GUARANTEE PENSIONS AND THE BABY BOOM GENERATIONS

Jussi Haapa-aho
The Social Insurance Institution of Finland
PO Box 450
FI-00101 Helsinki
FINLAND
Telephone +358 20 434 1350
Fax +358 20 434 1530
jussi.haapa-aho@kela.fi

Heikki Peltola
The Social Insurance Institution of Finland
PO Box 450
FI-00101 Helsinki
FINLAND
Telephone +358-20 434 1309
Fax +358 20 434 1530
heikki.peltola@kela.fi

ABSTRACT

With 'guarantee pensions', we refer to minimum pensions that serve the purpose of providing a minimum subsistence security for pensioners. In Finland, this role is played by the national pension, which is offset by any earnings-related pensions paid to its recipient. In the context of minimum pensions, various simulation models have proved useful tools for the forecasting of pensioner populations, of incomes and expenditures, and of the financial balance. An aggregate deterministic simulation model has been developed to assist in national pension projections.

In many countries, the large post-war baby boom generations are about to reach old-age retirement age. In Finland, this trend will be particularly pronounced in 2010-2030. The retirement of the baby boom generations together with low fertility rates will increase the financial burden of retirement provision. Retirement projections suggest that the number of pension beneficiaries in Finland will increase by a factor of at least 1.4. The cost of earnings-related retirement provision is increasing as well. The cost of the Finnish national pension scheme, on the other hand, will not increase in real terms unless pension levels are raised by specific decision. Any pension calculations will be sensitive to the underlying assumptions about economic performance on which they are based. The ability to pay for future pension expenditures will be decisively influenced by realised rates of economic growth.

Keywords: Minimum pension, guarantee pension, national pension, pension testing, simulation, simulation models, demographics, baby boom generations.

Introduction

Statutory pension schemes typically pursue two objectives. First, pensions are expected to provide a reasonable level of subsistence security relative to the standard of living to which the pensioner became accustomed while gainfully employed. Second, pensions are expected to secure an adequate level of subsistence security in retirement.

The first objective is typically realised through pension schemes providing benefits proportional to previous earnings which are financed by contributions and are at least partly prefunded. The amount of the pension benefit can be fixed beforehand (defined benefit) or can vary in relation to the contributions paid (defined contribution).

The second objective, the securement of an adequate level of subsistence, is usually achieved through various types of State minimum pensions. The guaranteed provision of a minimum pension can be implemented in various ways. Minimum pensions can be simple flat-rate pensions or they can be means tested. If flat-rate, the pensioner's retirement income does not affect the amount of the pension, and if means-tested, any personal or household income of the pensioner reduces the pension. At its most stringent, all income of the pensioner and his or her household counts against the guaranteed pension. The middle ground is occupied by a system where only the pensioner's own earnings-related pensions reduce the amount of the guaranteed pension. The first case involves a means-tested system affording a necessary minimum *subsistence*, while in the second case, involving an arrangement which we call pension testing, the benefits provided ensure a necessary minimum *pension.*

In this paper we analyse from an actuarial point of view which factors influence the development of minimum pension schemes, while taking a more detailed look at the Finnish pension model comprising pension-tested minimum pensions. Further, we examine the modelling of projections concerning the development of minimum pensions. Finally, we introduce an example whereby we model the future development of the Finnish minimum pension scheme when faced with the large-scale retirement of the post-war baby boom generations.

Factors influencing the development of minimum pensions

One of the central tasks of actuaries is to identify future trends in pension scheme income, expenditure and financial balance. This requires an understanding and analysis of the factors relating to the structure and development of pension schemes. The factors influencing the development of minimum pension schemes are largely the same as those which affect earnings-related schemes. Among the most important such factors are demographic trends and economic development. Means-tested, or pension-tested, schemes are distinguished by the strong link between pension benefits and other retirement income, while the key feature of earnings-related schemes is their link to past employment history.

In any pension system, one central factor - especially where long-term projections are concerned - is the demographic development, which forms the backbone of any projection. When forecasting cost trends it must be possible to estimate the number of new pensioners entering the scheme and of pensioners leaving the scheme, and to predict the trends affecting the amount of pension payable to various groups of pensioners. Demographic development also has an impact on labour force trends and hence earnings and the financing of pension provision.

A second important factor for projections is economic development. However, forecasting future economic development – even in the short term - has proved difficult. Therefore, assumptions about economic development are usually selected as a calculation factor that can be varied to account for alternative scenarios.

Along with purely demographic and economic factors, the features specific to each scheme affect the development of minimum pension schemes. In schemes affording a necessary minimum subsistence, the number of pensioners and the level of pension benefits can in principle be affected by all retirement income and even assets, whereas in schemes providing a minimum pension only other pension income is taken into account. To ensure the reliability of projections, it is necessary to identify and analyse the structure of these connections.

Changes in the rates of already granted pensions are essential to the long-term cost of pension provision. Pensions are usually linked to a specific index, typically a price or wage index or a mixed price-wage index. If minimum pensions are tied exclusively to a price index, any increases in the real value of minimum pensions are a matter of political decision-making, which – given that the timing and content of such decisions is difficult to predict – complicates realistic long-term projections.

The Finnish minimum pension arrangement

In Finland, minimum pensions are provided out of the National Pension Insurance scheme. National pensions are universal pensions conditional on residence in Finland. The scheme provides old-age, disability and survivors' pensions. National pensions are financed with contributions from employers and with State allocations. The scheme operates on a pay-as-you-go basis and involves little pre-funding apart from a small buffer fund. The pensions awarded are tied to the Consumer Price Index, in contrast to the Finnish earnings-related pensions, which are tied to a weighted index of prices (80%) and earnings (20%).

The national pension is a minimum personal pension. The full rate of the national pension varies with family structure and area of residence. In calculating the amount of national pension payable, a principle of "pension-testing" is applied, which means that the national pension is offset by 50% of the pensioner's own income from statutory earnings-related pensions – whether accrued from gainful employment performed in the public or private sector. The national pension can be accompanied by a variety of supplementary benefits, including housing and care allowance, increment for children or front-veteran's supplement.

National pensions are calculated according to the following formula:

$$p = \left(p_{\max} - 0.5(e - l)^{+}\right)^{+}$$

where $p_{\max}$ = full rate of the national pension

e = amount of earnings-related pension payable

l = income limit at which the national pension will begin to be reduced

If $e \le l$ then $p = p_{\max}$. If $\frac{p_{\max}}{0.5} + l > e > l$ then $p = p_{\max} - 0.5(e - l)$. If $e \ge \frac{p_{\max}}{0.5} + l$ then $p = 0$.

The total pension t is the sum of the national pension and the earnings-related pension:

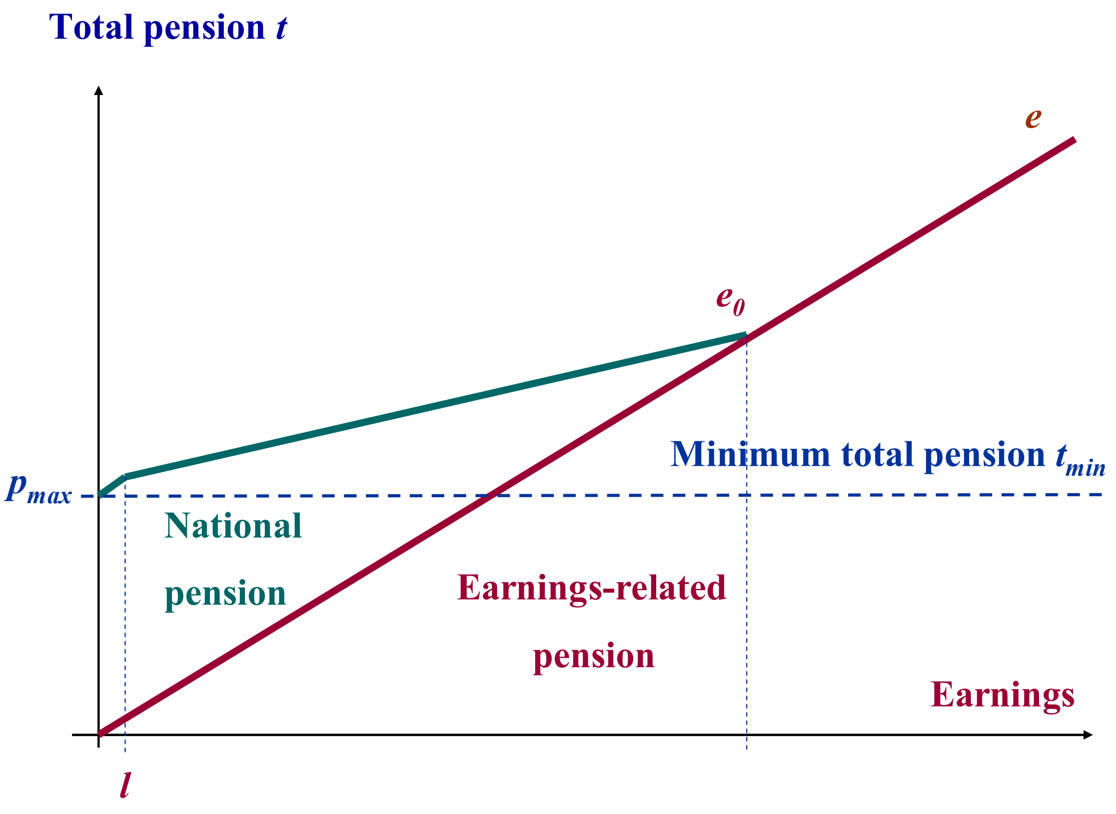
$$t = p + e = p_{\max} + e - 0.5(e - l)^{+}$$

If $e \le l$ then $t = p_{\max} + e$. If $l < e < \frac{p_{\max}}{0.5} + l$ then $t = p_{\max} + 0.5(e + l)$. If $e \ge \frac{p_{\max}}{0.5} + l$ then $t = e$.

It follows from the foregoing that the minimum amount of the total pension is equal to the maximum amount of the minimum pension: $t_{\min} = p_{\max}$

Figure 1 illustrates the determination of the total pension comprised of a national pension and an earnings-related pension as a function of earnings. The case is that of the gross total pension payable to a single pensioner. The Figure is based on the assumption that the earnings-related pension is equal to 60% of the pensionable earnings.

Figure 1. Total pension provision in Finland



At the end of 2005, the full amount of the national pension, p_{max}, ranged between €428 and €505, depending on marital status and area of residence and not including any supplementary benefit components. The national pension begins to decrease as the amount of earnings-related pension payable exceeds a limit of €47 (l) per month. No national pension is payable once the amount of earnings-related pension exceeds a limit of €880 - €1,035 (e_0) per month. In practical terms, this means that a person whose earnings are less than the national average will receive some national pension.

Modelling a minimum pension scheme

A pension scheme which operates with pension and income distributions presents several complications in terms of projections. It is not possible to devise models that would be unambiguous or very effective for analysing the shape of income distributions and any changes in them. This problem is usually worked around by modelling a number of processes portraying changes in the pension scheme. For actuaries, simulation techniques offer themselves as a useful tool for this purpose. Simulation techniques can be divided on one hand into dynamic and static simulations and on the other into stochastic and deterministic simulations. The actual simulation models can be either discrete models or microsimulation models.

In this paper, we take a closer look at an aggregate deterministic simulation model and its utility to projecting the cost of a pension-tested minimum pension scheme and the number of pensioners enrolled in the scheme. Models such as this usually start with a baseline from which one proceeds to a subsequent stage in specific increments, usually one year. The change from one stage to another is expressed in terms of certain transition probabilities. In static models the effect of model parameters on each other is usually not taken into account.

If at baseline in the year n the average number of persons receiving minimum pension is L_n and the average minimum pension is E_n, the benefit costs of the scheme can be expressed as $P_n = L_n E_n$. In the following year, the number of pensioners will be the number of pensioners in the previous year subtracting the pensioners exiting the scheme in the year observed $L_{t_{n+1}}$ and adding the number of pensioners entering the scheme $L_{e_{n+1}}$:

$$L_{n+1} = L_n - L_{t_{n+1}} + L_{e_{n+1}}$$

In order to calculate the pension cost in the year $n+1$ one must estimate the mean pension, which can basically be determined as follows:

$$E_{n+1} = (L_n E_n (1 + i_{n+1}) - L_{t_{n+1}} E_{t_{n+1}} + L_{e_{n+1}} E_{e_{n+1}}) \Big/ L_{n+1}$$

where $i_{n+1} =$ the index adjustment applied to the minimum pension in year $n+1$

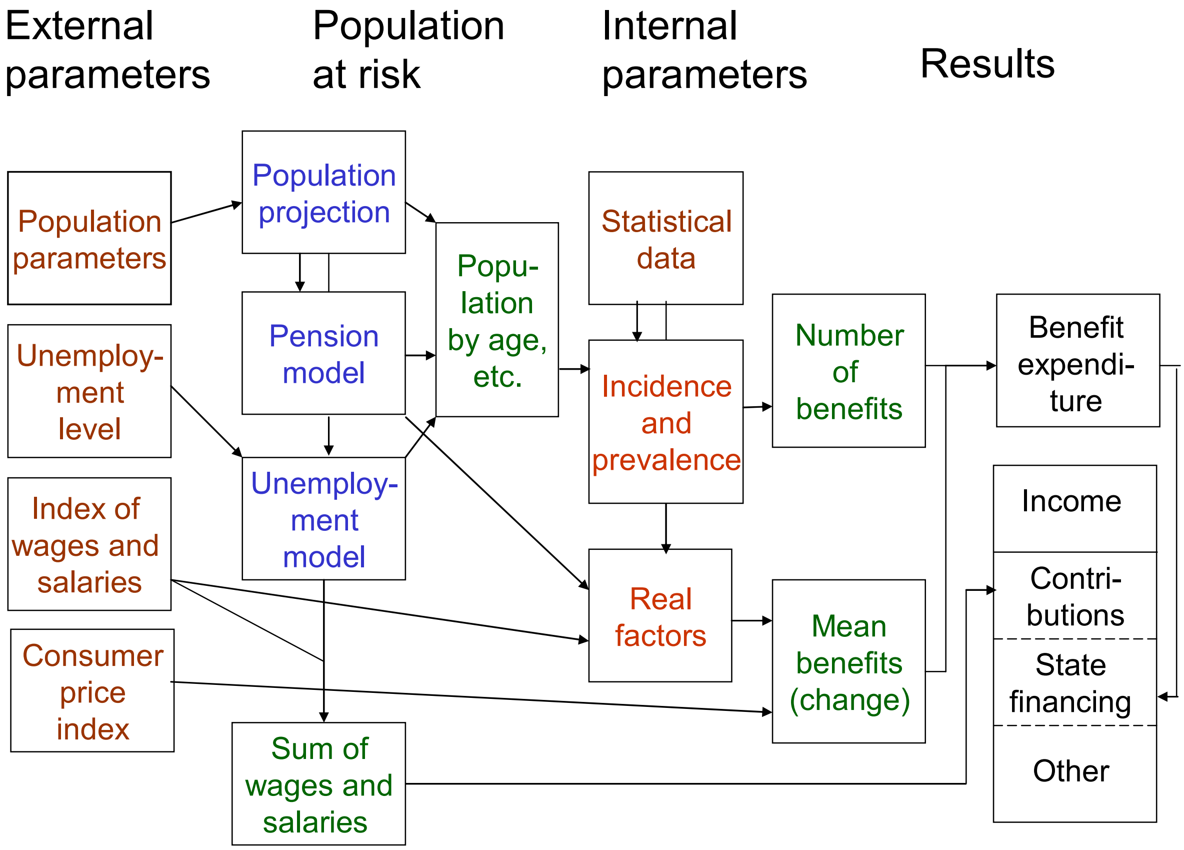
$E_{t_{n+1}} =$ the estimated mean amount of pensions ending in year $n+1$

$E_{e_{n+1}} =$ the estimated mean amount of pensions starting in year $n+1$

Changes in the number of pensioners entering and exiting the scheme can be estimated by means of retirement entry and exit probabilities specific to birth cohorts. They can be calculated on the basis of statistical data about the demographic structure of the pensioners and the general population (age and sex) and about a number of change factors (births, deaths and migration). When modelling a minimum pension scheme which provides pension-tested benefits, data are also required about earnings-related pensions and their distribution by size, in order to be able to estimate the share of pensioners on minimum pension. Such distribution data is needed for each year being modelled, because the distribution varies as a result of the real expenditure growth on earnings-related pensions. By contrast, the average amount of the minimum pension payable to pensioners entering or exiting the scheme can be calculated from the size distribution of the earnings-related pension payable to pensioners receiving a minimum pension. Once awarded, the pensions are adjusted to index changes.

In Finland, the minimum pension scheme is administered and actuarial calculations relating to national pensions are performed by the Social Insurance Institution of Finland, a public agency supervised by Parliament. The Institution has devised a calculation model for minimum pension projections, which operates on the basis of deterministic simulation. The model consists of demographic and economic factors as well as factors relating to the structure of the pension scheme. Both internal and external parameters are included in the model. The external parameters include basic demographic data (births, deaths and migration) and forecasts of economic performance (increase in the sum of wages and salaries, level of earnings, unemployment, prices). The data are sourced from public statistics and organisations carrying out economic surveys. The internal parameters are derived from various statistical indicators of the pension scheme. These external and internal parameters allow projections about the population, pensioners and mean pensions. The model produces a projection about the cost and income of the pension scheme. The workings of the model are described in Figure 2.

Figure 2. Actuarial pension model employed by the Social Insurance Institution of Finland

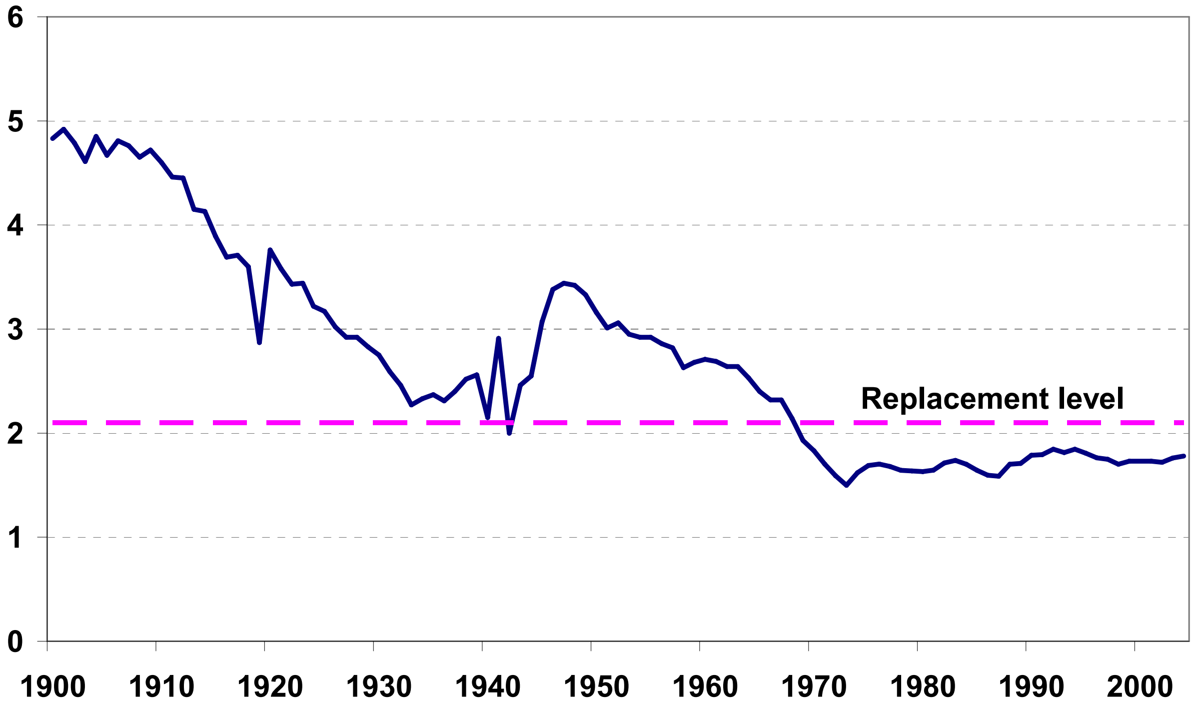


The advantage of this model is that it makes it convenient to perform various sensitivity analyses, which are particularly useful when attempting to compare projection outcomes under alternative economic scenarios.

Guaranteed pension schemes and the impact of aging baby boomers

In several countries, fertility rates soared in the immediate aftermath of the Second World War. In Finland, this baby boom was particularly pronounced. In time, the fertility upsurge subsided, and the birth rate dropped under the replacement rate. This development is shown in Figure 3, which presents the total fertility rate in Finland between 1900 and 2004. After jumping to nearly 3.5 towards the end of the 1940s, by the end of the 1960s the total fertility rate had declined below the replacement rate. Still, the Finnish population has increased and is projected to continue to increase until 2015 thanks to decreased mortality and positive net migration.

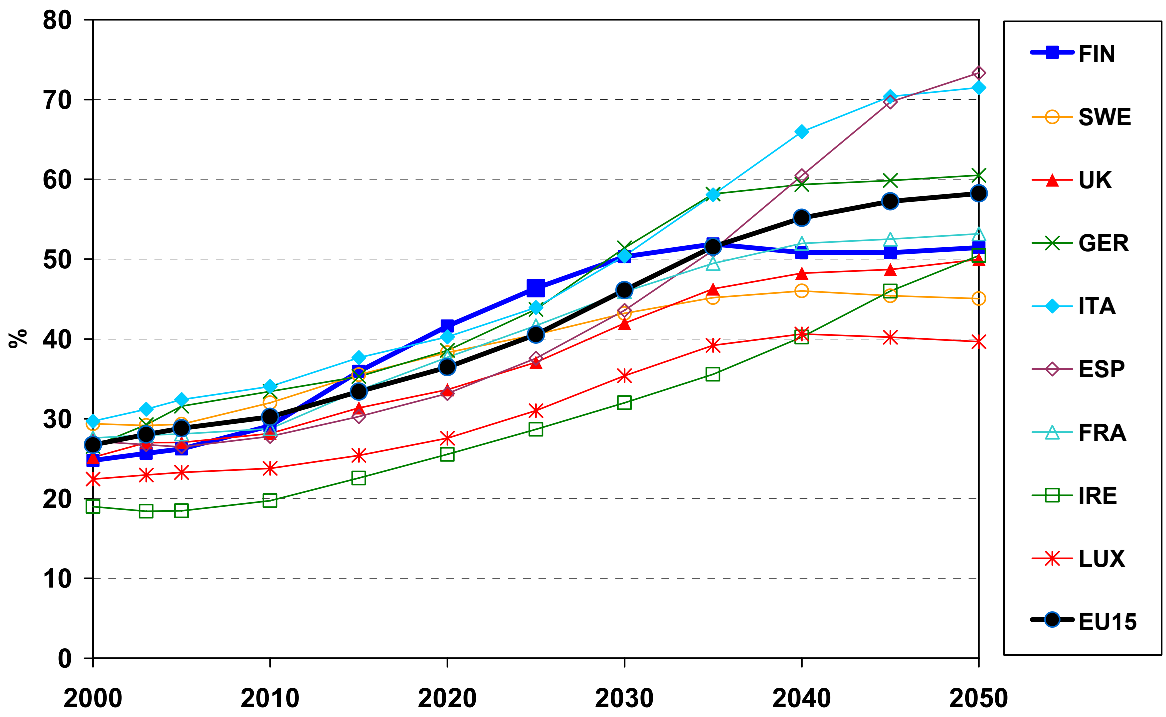
Figure 3. Total fertility rate in Finland 1900-2004



As the baby boom generations approach retirement age and leave the active workforce, not only the pension schemes but society at large will face serious challenges. With the number of pensioners increasing at the same time as birth rates in many industrialised countries have dropped below the replacement rate, the economic dependency ratio will decline in the next few decades. The economic dependency ratio is commonly measured as the population dependency ratio (the ratio of children and the elderly to the working-age population) and the social dependency ratio (the ratio of those out of work to those in work). The former addresses demographic factors only, while the latter also covers other factors such as unemployment, education and household work.

In the following, we shall focus exclusively on the population dependency ratio. The Finnish population dependency ratio will decline sharply starting from the end of the current decade until 2030 or later. At that point, Finland will have the least favourable population dependency ratio in the European Union except for Italy. This is shown in Figure 4, which presents the development of the old-age dependency ratio (population over 65 years to population aged 20 – 64 years) in Finland and selected EU countries. The decline in the Finnish old-age dependency ratio will then level off, but many other EU countries will continue to experience an increasingly unfavourable old-age dependency ratio.

Figure 4. Old-age dependency ratio in some EU countries 2000-2050



The declining population dependency ratio and the retirement of the baby boom cohorts will have a number of effects on minimum pension and earnings-related pension schemes. For the first the number of pensioners and the cost of pension provision will naturally increase, which can be expected to lead to considerable difficulties of financing pension provision. Since minimum pension schemes are mainly financed on a pay-as-you-go basis, nearly all minimum pension expenditures fall on the population in gainful employment. However, if the minimum pension benefits are means tested, a general increase in earnings will slow down the increase in the cost of minimum pension provision. This is the case with the Finnish minimum pension scheme, where the cost pressures created by the baby boomer population bump will be alleviated by a steadily improving earnings-related pension provision.

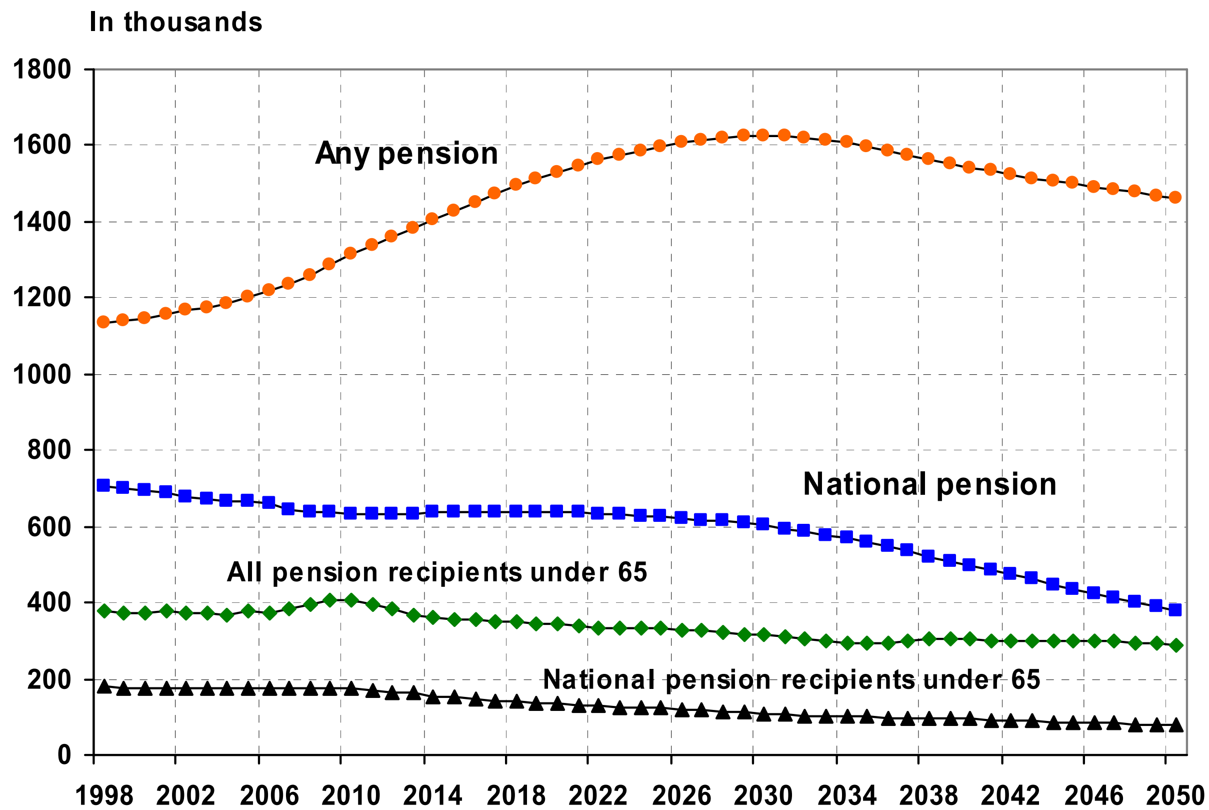
Calculations about the retirement of the baby boom generations

Exceptional demographic shifts, unanticipated economic fluctuations and changes in pension provision make long-term projections a challenge. Such projections tend to be quite conservative and make little provision for unexpected changes. However, various sensitivity analyses can be used to examine the effect of development paths diverging from the basic scenario. Deterministic simulation models present themselves as a useful tool for such analysis.

The following calculations are based on an estimated long-term total fertility rate of 1.76. Mortality has been predicted to decrease, with the life expectancy at birth of a Finnish male being expected to increase from its current level of 75 years to 80 years by 2050. The female life expectancy has been expected to rise from a little under 82 years to 85 years. Net migration is estimated at 2,000 persons per year. Under these assumptions, the share of those aged 65 or over will increase from its current 16% to a little over 26% by 2030, and remain there until 2050.

In the following, we look at results obtained with the calculation model described earlier, which was devised for the purpose of analysing the Finnish minimum pension scheme. Figure 5 shows the development of the number of all old-age, disability and unemployment pensioners until 2050, and the corresponding development for national pension recipients. The projection assumes that there is net growth in the Finnish economy. In this calculation, earnings are assumed to increase in real terms by an average of 1.5% per year. This will have its greatest effect on the amount of new earnings-related pensions, and indirectly, on the number of national pension recipients and the amount of their pensions.

Figure 5. The number of pension recipients in Finland (any pension/national pension)



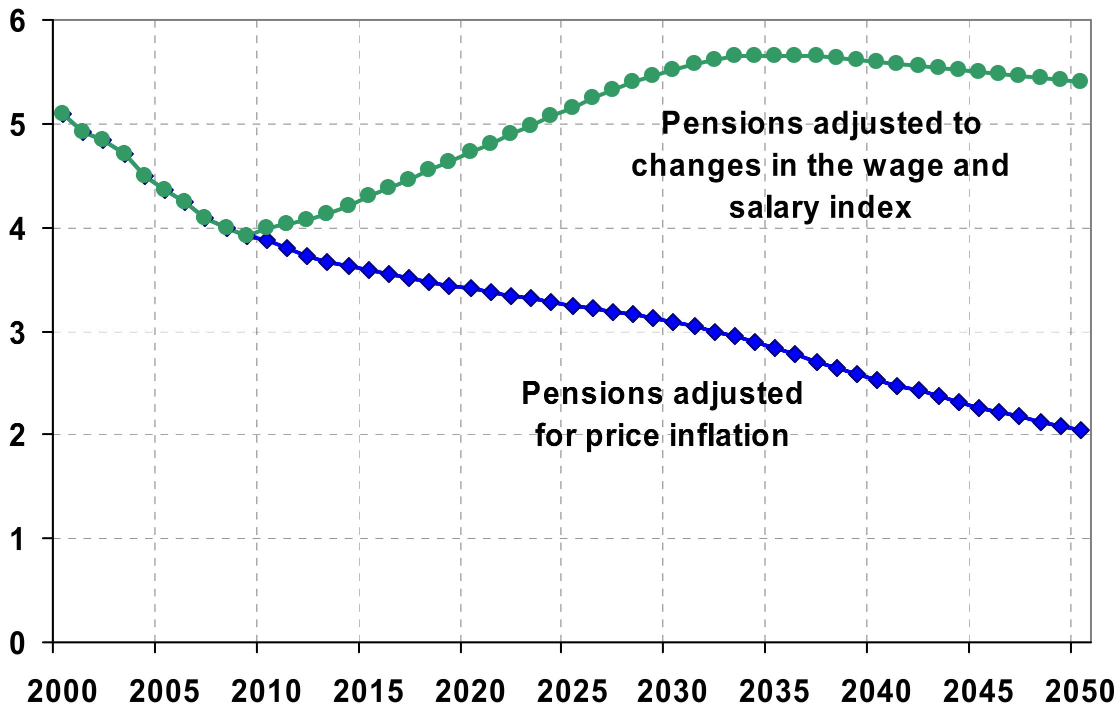
The Figure shows that the number of pension recipients in Finland will grow rapidly until the early 2030s. The share of all pension recipients of the total population aged 16 years or over will increase from its current level of 28% to about 38%, and remain there until 2050. The increase is explained by the large number of old-age pensioners and decline in the working-age population. The number of pension recipients under 65 years of age will also grow rapidly until 2010, at which point the baby boom generations will enter an age of elevated risk for work disability.

By contrast, the number of national pension recipients will increase less rapidly than that of all pension recipients. This is due primarily to an expected increase in the level of earnings, as a result of which a decreasing share of new pension recipients will qualify for a national pension. While 55% of all pension recipients received national pension in 2005, this projection suggests that by 2050 only 26% of them will. In this projection, pension testing will decrease the number of pension recipients by 0.6 percentage points per year.

Given that national pensions are price indexed, they will not increase in real terms – even if there is net growth in the economy - unless explicit decisions are taken to increase them. This is true not only for pensions already granted but also for new pensions. Earnings-related pensions, on the other hand, would increase under net economic growth due to their more favourable index linkage and increase in real earnings.

The effect of the index linkage is examined in Figure 6, which describes the change in the share of national pension expenditures of the sum of wages and salaries assuming the 1.5% real growth mentioned above and that the minimum pensions are tied either to the price index or the wage and salary index. In practical terms, political decisions to raise the level of national pensions annually would be identical to linking the pensions to the wage and salary index, as pensions would in both cases keep pace with increases in the general standard of living. Figure 6 is based on the assumption that the expenditure on national pensions includes not only the pensions as such but also the flat-rate supplementary components available with them, such as housing and care allowances, increments for children and front-veterans' supplements. They raise the total expenditure on national pensions by about a fourth.

Figure 6. National pension expenditure as a percentage share of the total sum of wages and salaries under two pension adjustment alternatives



According to Figure 6, national pension expenditure as a share of the total sum of wages and salaries would decrease from its 2000 level of more than 5% to about 2% by 2050 assuming pensions were fixed to the price index. The yearly decrease would be 0.06 percentage points on average. However, if national pensions were to follow the 1.5% increase in earnings assumed for the purpose of these calculations, their share of the total sum of wages and salaries would begin to increase and would exceed the 2000 level by 2025.

This example is enough to show that pension calculations are extremely sensitive to the assumptions about long-term economic performance which form the basis of such calculations. They are particularly sensitive to assumptions regarding real economic growth. In recognition of this, Figure 7 looks at changes in national pension expenditure as a share of the total sum of wages and salaries under alternative assumptions of earnings level growth in a scenario where national pensions are linked exclusively to the price index. Real annual growth in the wage and salary index is assumed to be 1.5% (in the conservative scenario), or alternatively 0%, 0.5% or 2.5%.

Figure 7. National pension expenditure as a percentage share of the total sum of wages and salaries under four alternative scenarios of earnings growth

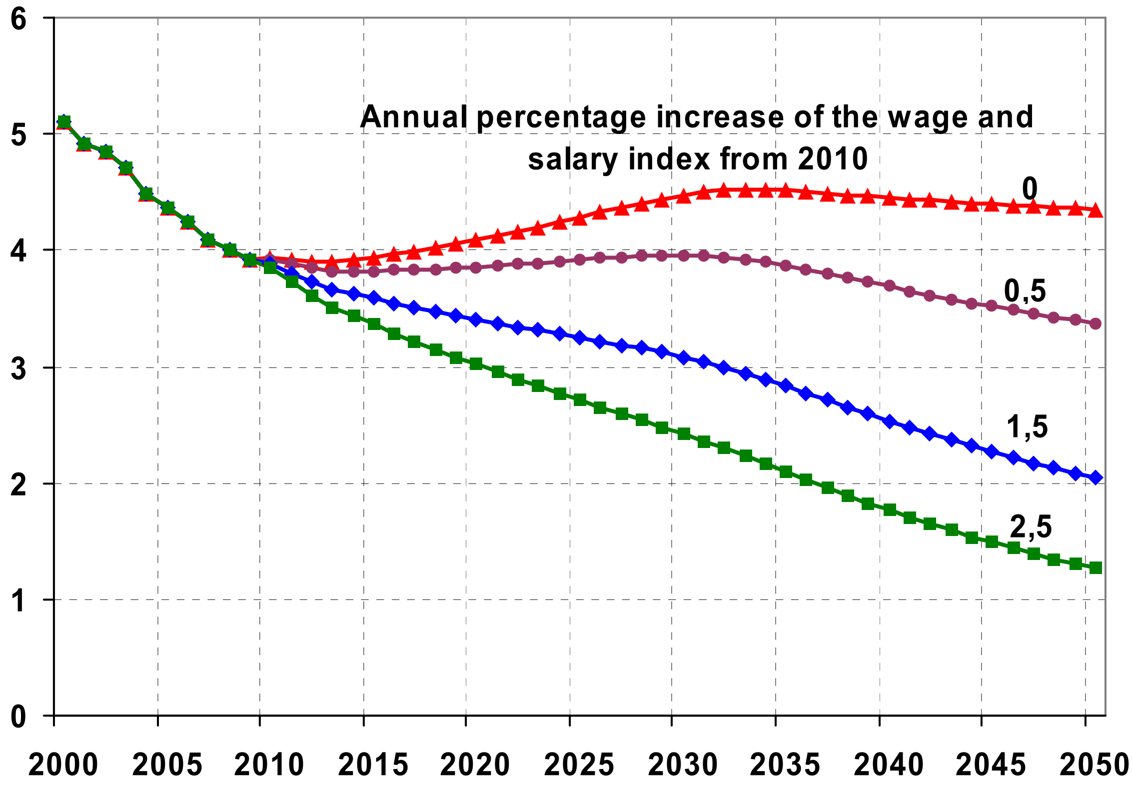


Figure 7 illustrates the significant link between the rate of economic growth and the burden imposed on the national economy by pension obligations. In our example, when the real growth in earnings was assumed to be one percentage point higher than the 1.5% of the conservative scenario, the share of national pension expenditure in the total sum of wages and salaries would drop below 1.5% by 2050. At zero earnings growth, it would end up near its current 4.5% level. And since the national pension system is financed on a pay-as-you-go basis, financing income would also not increase in real terms in the zero-growth scenario, which would place the system in financial difficulty.

Relative to GDP, total pension expenditure in Finland is estimated to increase from its current share of around 11% to around 16% by 2050. Over the same period, the GDP share of national pensions will decrease from 2% to a little less than 1%, assuming that national pensions are only adjusted for inflation. This means that the increase in total pension expenditure as a share of GDP will be attributable wholly to earnings-related pensions.

Conclusions

The central task of pension systems affording a minimum level of retirement security is to ensure that pensions are sufficient to provide retirees with a reasonable level of basic income security. In pension-tested systems, where pension benefits are offset by other benefits paid to the pensioner, the minimum level of security is afforded through pensions. Aside from demographic and economic factors, minimum pensions are by their very nature also affected by changes in income and earnings levels. With the complex dependencies at play here, methods such as simulation models offer an excellent tool for actuaries to perform pension forecasts. The benefits of such models include the possibility to flexibly calculate different alternatives and to perform sensitivity analyses. In Finland, as in many other countries, a popular method of forecast is deterministic simulation.

The retirement of the post-Second World War baby boom generations, coinciding with low birth rates, will place many countries before great social and economic challenges. The sustainability of pension financing will be tested in the next few decades. In Finland, the population dependency ratio looks set to decrease substantially over the period 2010-2030. To forestall the effects of the impending higher cost of earnings-related pensions, the system was reformed at the beginning of 2005 by adopting certain measures aimed at curbing expenditure growth. These include factoring in the expected rise in life expectancy to reduce the overall level of pensions. The prospects look quite favourable in terms of the financing of the minimum pension provision. Despite the expected strong increase in the population over age 65, neither the number of persons on minimum pension nor the expenditure on such pensions is projected to increase in real terms. This assumes that national pensions will be adjusted for inflation only and that real earnings growth will be 1.5% per year. Relative to the total sum of wages and salaries the national pension expenditure is estimated to decline from its current level of 4.5% to about 2%.

Along with demographic developments, sufficient economic growth is another crucial issue for ensuring continued retirement provision for the baby boom generations and securing the financing of their pensions. In many countries, retirement provision – like other areas of social security – is reliant upon sufficient economic growth. If economic growth should falter or stop altogether, the financing of retirement provision, along with other government activities, would come under threat. In recognition of this risk, it is important to analyse possible future trends and to perform risk analyses based on alternative scenarios. This will give decision-makers an advance look at possible threats and a chance to take preventive action. The role of actuaries in such forecasting is a crucial one.

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