-20	-23
% of average wage	0	0.0	0.0	-0.1	-0.1	-0.2	-0.3	-0.3	-0.3	-0.3

6.6.8 TyEL wage sum, expenditure, contribution and assets.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Wage sum, EUR bn	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditure, % of wages	0	0.0	0.0	0.0	-0.1	-0.2	-0.2	-0.2	-0.3	-0.3
Contribution, % of wages	0	0.1	0.5	0.9	1.3	1.8	1.8	1.8	1.8	1.8
Assets, % of wages	0	-5.2	-13.0	-19.2	-23.4	-25.4	-26.3	-27.8	-29.3	-31.4

Figure 6.7.
Statutory pension expenditure at different return assumptions 2010−2080, per cent of GDP.
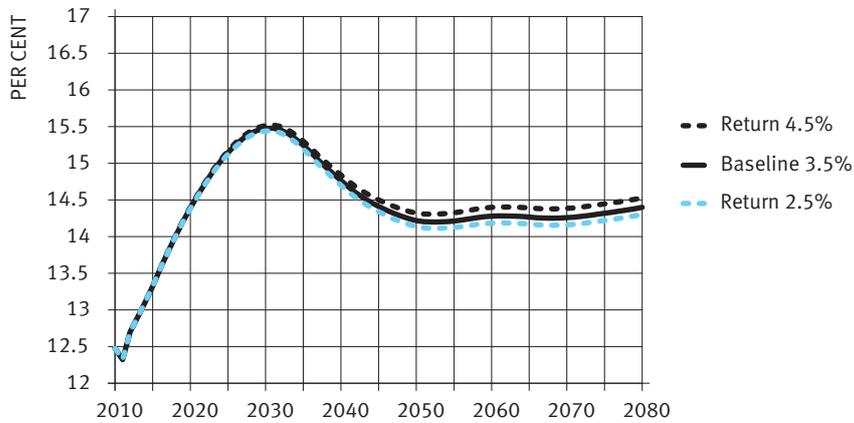
Figure 6.8.
Average pension at different return assumptions 2010−2080, per cent of average wage.
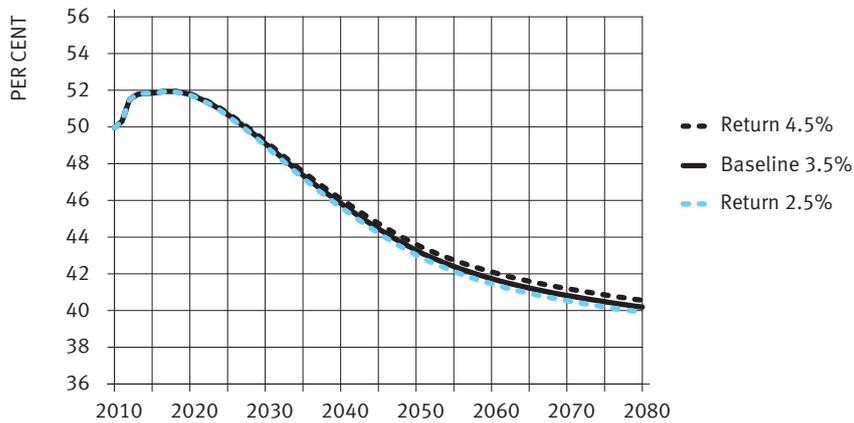
Figure 6.9.
TyEL contribution at different return assumptions 2010−2080, per cent of wage sum.
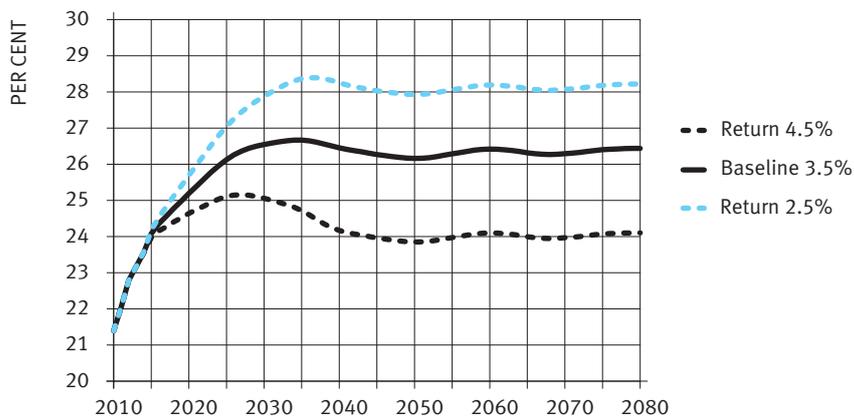
6.4 Optimistic and pessimistic scenario

In the optimistic scenario, the low retirement rate, the rapid growth in earnings level and the high investment returns from the earlier sensitivity analyses are combined. In the pessimistic scenario, on the other hand, the high retirement rate and the slow growth of the earnings level are combined with low investment returns.

The economic growth and the investment returns of the optimistic scenario correspond roughly to the realised development in Finland in 1997–2010 (Table 4.3).

In the optimistic scenario, all three factors (low retirement rate, rapid growth of earnings level and high investment return) decrease the relative expenditure and contribution levels. In the long term, the statutory pension expenditure will settle at approximately 13 per cent of GDP, i.e. at an ample one percentage point below the baseline projection. Correspondingly, the TyEL expenditure in relation to the wage sum will end up more than two percentage points below and the TyEL contribution rate at approximately 3.5 percentage points below the baseline projection. Nevertheless, the relative benefit level will not change much in the optimistic scenario compared to the baseline scenario. The rapid growth in earnings reduces while the low retirement rate increases the relative benefit level. Correspondingly, the relative level of expenditure and contributions in the pessimistic scenario increases due to the combined effect of various factors. The GDP share of expenditure will settle at slightly less than 16 per cent and the TyEL contribution at 30 per cent of wages. In the pessimistic scenario, the average pension in relation to the average wage is slightly higher than in the baseline projection (Tables 6.7 and 6.8 and Figures 6.10 to 6.12).

The differences between the optimistic and the pessimistic alternatives and the baseline projection deviate only slightly from the sum of the separate calculations. The largest deviance concerns the development of the TyEL contribution. In the optimistic scenario, the TyEL contribution rate in 2080 is 3.4 percentage points below the baseline projection. As the sum of the separate calculations, the TyEL contribution is 3.8 percentage points below the baseline projection. In the pessimistic alternative, the TyEL contribution is 3.5 percentage points above the baseline projection. As the sum of the separate calculations, the contribution is 3.2 percentage points above the baseline projection.

Table 6.7.

Sensitivity analysis, optimistic scenario, at 2010 price levels.

6.7.1 The employed, pension recipients and the expected effective retirement age for 25-year-olds.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Employed (thousand)	2,312	2,370	2,383	2,381	2,388	2,440	2,463	2,468	2,507	2,526
Pension recipients (thousand)	1,323	1,420	1,513	1,591	1,667	1,734	1,783	1,870	1,942	2,004
Expected effective retirement age, years	60.4	61.2	61.8	62.4	62.6	62.8	63.1	63.3	63.3	63.3

6.7.2 Statutory pension expenditure.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Total pension expenditure, EUR bn	22.5	26.4	30.9	35.4	39.9	47.7	57.3	71.4	89.2	111.6
% of GDP	12.5	13.0	13.6	14.0	14.2	13.5	13.0	13.1	13.0	13.1

6.7.3 Average pension.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
EUR/month	1,370	1,502	1,655	1,797	1,933	2,217	2,589	3,083	3,702	4,490
% of average wage	50.0	51.2	50.7	49.4	47.8	44.6	42.2	40.7	39.6	38.9

6.7.4 TyEL wage sum, expenditure, contribution and assets.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Wage sum, EUR bn	48.4	53.5	60.1	67.1	75.0	94.8	118.8	147.7	185.3	231.0
Expenditure, % of wages	21.4	23.6	25.3	26.5	27.2	26.5	26.2	26.8	26.9	27.1
Contribution, % of wages	21.4	23.8	23.7	23.5	23.2	22.8	22.7	23.0	22.9	23.1
Assets, % of wages	190.7	188.9	201.4	208.6	210.2	206.1	211.4	218.4	221.8	227.6

Differences compared to baseline projection:

6.7.5 The employed, pension recipients and the expected effective retirement age for 25-year-olds.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Employed (thousand)	0	11	26	42	49	51	53	52	52	56
Pension recipients (thousand)	0	-13	-36	-60	-72	-75	-79	-77	-77	-79
Expected effective retirement age, years	0	0.4	0.8	1.2	1.3	1.3	1.2	1.2	1.2	1.2

6.7.6 Statutory pension expenditure.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Total pension expenditure, EUR bn	0	-0.1	-0.1	0.1	0.8	3.1	6.3	11.1	17.3	25.9
% of GDP	0	-0.3	-0.8	-1.1	-1.3	-1.3	-1.2	-1.2	-1.2	-1.3

6.7.7 Average pension.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
EUR/month	0	4	29	68	116	230	383	581	831	1,169
% of average wage	0	-0.6	-1.1	-1.3	-1.3	-1.2	-1.1	-1.1	-1.2	-1.2

6.7.8 TyEL wage sum, expenditure, contribution and assets.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Wage sum, EUR bn	0	0.9	2.8	5.0	7.5	13.6	22.1	33.2	48.6	69.0
Expenditure, % of wages	0	-0.6	-1.4	-2.1	-2.5	-2.5	-2.4	-2.3	-2.4	-2.4
Contribution, % of wages	0	-0.3	-1.5	-2.6	-3.4	-3.6	-3.5	-3.4	-3.4	-3.4
Assets, % of wages	0	3.0	6.7	9.1	10.5	8.5	7.7	7.5	7.6	8.4

Table 6.8.

Sensitivity analysis, pessimistic scenario, at 2010 price levels.

6.8.1 The employed, pension recipients and the expected effective retirement age for 25-year-olds.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Employed (thousand)	2,312	2,354	2,342	2,317	2,311	2,352	2,360	2,356	2,391	2,402
Pension recipients (thousand)	1,323	1,440	1,567	1,680	1,776	1,860	1,932	2,031	2,106	2,175
Expected effective retirement age, years	60.4	60.6	60.7	60.7	60.7	60.7	60.8	60.8	60.8	60.8

6.8.2 Statutory pension expenditure.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Total pension expenditure, EUR bn	22.5	26.5	30.9	34.6	37.8	41.5	45.3	51.1	57.7	65.6
% of GDP	12.5	13.5	14.9	15.9	16.5	16.0	15.5	15.7	15.6	15.8

6.8.3 Average pension.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
EUR/month	1,370	1,493	1,598	1,669	1,720	1,799	1,893	2,032	2,214	2,434
% of average wage	50.0	52.4	52.8	52.0	50.6	47.5	44.6	42.8	41.8	41.0

6.8.4 TyEL wage sum, expenditure, contribution and assets.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Wage sum, EUR bn	48.4	51.8	54.9	57.9	61.4	70.0	79.1	88.6	100.6	113.2
Expenditure, % of wages	21.4	24.5	27.7	30.1	31.6	31.3	31.1	31.8	31.8	32.1
Contribution, % of wages	21.4	24.3	26.3	28.1	29.4	29.8	29.6	30.0	29.8	29.9
Assets, % of wages	190.7	182.8	187.3	188.9	188.1	189.2	196.0	203.2	206.2	210.7

Differences compared to baseline projection:

6.8.5 The employed, pension recipients and the expected effective retirement age for 25-year-olds.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Employed (thousand)	0	-6	-15	-23	-28	-38	-50	-61	-64	-68
Pension recipients (thousand)	0	6	18	29	37	51	70	84	88	92
Expected effective retirement age, years	0	-0.2	-0.3	-0.5	-0.6	-0.8	-1.1	-1.3	-1.3	-1.3

6.8.6 Statutory pension expenditure.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Total pension expenditure, EUR bn	0	0.0	-0.2	-0.6	-1.3	-3.1	-5.6	-9.2	-14.1	-20.2
% of GDP	0	0.2	0.5	0.8	1.0	1.2	1.3	1.4	1.4	1.4

6.8.7 Average pension.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
EUR/month	0	-5	-29	-61	-97	-188	-313	-470	-657	-887
% of average wage	0	0.5	1.0	1.3	1.5	1.6	1.3	1.0	0.9	0.9

6.8.8 TyEL wage sum, expenditure, contribution and assets.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Wage sum, EUR bn	0	-0.8	-2.4	-4.1	-6.1	-11.2	-17.7	-25.8	-36.1	-48.7
Expenditure, % of wages	0	0.4	1.0	1.5	1.9	2.3	2.5	2.7	2.5	2.5
Contribution, % of wages	0	0.2	1.1	2.0	2.8	3.4	3.4	3.5	3.5	3.5
Assets, % of wages	0	-3.1	-7.5	-10.5	-11.6	-8.5	-7.7	-7.6	-8.0	-8.6

Figure 6.10.

Statutory pension expenditure in combined alternatives 2010–2080, per cent of GDP.
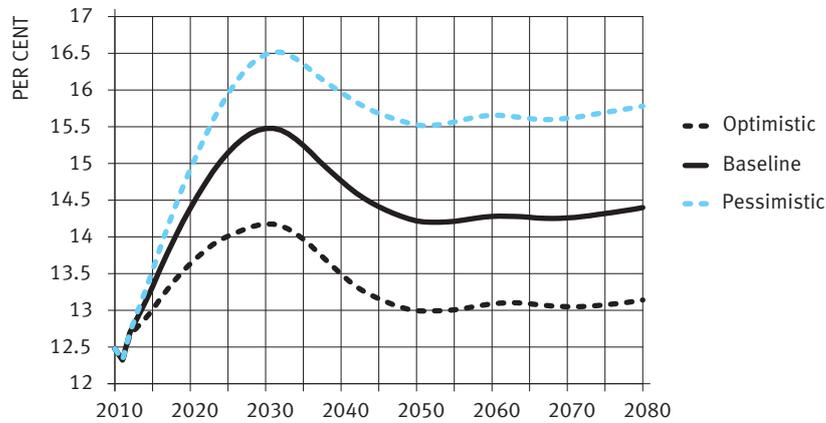
Figure 6.11.

Average pension in combined alternatives 2010–2080, per cent of average wage.
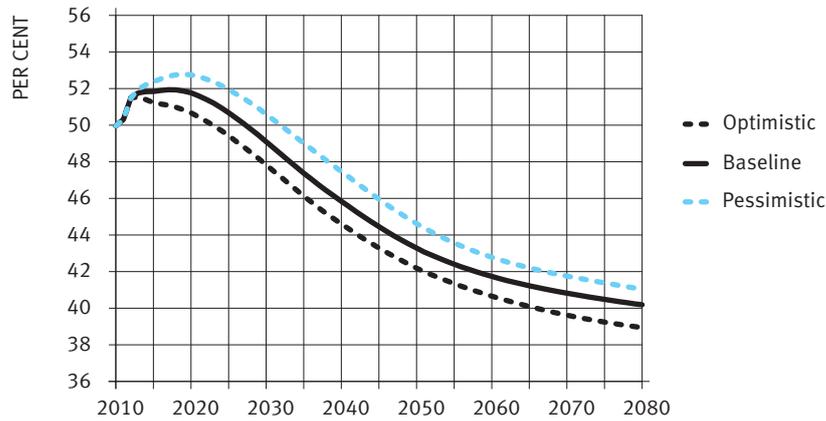
Figure 6.12.

TyEL contribution in combined alternatives 2010–2080, per cent of wage sum.
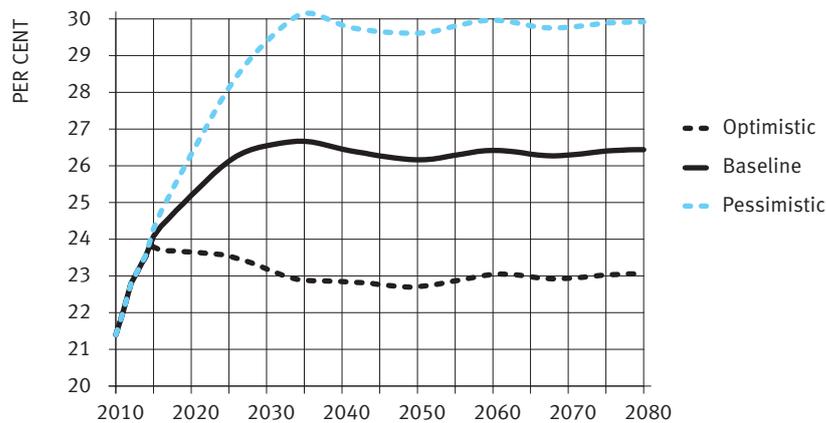
6.5 Economic outlook in the 2010s

The baseline projection assumptions of the near-future economic outlook are based on the forecast compiled in August 2011. During the autumn, the uncertainty on the financial markets has increased and the risk of an unfavourable economic outlook is higher.

A weaker near-future economic outlook than that presented in the baseline projection is described in an alternative projection, in which the growth in employment, earnings level and investment returns deviate from those in the baseline projection:

1. The employment rate will decrease until 2013, when it will be 66.8 per cent, i.e. three percentage points below the baseline projection. After this, employment will improve steadily, reaching the employment rate presented in the baseline projection in 2020.
2. The real growth rate of earnings will be zero in 2012–2014. After this, the real growth rate of earnings will converge to the baseline projection at 1.6 per cent per year.
3. In 2011 and 2012, the investment returns will remain 3 percentage points below the baseline projection, i.e. the real return in 2011 and 2012 will be -9.7 per cent and 0.5 per cent respectively. After this, the real return on investments will converge to the baseline projection at 3.5 per cent.

The wage sum and GDP will decrease from the 2011 level by 2.5 per cent by 2013. The 2011 production level will be reached again in 2015. In relation to the baseline projection, production will decrease at most by approximately 8 per cent. In the long run, the production volume will remain at about 4 per cent below the baseline projection.

The recession reduces pension expenditure but, in relation to the wage sum and GDP, the pension expenditure will increase since earnings and production are reduced more than pension expenditure is. At its most, the pension expenditure share in GDP will grow to be almost one percentage point above the baseline projection. As employment returns to the baseline level, the relative pension expenditure ratio will approach the baseline level, but the difference will not be levelled out completely until the 2030s. As a long-term consequence of the recession, both the pension expenditure and production volume will remain approximately 4 per cent below the baseline projection.

The TyEL contribution rate will react with a delay to the recession since the contribution rate level has been fixed until the year 2014. In 2016–2030, the TyEL contribution will be, on average, circa one percentage point above the baseline projection. After this, the contribution rate will converge to the baseline projection (Table 6.9 and Figures 6.13–6.15).

Table 6.9.

Sensitivity analysis, economic outlook in the 2010s, at 2010 price levels.

6.9.1 The employed, pension recipients and the expected effective retirement age for 25-year-olds.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Employed (thousand)	2,312	2,286	2,357	2,340	2,339	2,390	2,411	2,416	2,454	2,471
Pension recipients (thousand)	1,323	1,434	1,548	1,649	1,736	1,807	1,861	1,947	2,019	2,083
Expected effective retirement age, years	60.4	60.7	61.0	61.2	61.3	61.6	61.8	62.1	62.1	62.1

6.9.2 Statutory pension expenditure.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Total pension expenditure, EUR bn	22.5	26.3	30.5	34.5	38.0	43.2	49.1	58.2	69.4	82.9
% of GDP	12.5	14.2	14.7	15.3	15.6	14.8	14.2	14.3	14.3	14.4

6.9.3 Average pension.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
EUR/month	1,370	1,483	1,599	1,691	1,770	1,924	2,128	2,413	2,773	3,211
% of average wage	50.0	53.6	53.0	51.6	49.8	46.2	43.4	41.9	41.0	40.4

6.9.4 TyEL wage sum, expenditure, contribution and assets.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Wage sum, EUR bn	48.4	48.8	55.0	59.6	64.9	78.0	93.0	110.0	131.4	155.7
Expenditure, % of wages	21.4	25.8	27.3	29.0	29.9	29.0	28.5	29.0	29.1	29.5
Contribution, % of wages	21.4	24.4	26.3	27.2	27.5	26.4	26.1	26.4	26.3	26.5
Assets, % of wages	190.7	183.1	184.8	191.8	195.1	195.5	201.0	208.5	212.7	218.4

Differences compared to baseline projection:

6.9.5 The employed, pension recipients and the expected effective retirement age for 25-year-olds.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Employed (thousand)	0	-73	0	0	0	0	0	0	0	0
Pension recipients (thousand)	0	1	-1	-2	-3	-2	-2	0	0	0
Expected effective retirement age, years	0	0	0	0	0	0	0	0	0	0

6.9.6 Statutory pension expenditure.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Total pension expenditure, EUR bn	0	-0.2	-0.5	-0.8	-1.1	-1.5	-1.8	-2.2	-2.5	-2.8
% of GDP	0	0.8	0.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0

6.9.7 Average pension.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
EUR/month	0	-15	-28	-38	-47	-63	-78	-90	-99	-109
% of average wage	0	1.7	1.3	0.9	0.7	0.3	0.2	0.1	0.2	0.2

6.9.8 TyEL wage sum, expenditure, contribution and assets.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Wage sum, EUR bn	0	-3.8	-2.4	-2.4	-2.6	-3.1	-3.7	-4.4	-5.3	-6.3
Expenditure, % of wages	0	1.6	0.6	0.4	0.2	0.0	-0.1	-0.1	-0.1	0.0
Contribution, % of wages	0	0.3	1.1	1.1	0.9	0.0	-0.1	0.0	0.0	0.0
Assets, % of wages	0	-2.8	-10.0	-7.6	-4.5	-2.2	-2.7	-2.4	-1.5	-0.9

Figure 6.13.

Statutory pension expenditure in the recession and the baseline projections 2010–2080, per cent of GDP.
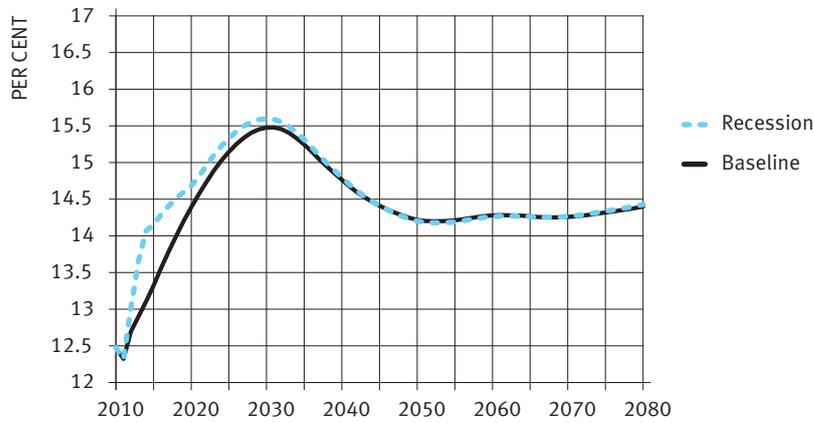
Figure 6.14.

Average pension in the recession and the baseline projections 2010–2080, per cent of average wage.
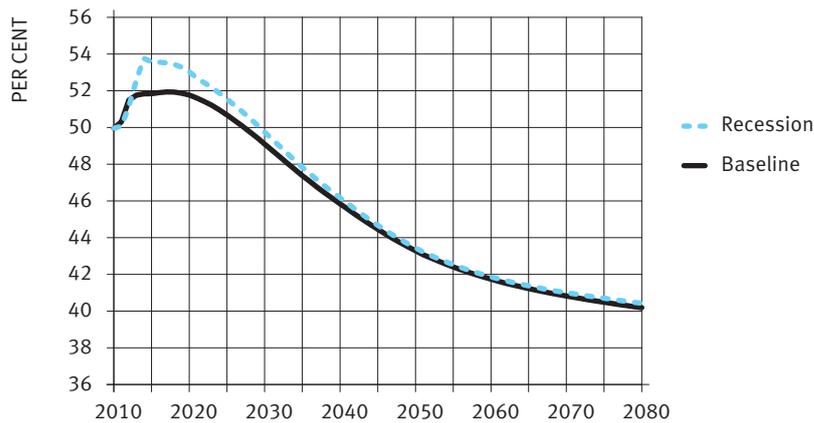
Figure 6.15.

TyEL contribution in the recession and the baseline projections 2010–2080, per cent of wage sum.
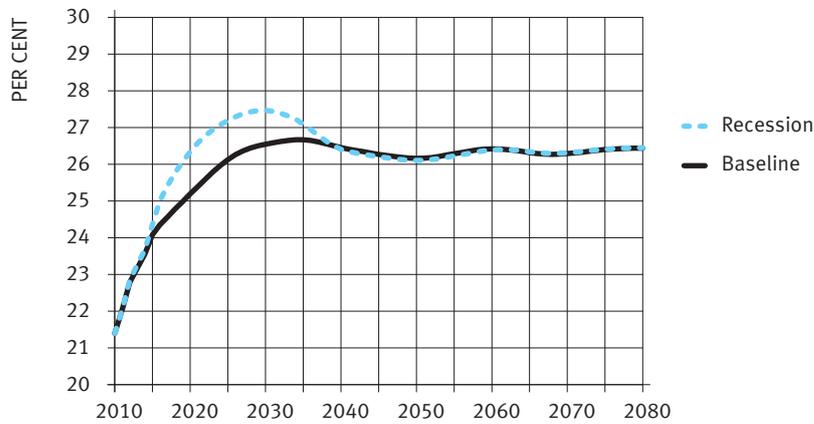
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APPENDICES

Appendix 1: Indexation of the national pension and the guarantee pension to consumer prices

In the baseline projection, the indexation of the national pension and the guarantee pension follows consumer prices until 2015 and earnings level as of 2016. In the development of statutory pension expenditure presented in Table A.1, the indexing of the national pension and the guarantee pension follows the development of consumer prices until 2080, the end of the projection period. The equivalent results of the baseline projection are shown in Table 5.2.[14]

The level of the earnings-related pension is linked to the earnings-level through accrual rates, the wage coefficient and the pension index. The national pension and the guarantee pension, on the other hand, are reduced as the earnings-related pension increases. Without increases to the benefit level, the national and guarantee pension benefit expenditure will shrink from EUR 2.5 billion in 2010 to EUR 1.5 billion in 2080. In relation to GDP, the decrease is even fiercer: from 1.5 per cent to 0.3 per cent. If the projection was continued under the same assumptions, the share of national and guarantee pension expenditure in GDP would shrink continuously.

Table A.1.
The national pension and the guarantee pension indexed to consumer prices, at 2010 price levels.

A.1.1 GDP, earnings, employed and average earnings.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
GDP, EUR bn	180.3	198.9	216.0	232.9	252.5	302.2	358.3	422.6	503.7	595.6
Earnings sum, EUR bn	76.1	81.8	88.8	95.8	103.9	124.3	147.4	173.8	207.2	245.0
Employed (thousand)	2,312	2,359	2,357	2,340	2,339	2,390	2,411	2,416	2,454	2,471
Average earnings, EUR/month	2,741	2,890	3,142	3,412	3,700	4,335	5,096	5,996	7,034	8,264

A.1.2 Pension expenditure, EUR bn.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Total expenditure	22.5	26.5	30.9	34.8	38.4	43.2	48.8	57.1	67.3	79.7
Earnings-related pensions	19.5	23.5	27.9	31.9	35.4	40.2	45.8	54.0	64.1	76.2
National and guarantee pensions	2.5	2.5	2.4	2.3	2.2	2.1	1.9	1.7	1.6	1.5
SOLITA pensions	0.5	0.5	0.6	0.7	0.7	0.9	1.1	1.3	1.6	1.9

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14   According to the law, the national pension and the guarantee pension are indexed to consumer prices. The baseline projection anticipates future legislative amendments with which the continuous lagging behind of smaller pensions will be prevented.

A1.3 Pension expenditure, per cent of GDP.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Total expenditure	12.5	13.3	14.3	15.0	15.2	14.3	13.6	13.5	13.4	13.4
Earnings-related pensions	10.8	11.8	12.9	13.7	14.0	13.3	12.8	12.8	12.7	12.8
National and guarantee pensions	1.4	1.3	1.1	1.0	0.9	0.7	0.5	0.4	0.3	0.3
SOLITA pensions	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3

A.1.4 Pension recipients and average pension.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Pension recipients (thousand)	1,323	1,433	1,549	1,651	1,739	1,809	1,862	1,947	2,018	2,083
Average pension, all, EUR/month	1,370	1,498	1,617	1,709	1,785	1,928	2,114	2,374	2,697	3,095
of which earnings-related pension EUR/month	1,201	1,341	1,475	1,578	1,661	1,810	2,002	2,265	2,589	2,984
% of average wage	50.0	51.8	51.5	50.1	48.2	44.5	41.5	39.6	38.3	37.4

Appendix 2:   Fixed TyEL contribution as of 2012

The baseline projection illustrates the future development of the TyEL contribution according to current legislation. An alternative way to assess the need to raise the TyEL contribution rate is to find a fixed contribution rate level, which would enable the financing of TyEL expenditure from 2012 until 2080, the end of the projection period. In addition, there must be an adequate amount of assets at the end of the projection period to maintain the same contribution level after that.

The adequate amount of the assets depends on the demographic and economic development after 2080. In the following, the adequacy is assessed with a contribution rate that results in a stable ratio between the assets and the wage sum during the last decades of the projection period. In this case, the key variables – wage sum, pension expenditure, contribution income and assets – grow at a similar pace in relation to each other, and the contribution level can be assessed to be adequate also for the post-projection period.

According to these conditions, an adequate TyEL contribution level as of 2012 would be 25.9 per cent. Table A.2 includes pension assets and cash flows according to a fixed contribution calculation.

According to the 2009 long-term projection, an adequate contribution level as of 2010 was 25.4 per cent. The increase in contribution level is mainly due to the reduction of the investment return assumption from 4.0 per cent to 3.5 per cent. On the other hand, the realised high investment returns in 2009 and 2010 reduce the contribution rate level. In addition, the fixed TyEL contribution rate was presented in the 2009 report without the items "other contribution income" and "other expenditure" of Table A.2. These items reduce the net amount of the TyEL contribution by 0.2–0.5 per cent of the wage sum. Incorporating these items into the calculation makes it easier to compare the fixed contribution rate with the contribution rate of the baseline projection.

Table A.2.
Fixed TyEL contribution as of 2012. Assets and cash flow, per cent of wage sum, wage sum at 2010 price levels.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Wage sum, EUR million	48,373	52,589	57,311	62,042	67,501	81,185	96,741	114,463	136,685	161,952
Assets 1 Jan.	172.8	185.7	203.8	212.8	213.2	206.2	209.8	214.9	214.7	215.2
TyEL contribution income	21.4	25.9	25.9	25.9	25.9	25.9	25.9	25.9	25.9	25.9
Other contribution income*	1.0	0.9	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Return on investments	18.3	9.8	10.7	11.1	11.1	10.8	11.0	11.2	11.2	11.2
TyEL pension expenditure	-21.4	-24.2	-26.7	-28.5	-29.6	-29.0	-28.6	-29.2	-29.3	-29.6
Other expenditure**	-0.7	-0.6	-0.5	-0.4	-0.4	-0.3	-0.2	-0.2	-0.1	-0.1
Administrative expenses	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7
Assets 31 Dec.	190.7	196.9	213.2	220.6	220.1	213.5	217.7	222.5	222.3	222.5

* Contribution from the Unemployment Insurance Fund and TEL supplementary provision.
** Supplementary provision under TEL, contribution losses, net expense caused by MEL in the TyEL-MEL pooling and a transition contribution to the State.

Appendix 3: Value of accrued pension entitlements

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 the pensions accrued to a particular point in time is the amount of money which would be enough to cover the pensions accrued by that particular point in time.

When assessing the value of the accrued pensions, the return received for the assets (the discount rate) must be taken into consideration. In addition, a line between which pension components are to be interpreted as accrued in the past and which in the future must be drawn. In the following projection, the starting point for drawing the line is a fictive situation in which all already accrued pensions would be paid to the insured but no new pensions would accrue for anyone. The following pension components are considered to have been accrued in the past:

1. All earnings-related pensions already in payment, including 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 include future adjustments with the wage coefficient, the life expectancy coefficient and the earnings-related pension index.

The pension expenditure based on 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 5. Thus, among other things, the future disability pension expenditure is interpreted as accrued pensions as far as the pension amount is based on an already realised employment history.

Pensions accrued in the past do not include pension components that will accrue based on future work or future periods of social benefits. Similarly, the pension component for future projected disability pensions or future part-time pensions are not calculated as already accrued pensions.

The interest used to discount future pensions has a substantial impact on the value of accrued pensions. Table A.3.1 presents the value of accrued pensions, using a real discount rate of 3.5 per cent. This interest rate corresponds to the expected asset return in the baseline projection. The total value of earnings-related pensions accrued by the end of 2009 was EUR 505.7 billion, which is nearly three times the amount of GDP in 2009 (EUR 173.3 bn). In 2010, EUR 19.3 billion of the pensions were paid.[15] New pensions were accrued to the value of EUR 16.0 billion. The passing of time means that the previously accrued pensions are nearing their time of payment, which means that their value increases due to the interest factor (EUR 23.9 bn). By adding up the pensions accrued by the end of 2009, the pensions

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15   The total earnings-related pension expenditure for 2010 was EUR 19.5 billion (Table 5.1). The accrual calculation does not include the supplementary pension under TEL, so the pension expenditure accounts for EUR 19.3 billion.

accrued during the year and the impact of the interest factor, and by deducting the pensions paid during the year, the value of the accrued pensions by the end of 2010 (EUR 526.4 bn) is received. The same result would be achieved by counting the current value of pensions accrued as of the end of 2010.

Table A.3.2 presents the same results as those in Table A.3.1, with the exception that that future pension expenditure has been discounted by a real interest rate of 2.5 per cent. According to this projection, the value of accrued pension entitlements by the end of 2009 (EUR 599.6 bn) is slightly below the corresponding value in the 2009 report (EUR 610.3 bn). The new projections include updated information on the amount of accrued pensions, pensions in payment and retirement rates.

Table A.3.1.

Value of accrued pension rights and pension assets 2009–2010, discount interest rate 3.5 per cent.

	2010	TyEL	Private	Public	Total*
Pension assets per 31 Dec. 2009	[a]	83.6	84.4	39.4	123.8
Pension assets per 31 Dec. 2010	[b]	92.2	93.2	45.3	138.5
Earnings sum 2010	[c]	48.4	53.9	22.1	76.1
Accrued per 31 Dec. 2009	[d]	289.9	327.1	177.9	505.7
Pensions paid in 2010		-10.4	-12.1	-7.2	-19.3
Pensions accrued in 2010	[e]	9.3	10.7	5.0	16.0
Interest**		13.7	15.5	8.4	23.9
Accrued per 31 Dec. 2010	[f]	302.6	341.2	184.1	526.4
Funding ratio per 31 Dec. 2009	[100×a/d]	28.8	25.8	22.2	24.5
Funding ratio per 31 Dec. 2010	[100×b/f]	30.5	27.3	24.6	26.3
Accrued pensions/earnings	[100×e/c]	19.3	19.8	22.8	21.0

* Includes private and public sector and VEKL; supplementary pension under TEL not included in the figures.

** Nominal interest rate 4.7 per cent, real interest rate 3.5 per cent and inflation 1.2 per cent.

Table A.3.2.

Value of accrued pension rights and pension assets 2009–2010, discount interest rate 2.5 per cent.

	2010	TyEL	Private	Public	Total*
Pension assets per 31 Dec. 2009	[a]	83.6	84.4	39.4	123.8
Pension assets per 31 Dec. 2010	[b]	92.2	93.2	45.3	138.5
Earnings sum 2010	[c]	48.4	53.9	22.1	76.1
Accrued per 31 Dec. 2009	[d]	346.2	389.5	208.9	599.6
Pensions paid in 2010		-10.4	-12.1	-7.2	-19.3
Pensions accrued in 2010	[e]	12.2	13.9	6.4	20.7
Interest**		12.9	14.6	7.8	22.4
Accrued per 31 Dec. 2010	[f]	361.0	405.9	215.9	623.4
Funding ratio per 31 Dec. 2009	[100×a/d]	24.1	21.7	18.9	20.7
Funding ratio per 31 Dec. 2010	[100×b/f]	25.5	23.0	21.0	22.2
Accrued pensions/earnings	[100×e/c]	25.3	25.8	28.8	27.2

* Includes private and public sector and VEKL; supplementary pension under TEL not included in the figures.

** Nominal interest rate 3.7 per cent, real-term interest rate 2.5 per cent and inflation 1.2 per cent.

The funding ratio is the amount of pension assets divided by the value of accrued pensions. This parameter is also heavily dependent on the assumed interest rate. At the end of 2010, the funding ratio of all earnings-related pensions was 22–26 per cent, when the real discount rate used was 2.5–3.5 per cent. In 2010, the funding ratios of earnings-related pensions rose due to high investment returns (Tables A.3.1 and A.3.2).

The value of pension entitlements accrued during a year can be proportioned to the insured earnings. The value of pensions accrued in 2010 is 27–21 per cent of earnings when the real discount rate is 2.5–3.5 per cent. In the public sector, the value of the accrued pension in proportion to the earnings is higher than in the private sector due to the older and more female-dominated work force of the public sector (Tables A.3.1 and A.3.2).

Table A.3.3.
Accrued pension rights and pension assets 2010−2030, TyEL, discount rate 3.5 per cent, at current price levels.

Wage sum and pension assets		2010	2015	2020	2025	2030
Wage sum	[a]	48.4	58.5	69.4	81.7	96.7
Pension assets per 31 Dec. y	[b]	92.2	108.8	135.1	162.9	193.1
Accrued pensions						
Pensions accrued by 31 Dec. y-1		289.9	371.3	456.1	550.5	656.4
Pensions paid in y		-10.4	-14.1	-18.5	-23.3	-28.7
Pensions accrued in y	[c]	9.3	10.9	12.8	14.8	17.2
Interest*		13.7	19.4	23.8	28.7	34.2
Pensions accrued by 31 Dec. y	[d]	302.6	387.5	474.2	570.7	679.1
Ratios (%)						
Funding ratio per 31 Dec. y	[100×b/d]	30.5	28.1	28.5	28.6	28.4
Unfunded share per 31 Dec. y/wage sum	[100×(d-b)/a]	434.9	476.4	488.7	499	502.5
Pensions accrued/wage sum	[100×c/a]	19.3	18.7	18.4	18.1	17.8

* Real interest rate 3.5 per cent; nominal interest rate in 2010 4.7 per cent and 5.3 per cent in 2015−2030.

The development of accrued TyEL pension entitlements, pension assets and wage sums until 2030 is presented in Table A.3.3. The future pension expenditure has been discounted with a real discount rate of 3.5 per cent and the monetary amounts are presented at current values. For 2010, the information is the same as in Table A.3.1. The TyEL funding ratio will be reduced until 2015 since the pension asset return for 2011 was forecasted to be negative. As of 2015, the funding ratio will not change significantly.

A somewhat stable funding ratio means that the growth rate of pension assets and accrued pension entitlements are approximately the same. The unfunded component of future pension expenditure must be financed through contributions from earnings. In relation to earnings, the unfunded component of accrued pensions will grow from 435 per cent in 2010 to an ample 500 per cent in 2030 (Table A.3.3).

Appendix 4:   Life expectancy based on age and gender

The *period-specific life expectancy* is calculated based on the mortality of a certain calendar year. It expresses the life expectancy of specific cohorts at the time in question, if mortality remains unchanged. When calculating the period-specific life expectancy, only the mortality rates of the year under review are used.

In the population forecast of this report, mortality continuously decreases. Therefore, the period-specific life expectancy underestimates the life expectancy of the various cohorts. A more accurate image of the life expectancy of the various age groups is provided by the cohort-specific life expectancy, which is calculated using the projected mortality rates of each birth cohort.

Table A.4.1.
Period-specific life expectancy, years.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Total, newborn	80.0	81.2	82.3	83.4	84.5	86.4	88.0	89.5	90.2	90.8
Men, newborn	76.8	78.1	79.4	80.6	81.8	84.0	85.9	87.6	88.4	89.1
Women, newborn	83.3	84.3	85.3	86.2	87.1	88.8	90.2	91.4	92.0	92.5
Total, 25-year-olds	55.7	56.8	57.8	58.9	59.9	61.7	63.3	64.7	65.3	66.0
Men, 25-year-olds	52.5	53.8	55.0	56.1	57.3	59.3	61.2	62.8	63.6	64.3
Women, 25-year-olds	58.7	59.7	60.6	61.6	62.4	64.0	65.4	66.6	67.2	67.7
Total, 63-year-olds	21.0	21.9	22.8	23.7	24.5	26.0	27.3	28.5	29.0	29.5
Men, 63-year-olds	18.8	19.8	20.7	21.6	22.5	24.1	25.6	26.9	27.5	28.0
Women, 63-year-olds	22.9	23.8	24.7	25.5	26.3	27.7	29.0	30.1	30.6	31.0
Total, 65-year-olds	19.4	20.3	21.2	22.0	22.8	24.2	25.5	26.7	27.2	27.6
Men, 65-year-olds	17.3	18.3	19.2	20.0	20.9	22.4	23.8	25.1	25.6	26.2
Women, 65-year-olds	21.2	22.1	22.9	23.8	24.5	25.9	27.1	28.2	28.7	29.1

Table A.4.2.
Cohort-specific life expectancy, years.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
Total, newborn	90.6	91.0	91.4	91.7	92.0	-	-	-	-	-
Men, newborn	88.7	89.2	89.6	90.0	90.4	-	-	-	-	-
Women, newborn	92.6	92.9	93.2	93.5	93.8	-	-	-	-	-
Total, 25-year-olds	63.9	64.5	65.0	65.4	65.8	66.5	67.1	67.6	-	-
Men, 25-year-olds	61.6	62.3	62.9	63.5	63.9	64.8	65.5	66.1	-	-
Women, 25-year-olds	66.4	66.8	67.2	67.5	67.8	68.3	68.8	69.2	-	-
Total, 63-year-olds	23.6	24.5	25.4	26.2	26.9	28.1	28.9	29.5	30.0	30.4
Men, 63-year-olds	21.3	22.3	23.2	24.1	24.9	26.3	27.3	27.9	28.5	29.0
Women, 63-year-olds	25.8	26.7	27.4	28.2	28.8	29.9	30.6	31.1	31.5	31.9
Total, 65-year-olds	21.7	22.6	23.4	24.2	24.9	26.1	27.0	27.5	28.0	28.5
Men, 65-year-olds	19.5	20.4	21.3	22.2	23.0	24.4	25.3	26.0	26.5	27.1
Women, 65-year-olds	23.8	24.6	25.4	26.1	26.8	27.9	28.6	29.1	29.6	30.0

Appendix 5:   Population projection per age and gender

Table A.5.

Population projection 2010–2080 per age and gender.

Men, 1,000 persons.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
0–4	154	158	160	159	156	157	161	160	160	163
5– 9	148	157	161	163	161	157	162	163	162	164
10–14	152	150	159	163	165	160	161	166	164	165
15–19	169	154	152	161	165	165	161	166	167	166
20–24	168	173	158	156	165	171	166	167	172	171
25–29	178	175	180	166	164	176	177	173	179	180
30–34	174	183	181	186	171	178	184	180	182	186
35–39	161	177	186	184	188	174	186	187	183	188
40–44	178	163	179	187	185	177	184	190	186	188
45–49	191	177	163	179	187	191	177	189	190	187
50–54	188	188	175	162	177	184	177	184	191	187
55–59	190	182	183	171	159	183	187	174	186	188
60–64	197	181	175	177	166	170	178	172	180	187
65–69	135	183	171	166	169	150	174	180	170	182
70–74	101	122	168	159	156	153	160	171	167	175
75–79	75	85	106	149	143	148	136	163	170	162
80–84	51	56	66	84	121	121	126	138	151	149
85–89	23	30	35	43	57	87	99	99	123	132
90–94	6	9	13	16	20	44	51	60	71	81
95–	1	1	2	4	5	9	17	23	26	34

Women, 1,000 persons.

	2010	2015	2020	2025	2030	2040	2050	2060	2070	2080
0–4	147	151	153	152	149	150	154	153	153	156
5– 9	142	150	154	156	154	150	155	156	155	157
10–14	145	143	152	155	157	153	154	158	157	158
15–19	163	147	145	153	157	158	154	159	160	159
20–24	160	166	151	149	157	163	159	160	164	163
25–29	168	166	172	157	155	167	168	164	168	169
30–34	165	172	170	175	161	167	172	169	170	174
35–39	153	168	174	172	178	162	173	174	170	175
40–44	172	155	169	176	174	166	172	177	174	175
45–49	186	173	156	171	177	181	166	177	178	174
50–54	187	186	173	157	171	176	168	174	179	176
55–59	194	186	185	172	156	177	180	166	177	178
60–64	205	190	182	182	170	168	173	166	172	178
65–69	147	198	185	178	178	152	173	177	164	175
70–74	123	141	191	179	173	164	164	170	164	170
75–79	104	113	132	180	171	168	146	168	173	161
80–84	91	88	98	117	162	154	150	154	162	157
85–89	57	64	65	75	92	129	136	124	147	154
90–94	21	28	34	36	43	83	88	94	102	112
95–	6	7	10	12	14	24	41	50	51	62

Appendix 6:   Earnings 2010 per age and gender

Table A.6.

Earnings 2010 per age and gender, EUR/month. Note! A one-year-grading has been used in the projections.

Men

	MEL	TyEL	YEL	MYEL	KuEL	VaEL	Others	Total
18–19	1,976	1,103	1,361	991	2,016	1,071	1,344	1,148
20–24	2,886	2,000	1,361	1,434	2,300	1,862	2,024	2,098
25–29	3,411	2,554	1,427	1,871	2,758	2,503	2,521	2,661
30–34	3,806	3,095	1,564	2,035	3,128	2,897	2,796	3,152
35–39	4,252	3,480	1,701	2,049	3,611	3,116	3,078	3,475
40–44	4,323	3,604	1,795	1,710	3,742	3,250	3,192	3,540
45v49	4,463	3,584	1,874	1,617	3,789	3,335	3,242	3,505
50–54	4,488	3,511	1,917	1,536	3,793	3,476	3,271	3,455
55–59	4,603	3,349	1,839	1,462	3,797	3,314	3,163	3,291
60–64	4,212	3,045	1,657	1,419	3,675	2,951	2,855	3,007
65–67	4,702	2,983	1,688	1,356	3,864	2,869	2,695	2,986

Women

	MEL	TyEL	YEL	MYEL	KuEL	VaEL	Others	Total
18–19	2,027	790	1,206	868	1,535	1,651	1,522	870
20–24	2,621	1,376	1,206	1,253	1,937	2,297	2,099	1,544
25–29	2,696	1,874	1,258	1,463	2,324	2,360	2,029	2,033
30–34	2,977	2,162	1,365	1,510	2,401	2,293	1,993	2,213
35–39	3,184	2,459	1,465	1,521	2,903	2,457	2,234	2,462
40–44	3,415	2,657	1,545	1,274	3,067	2,632	2,465	2,649
45–49	3,321	2,636	1,598	1,230	3,160	2,721	2,617	2,670
50–54	3,457	2,571	1,602	1,259	3,230	2,658	2,643	2,615
55–59	3,061	2,381	1,569	1,259	3,130	2,420	2,500	2,411
60–64	2,561	2,099	1,478	1,120	2,873	2,049	2,165	2,122
65–67	2,070	1,988	1,483	1,039	2,929	1,901	1,755	2,052

Appendix 7:   The life expectancy coefficient and compensating work

A life expectancy coefficient was confirmed for the first time for the year 2009. Its value is 1, and it is applied to those born in 1947. The life expectancy coefficient is determined so that the capital value of the converted pension is the same when calculated on the basis of the mortality statistics of Statistics Finland, which are available for the last respective five years, as when calculating the capital value of the unconverted pension in 2009 on the basis of the mortality statistics for the time period 2003–2007 (TyEL, Section 83). The coefficient is cohort-specific and confirmed for the year when the cohort in question turns 62. The cohort born in 1948 is the first one to be affected by the life expectancy coefficient. A mitigated life expectancy coefficient is applied to disability pensions. It affects the size of the accrued pension but not the pension component for a projected pension.

Table A.7.
*The life expectancy coefficient and compensating work.*

Year of birth	Year of 63rd birthday	Life expectancy of 63-year-old	Life expectancy coefficient	Employee's contribution*, %	Compensating work after turning 63		Change in life expectancy of 63-year-old after 2010
					Pension 50% of wages	Pension 60% of wages	
1947	2010	21.0	1.00000	5.7	0 mo.	0 mo.	0 mo.
1948	2011	21.2	0.991700	6.0	1 mo.	1 mo.	2 mos
1949	2012	21.4	0.98689	6.5	2 mos	2 mos	4 mos
1950	2013	21.6	0.983	7	2 mos	3 mos	7 mos
1951	2014	21.7	0.980	7	3 mos	3 mos	9 mos
1952	2015	21.9	0.975	7	3 mos	4 mos	11 mos
1957	2020	22.8	0.944	8	8 mos	9 mos	1 yr 10 mos
1962	2025	23.7	0.914	9	1 yr	1 yr 2 mos	2 yrs 8 mos
1967	2030	24.5	0.887	9	1 yr 4 mos	1 yr 7 mos	3 yrs 6 mos
1972	2035	25.3	0.864	9	1 yr 8 mos	2 yrs	4 yrs 3 mos
1977	2040	26.0	0.843	9	2 yrs	2 yrs 4 mos	5 yrs
1982	2045	26.7	0.824	9	2 yrs 3 mos	2 yrs 8 mos	5 yrs 8 mos
1987	2050	27.3	0.807	9	2 yrs 7 mos	3 yrs	6 yrs 4 mos
1992	2055	27.9	0.792	9	2 yrs 10 mos	3 yrs 3 mos	6 yrs 11 mos
1997	2060	28.5	0.779	9	3 yrs	3 yrs 6 mos	7 yrs 6 mos
2002	2065	28.8	0.767	9	3 yrs 3 mos	3 yrs 9 mos	7 yrs 9 mos
2007	2070	29.0	0.761	9	3 yrs 4 mos	3 yrs 11 mos	8 yrs
2012	2075	29.3	0.756	9	3 yrs 5 mos	4 yrs	8 yrs 3 mos
2017	2080	29.5	0.751	9	3 yrs 6 mos	4 yrs 1 mos	8 yrs 6 mos

* The projected contribution rate for the 53-year-olds in the year in which this cohort turns 63.

Table A.7 presents the calculation of life expectancy coefficient values based on the population projection. In addition, the table presents the required additional time of working after reaching the age of 63 for each cohort in order to compensate for the impact of the life expectancy coefficient on the pension. In the projection, the pension accumulation is assumed to be either 50 or 60 per cent of the wage prior to retirement, from which no pension contribution has been deducted. The real growth of the earnings is 1.6 per cent, and the pension accrual rate is 4.5 per cent per year of the wages from which the employee's pension contribution has been deducted.

Figure A.7.
Extended life expectancy at age 63 and the required additional work to compensate for the life expectancy coefficient, years.
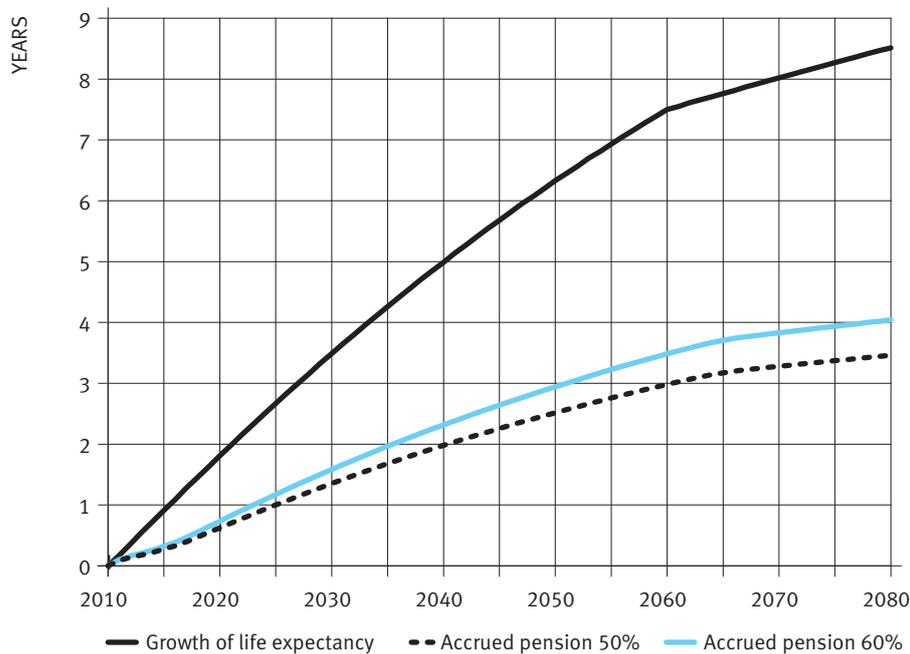
According to the population projection, people are expected to live increasingly longer, which means that the younger cohorts' life expectancy coefficient is always smaller than that of the previous cohort. Hence, the time of work required to compensate for the coefficient is longer for younger employees. If the accrued pension is 50 per cent of the wages, the cohorts born prior to 1960 would have to prolong their careers with less than one year, while those born in the 1980s would have to prolong their careers with more than two years. On the other hand, the last column of the table shows that the extended life expectancy as of 2010 is more than twice the required compensating working time. The size of the pension accrual also affects the required compensating working time: the more pension that has accrued in relation to the wage, the longer the required additional working period is to compensate for the life expectancy coefficient.

Appendix 8:   Projection model

The results of this report have been calculated using the long-term projection model of the Finnish Centre for Pensions. The model simulates the operation of the pension schemes and enables projections that meet the forecasting and planning needs of the pension schemes. Unless otherwise stated, acts and other regulations governing the schemes will remain unchanged throughout the projection period.

The model consists of several interconnected modules (Figure A.8.1).

Figure A.8.1.
Modules of the projection model.
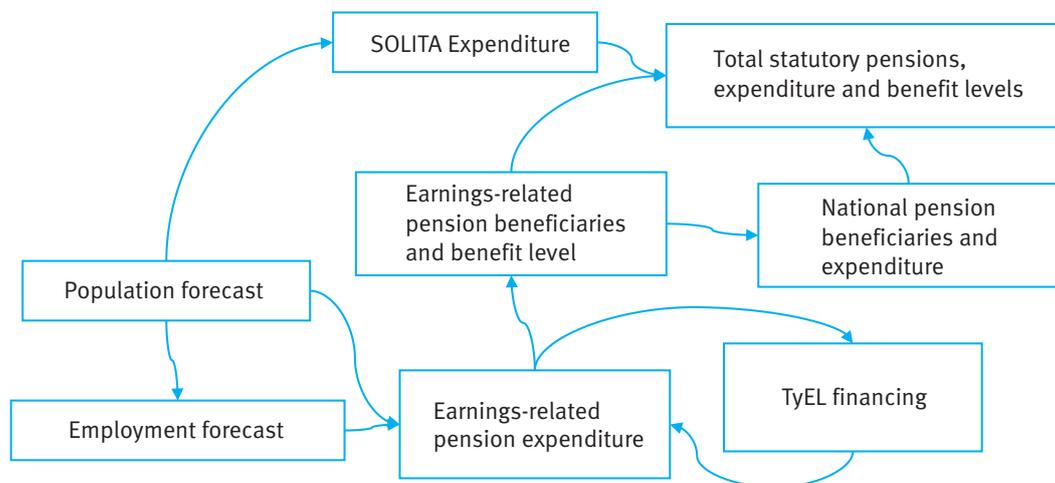
The employment forecast is based on a cohort component method developed by the OECD.[16] It consists of two parts. First, an assessment has been made on cohort-specific participation in the labour force. Second, an assessment of the cohort-specific development of unemployment has been made. A combination of these two factors yields an employment projection per cohort for men and women.

When assessing the labour force participation, it has been assumed that the profiles in labour force participation shares of different cohorts are similar but their levels may vary. Participation in the labour market per cohort may differ, for example, due to differences in education level, length of economic disturbances or structural changes in the labour markets. The age-specific change in labour force participation shares has been assessed on the basis of the employment statistics 2000–2009 of Statistics Finland. Cyclical factors and trends in the development have been taken into consideration. Information on age-specific changes in entry to and exit from the labour markets has been used in cohort-specific projection of employment shares from the latest observations onward. In the development of the labour

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16   Burniaux Jean-Marc, Romain Duval and Florence Jaumotte (2004): "Coping with Ageing: A Dynamic Approach to Quantify the Impact of Alternative Policy Options on Future Labour Supply in OECD Countries", OECD Economic Department Working papers no. 371, OECD publishing.

force participation share of the elderly, the projected changes in retirement rates have been taken into consideration.

The evaluation of the development of the economy's total unemployment rate has been 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, are compatible with a cost structure that is consistent with a stable rate of inflation. The level of the equilibrium unemployment is determined by structural factors such as taxation influencing the purchasing power of wages, labour market institutions, labour force policy and the functioning of commodity markets.

In this report, the equilibrium unemployment rate has been estimated to be 7.0 per cent. The unemployment is assumed to adjust to this level by the year 2020. In the adjustment process, the cohort- and gender-specific unemployment rates will change so that the amounts emphasised by labour force participation shares will equal the average unemployment rate. Due to the changes in the age structure of the work force, the unemployment rate will settle at 6.8–6.9 per cent.

In the *earnings-related pension expenditure module*, the earnings-related pension expenditure is calculated separately for each earnings-related pension act. Pensions are paid out to pensioners annually, insured employees accrue future pensions, and persons move between different states (e.g. employed, unemployed, pensioner), according to given probabilities. The model's states and transitions between these states are presented in Figure A.8.2. Unemployment pensions will be eliminated by the beginning of the 2010s. In the future, persons will transfer directly from unemployment to old-age pension.

Those active in the model are in gainful employment, their earnings accrue a pension, and their contribution is levied on the basis of the earnings. The unemployed are split into three different states. Those receiving an earnings-related unemployment allowance for 500 days are placed in the state of the unemployed. Those entitled to additional days of unemployment allowance are in their own state, and the other unemployed persons (on labour market support or basic unemployment allowance) are categorised as inactive. The category of inactive 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 examined act but are no longer in employment covered by this act and are not drawing a pension. Pensions accrued under other social benefit periods than unemployment are ascribed in the model to active persons.

In addition to the transitions presented in Figure A.8.2, new employees are added to the active category annually, based on population and employment forecasts. Furthermore, in each state, persons die over the course of the year, and a part of these deaths result in the granting of a survivors' pension to family members.

Within the model's states, people are categorised into different classes according to age and gender. An average technique is applied in these classes, e.g. all 50-year-old men insured under TyEL are identical to each other. It is easier to apply an average modelling technique as opposed to an individual-level projection, although it produces less information. For example, the projection does not provide data on the distribution of pensions by size.

The average modelling technique does not prevent taking into account the selectiveness associated with transfers between the various states. The following phenomena have been taken into consideration:

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

Figure A.8.2.
States in the projection model.

UE = unemployment pension	PD = partial disability pension
EO = early old-age pension	DI = disability pension
OA = old-age pension	PT = part -time pension
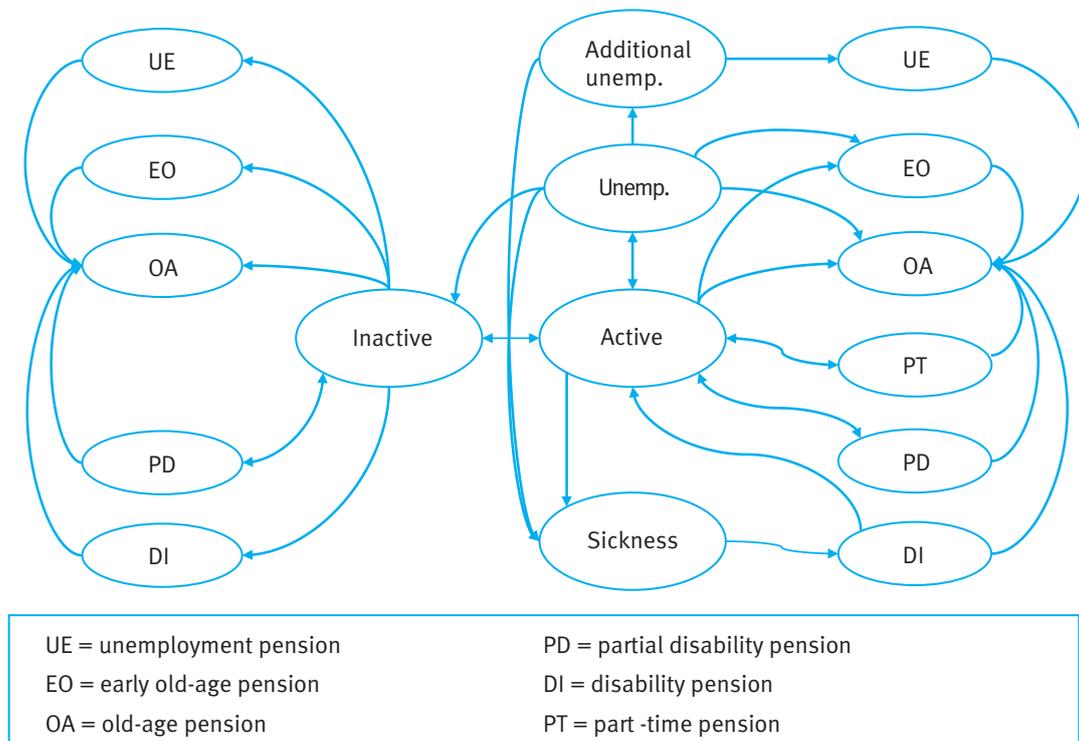
The *TyEL financing model* is used to calculate the development of the TyEL contribution rate, technical provisions and assets. It contains a detailed description of the legislation and the bases of calculation pertaining to TyEL financing. The financing module is joined to the TyEL expenditure module via a two-way connection: TyEL expenditure and wages sums affect the contribution rate as well as the formation and dissolution of technical provisions. Conversely, the size of the employee's pension contribution affects the size of pension accruals and index adjustments.

In the model, premium income is composed of a pooled, a funded and a remaining component, which includes, among other things, operating expenses. The pooled component is used to finance PAYGO pensions, and the funded premium income is accumulated into technical provisions of the pension providers. The technical provision is dissolved to finance the funded component of annually paid pensions. The larger the share of a pension in payment that can be funded with the funded component, the smaller the pooled component.

The number of earnings-related pension recipients and the average earnings-related pension are calculated once the pension expenditure of all earnings-related pension acts is known. The number of earnings-related pension recipients is calculated in the same way as the number of pensions in the act-specific pension expenditure calculations. However, the calculation covers all persons subject to the earnings-related pension insurance, which means that for every pension (in one's own right) in payment, there is one pension recipient. The average pension is assessed based on the pension expenditure and the number of pension recipients.

In the *national pension module*, the number of pension recipients and the size of national pensions are calculated with the help of the population forecast and the size of starting earnings-related pensions. From the earnings-related pension calculation, 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 earnings-related pensions. For the projection of national pensions, it is assumed that the size distribution will remain in its current form.

The *SOLITA module* is a simple description of the development of SOLITA expenditure based on the population projection. The starting point for the projection is the current SOLITA expenditure, divided by age and gender. For those of active age (18–62 yrs), SOLITA pensions will grow at the same rate as the general wage level, while pensions are tied to the earnings-related pension index for those who are 63 and above.

The total pension expenditure and the average total pension are calculated as the joint result of different modules. The population, for whom the average pension is projected, can be selected within certain limits. In this report, those under review are persons residing in Finland who receive a pension in their own right, excluding part-time pension recipients.

The projection model requires the following data to describe the initial situation, specified by pension act as well as by the age and gender of the insured:

1. population distribution over different acts and different states under the acts
2. wages of the insured and other earnings that accrue pension
3. amounts of pensions accrued
4. technical provision and the amount of pension assets
5. the size of pensions in payment
6. transition probabilities between the different states, particularly pension retirement rates.

The figures describing the initial values for the projection come from the Finnish Centre for Pensions' employment and pension registers, the joint statistics of the Social Insurance Institution of Finland and the Finnish Centre for Pensions, Keva (a public-sector pension institution) and the State Treasury.

The Finnish Centre for Pensions is a statutory co-operation body, expert and producer of joint services for the development and implementation of earnings-related pension provision. The aim of our research is to produce high-quality, widely applicable information for the evaluation and development of pension provision.

Eläketurvakeskus on työeläketurvan kehittämisen ja toimeenpanon lakisääteinen yhteistyöelin, asiantuntija ja yhteisten palveluiden tuottaja. Tutkimustoiminnan tavoitteena on tuottaa korkeatasoista ja laajasti hyödynnettävää tietoa eläketurvan arvioimiseen ja kehittämiseen.

Pensionsskyddscentralen är ett lagstadgat samorgan och sakkunnig inom verkställigheten och utvecklingen av arbetspensionsskyddet. Vi producerar gemensamma tjänster för arbetspensionssystemet. Vår forskning har som mål att ta fram högklassig information som nyttiggörs på bred front vid bedömningen och utvecklingen av pensionsskyddet.

Finnish Centre for Pensions
ELÄKETURVAKESKUS