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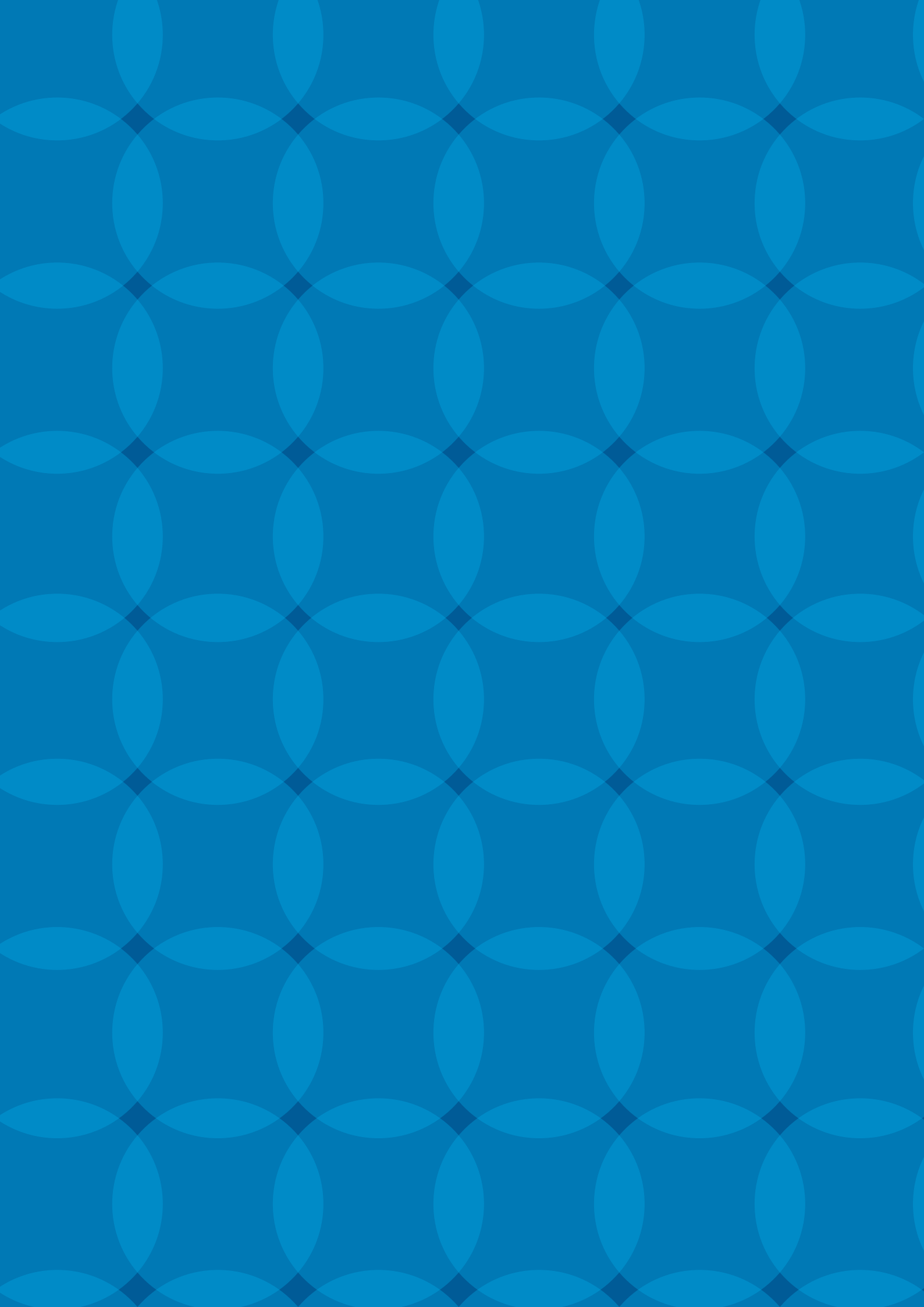
FINNISH CENTRE FOR PENSIONS, WORKING PAPERS

Microsimulating Finnish earnings-related pensions

Heikki Tikanmäki, Hannu Sihvonen and Janne Salonen



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FOREWORD

Dynamic microsimulation is a powerful tool for analysing pension schemes and their reforms. So far, there has not been any extensive microsimulation model on the Finnish Pension system but the pension projections have been carried out using a macro model. In this paper, we introduce a new pension microsimulation model, ELSI, which is a model with dynamic aging but without behavioural adjustments.

This paper was originally written for the European Meeting of the International Microsimulation Association, held 23–24 October 2014, in Maastricht, the Netherlands. The paper contains essentially the same content as the Finnish report *Eläketurvakeskuksen ELSI-mikrosimulointimallin kuvaus*, published earlier this year in the same series.

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ABSTRACT

In this study we introduce a new microsimulation model, ELSI, for modelling the statutory pension scheme of Finland. The Finnish pension system consists of earnings-related pensions (almost 90% of the total pension expenditure) and the national pension. The statutory earnings-related pension system will undergo a major reform in 2017. One of the main objectives of the ELSI project is to utilize the model in analysing different policy proposals related to the pension reform in order to support the policymakers in their preparatory work.

ELSI is the first detailed microsimulation model of the Finnish pension system. The model is based on large register data of the adult population of Finland. We currently have functional modules for population, earnings and earnings-related pensions. In the near future, we will introduce new modules for simulating national pensions and taxation. A typical simulation period is 2009–2060.

Until recently, the long-term projections of the Finnish pension system (for instance EU Commission AWG projections) have been carried out using our macro model. The macro model gives a good overview of the pension scheme on a system level, but it cannot be used to derive distributional results on pension benefits. The results in both the macro and micro models are driven by exogenous transition probability matrices. The macro behaviour of the micro model is aligned to the macro model.

The ELSI model gives additional information on the distributions of pension benefits. It is also possible to see the impact of policy alternatives on subpopulations; for example on immigrants or different educational groups.

Keywords:

- Pension microsimulation
- Finnish pension system
- Earnings-related pensions
- Education dynamics

ABSTRAKTI

Tässä raportissa esitellään uusi ELSI-mikrosimulointimalli, joka mallintaa Suomen lakisääteistä eläkejärjestelmää. Suomen eläkejärjestelmä koostuu työeläkkeistä (lähes 90 % eläkemenoista) sekä kansan- ja takuueläkkeistä. Työmarkkinajärjestöt ovat sopineet uudistuksista, joilla työeläkejärjestelmää muutetaan vuoden 2017 alussa. Eräs ELSI-hankkeen keskeisistä tavoitteista on analysoida muutosten vaikutuksia päätöksenteon tueksi.

ELSI on ensimmäinen yksityiskohtainen mikrosimulointimalli Suomen työeläkejärjestelmästä. Malli perustuu laajaan rekisteriaineistoon Suomen aikuisväestöstä. Tällä hetkellä malli laskee henkilön omaan työuraan perustuvan eläkkeen. Lähitulevaisuudessa malliin on tarkoitus lisätä myös Kelan eläkkeiden ja verotuksen laskenta. Tyypillinen simulointijakso kattaa vuodet 2009–2060.

Perinteisesti pitkän aikavälin eläkelaskelmia Suomen eläkejärjestelmästä on tehty Eläketurvakeskuksen PTS-makromallilla. Se antaa hyvän kuvan keskeisten suureiden kehityksestä eläkejärjestelmän tasolla, mutta sillä ei saada tietoa eläke-etuuksien jakaumasta. Sekä mikro- että makromallien laskenta perustuu eksogeenisiin siirtymätodennäköisyysmatriiseihin. ELSI-mallin makrokehitys on kohdistettu PTS-mallin kanssa.

ELSI-mallilla saadaan uutta tietoa eläke-etuuksien jakaumasta tulevaisuudessa. Sen lisäksi sillä voidaan analysoida eläkepolitiikan muutosten vaikutuksia eri väestöryhmissä. Tuloksia voidaan ryhmitellä esimerkiksi sukupuolen, koulutustason tai maahanmuuttajataustan mukaan.

Avainsanat:

- Eläkkeiden mikrosimulointi
- Suomen eläkejärjestelmä
- Työeläkkeet
- Koulutusdynamikka

CONTENTS

1 Introduction	9
2 Main features of the Finnish pension system	11
2.1 Rules of accrual	11
2.2 Pension benefits	12
2.3 The life expectancy coefficient	13
3 Data and model structure	14
3.1 Structure of the model	15
3.2 Population and education dynamics.....	15
3.3 Population projection	17
3.4 Earnings dynamics.....	18
3.5 Earnings-related pension module.....	19
4 Main results	20
5 Conclusions	24
References	25

1 Introduction

Compared to other countries, microsimulation that extensively analyses Finnish social security is very much in the early stages. In many other countries, ministries of government and the authorities that produce statistics have supported decision-making processes through microsimulation models already for years. Finnish microsimulation models are primarily static models, where policy alternatives can be evaluated based on current population and legislation. The taxation model of Statistics Finland, SISU, is an example of a static microsimulation model (Statistics Finland 2014). So far, dynamic microsimulations have not been carried out in Finland, despite Finnish involvement in the EUROMOD project.

The new model (ELSI) constructed at the Finnish Centre for Pensions is a dynamic microsimulation model, the purpose of which is to produce new information on the future of the Finnish pension scheme, based on extensive data on individuals. The new model is a good and flexible tool for analysing the impact of pension policy changes. Dynamics here refers to dynamics in relation to time. At this stage, the model does not show behavioural impact by, for example, decision optimisation.

Microsimulation models can be made based on a great number of premises (Li 2011). The Swedish SESIM model (Flood 2008) is a good example of a very detailed model created with extensive resources. However, more limited resources is not a hindrance to achieving functional and useful models such as, for instance, the microsimulation models used for modelling the disability and national pension schemes of the Netherlands (van Sonsbeek 2011). The latter of these approaches our premises.

In Finland, earnings-related pensions constitute a benefit with an exceptionally large impact on the future income of the population (Pocket Statistics 2013). At the macro level we get a clear impression of the future of pension security. What we need more information about is the income distribution effects that will be seen going forward.

ELSI microsimulation model is a complement to the PTS macro model that has long been in use at the Finnish Centre for Pensions. The PTS model describes pension system development at the macro level (Risku *et al* 2013). For example, the AWG calculations of the European Commission (European Commission 2012) are based on the results of the PTS model where earnings-related pensions are concerned. In addition to data on average values, the new ELSI model also provides distributional results on pensions in euros and on replacement rates. The ELSI model makes it possible to review different groups of individuals based on criteria such as education level.

The base population in the model consists of the adult population of Finland. The model thus processes pension recipients as well as those still in working life. As far as possible, the pension calculation has been implemented according to currently valid rules and laws (Kujanpää *et al.* 2012). In addition to new pension recipients, the model also simulates future pensions in the years 2008–2060 for those already retired.

The microsimulation model can be used to evaluate and analyse changes to the earnings-related pension scheme. Naturally, assumptions of the development of the economy or

demographics can be changed when need be, for example in the event of adjusted population projections.

This article describes the functionality of the ELSI model at a very general level, its modular structure, central selections and results. A separate report will be written on the analyses of the pension reform that will come into force in 2017.

2 Main features of the Finnish pension system

The pension system of Finland is described here as it is in 2014. The earnings-related pension system is undergoing a major reform in 2017. There is already an agreement by the labour market organisations of the reform, but the final decisions by the government will be completed in 2015. The impacts of the reform are not analysed in this article.

As opposed to the situation in many other countries, the statutory pension system of Finland practically covers the entire population, and income during retirement consists largely of statutory pensions. Private pension saving is comparatively small-scale. The statutory pension scheme consists of earnings-related pensions and the national pensions of the Social Insurance Institution (Kela). The ELSI model calculates an individual's pension in their own right from the earnings-related pension scheme. In other words, the pensions of Kela as well as the survivors' pensions of the earnings-related pension scheme have been omitted from our review. Voluntary supplementary pension security or private pension savings, acquired at the initiative of the individual, have likewise been omitted from these reviews.

The earnings-related pension scheme consists of several types of pension that cover the employees and self-employed persons of both the public and private sectors. In practice, all work carried out by persons between the ages of 18 and 68, either as wage earners or as self-employed, is insured through one of the pension acts. Pensions are determined in much the same way in all earnings-related pension acts.

All current pension benefits (excluding survivors' pensions) are simulated in the model. These benefits are old-age pension, disability pension, partial disability pension, part-time pension and special pensions for farmers. Types of pension that will be discontinued in the next few years, such as old-age pension taken early, unemployment pension and individual early retirement pension, are included in the first years of simulation.

2.1 Rules of accrual

Earnings-related pension accrues between the ages of 18 and 68, from all earnings from work (the wages of wage earners and work income of the self-employed) based on age-specific accrual rates (1.5%, 18–62 y., 1.9%, 53–62 y., or 4.5% at 63–67 y.). Pension does not accrue for those under the age of 18 and over the age of 68. For wage earners, the income from work that accrues a pension equals the wage from which the employee's pension contribution has been deducted. According to the Seafarer's Pensions Act, however, the employee pension contribution deduction is not made on the earnings. According to the Self-Employed Person's Pensions Act and the Farmers' Pensions Act, pension accrues based on the total income from work.

According to the earnings-related pension acts, pension accrues based on several social benefits. It accrues based on family benefits, unemployment benefits, periods of study, the alternation leave benefit as well as health and rehabilitation benefits. Earnings-related

pension also accrues from a few other benefit periods, less significant from the point of view of pension expenditure.

The accrual rate from periods of social benefit is 1.5 per cent per year, regardless of age. The primary basis for the accrual is the same income from work based on which the benefit itself is calculated.

In special cases, 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, pension accrues at a rate of 1.5 per cent for periods of study leading to a vocational or university-level degree, as well as for periods of caring for a child under the age of 3 at home.

When calculating the initial pension amount, the income from previous years is adjusted with the wage coefficient in which the weighting of the change in earnings level is 80 per cent, and that of the change in consumer prices is 20 per cent. Pensions in payment are checked against an earnings-related pension index, where the weighting of the change in earnings level is 20 per cent and that of the weighting of change in consumer prices is 80 per cent.

2.2 Pension benefits

The ELSI model calculates the statutory earnings-related pension benefits, with the exception of survivors' pension. The types of benefit included are thus the old-age, disability, unemployment and part-time pensions as well as the special pensions for farmers.

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. *The partial disability pension* is half the amount of a full disability pension. The size of the disability pension is reached after adding the pension accrued by the start of the disability to the projected pension rights. The projected pension rights are calculated from the pension contingency until the date when the recipient turns 63. The accrual rate for projected pensionable service is 1.5 per cent per year, and the projected earnings equal the average wage of the five years immediately preceding disability. The life expectancy coefficient for the year of disability has an impact on the starting amount of disability pension.

Part-time pension may be granted to a person who has decreased his or her working hours in order for earnings to decrease to 35–70 per cent of the stabilised earnings level. The size of the part-time pension is half of the decrease in income that was the result of a cut-back in working hours. Old-age pension is accrued on work carried out while in part-time retirement, in the same way as for other work. The lower age limit for part-time pension will be 61 years from 2015 onwards.

A person is entitled to *old-age pension* from the age of 63. In some cases, the established old-age retirement age may be earlier than 63. If the insured person continues to work after having turned 63 and chooses to postpone the start of old-age pension, the annual pension accrual rate rises to 4.5 per cent. If the insured person is in gainful employment or self-employment while also being retired (receiving other than part-time pension), the pension accrual rate is 1.5 per cent. Pension will cease to accrue by the month of the 68th birthday. If

the insured person chooses not to withdraw the old-age pension by the time he or she turns 68, an increment for deferred retirement of 0.4 per cent per month is added to the pension.

2.3 The life expectancy coefficient

In order to slow the growth of pension expenditure, a life expectancy coefficient has been introduced in 2010 that reacts to extensions in life expectancy. With the help of a life expectancy coefficient, the starting amount of old-age and disability pensions is adjusted to the change in life expectancy of 62-year-olds. The size of the starting old-age pension is obtained by multiplying the accrued pension with the life expectancy coefficient. In starting disability pensions, too, the share of accrued pension is multiplied by the life expectancy coefficient. The closer to old-age retirement age a person was when becoming disabled, the greater the impact of the life expectancy coefficient on the size of the disability pension.

The numerical value of the life expectancy coefficient is determined so that the capital value of the old-age pension remains unchanged even if the mortality of the old-age pensioners would deviate from the level realised in the years 2003–2007. The life expectancy coefficient affects the pensions of those born in and after 1948. The value of the coefficient is determined separately for each age cohort based on the year of birth. The value of the life expectancy coefficient in 2014 is 0.97552, and according to the population projection, in 2060 it will be 0.790.

3 Data and model structure

The Finnish Centre for Pensions and the Social Insurance Institution (Kela) maintain an administrative register of statutory pensions and residential data of Finnish citizens. Additionally, the parties to the earnings-related pension scheme maintain an earnings register on working days carried out in Finland and earnings related to these. The earnings register also contains information on social security benefits. In addition to this, the simulation utilizes information on the education background of individuals. Annual data on the highest education level of the individuals (the ISCED 1997 classification) has been added to the primary data.

Our primary data is the adult (18+) population of Finland in the years 2004–2008. For the microsimulation we have picked a random five per cent sample from 2008, which is the baseline year of the model. The primary data provides all the necessary data for the individuals of the sample, covering the years 2004–2008. In order to test the sample and calibrate the model, there is register data also for the years 2009–2013. In-sample testing has improved significantly the credibility of the time dynamics of the social security benefits.

The sample used in the simulation contains approximately 250,000 persons in the baseline year 2008. New persons are added to the sample every year, meaning that the model processes the data of approximately 473,000 persons during the simulation that reaches as far as 2060 (including the deceased and those who have moved abroad).

The final pieces of information added to the primary data are residential status (resident or non-resident) and education level. Based on the place of residence, the country of residence is either Finland or abroad (resident or non-resident). The country of residence may change during the simulation period, if the person in question is moving to or from Finland.

There are frequent deficiencies in administrative register data, and these have to be taken into account when forming the primary data. By imputation is in this context meant the replacement of deficient information by imputed information, the distribution of which corresponds to figures that have been observed or statistically registered.

With the help of the imputation method (see e.g. Davison and Hinkley 1997), accruals based on the State Pension Act (VaEL; public-sector professions, in particular military professions) for the year 2004 could be placed at the right level. However, there are also problems associated with the method. One is that accruals are not necessarily targeted entirely to the right persons. These imputed accruals are used to replace the year 2004 VaEL accruals selected from the register. From 2005 onwards, the VaEL accrual is calculated by adding new accrual to the imputed accrual based on actual earnings data.

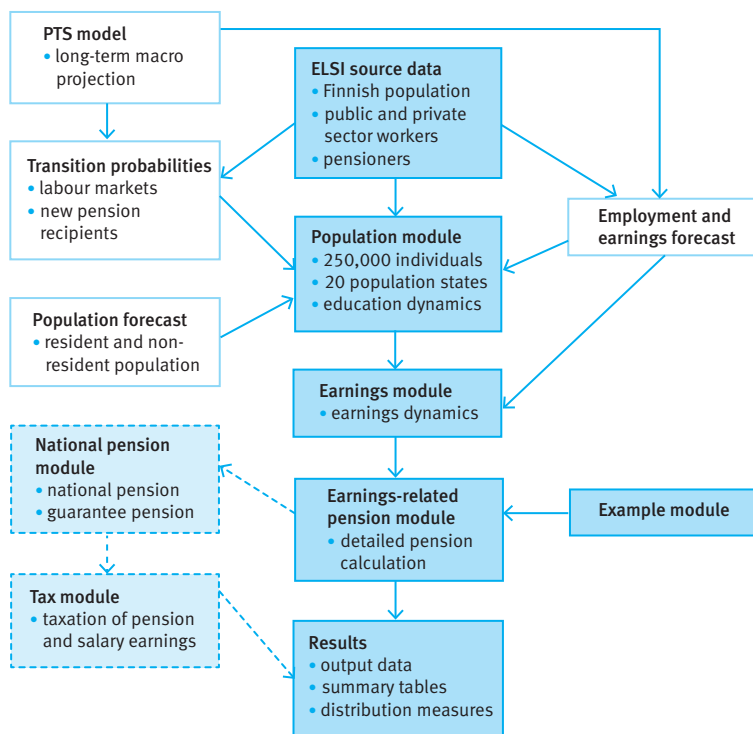
Deficiencies can be found also in the data of the self-employed. Over half of all data on computational income based on YEL is missing from the earnings register. The YEL deficiencies are also taken into account in the simulation.

3.1 Structure of the model

The model has a modular structure, and each module functions independently without feedbacks to previous models. Each module processes the data annually and simulates the characteristics of each individual for each year. Each module updates a certain, limited share of an individual's attributes.

In figure 3.1, the module boxes are dark and the boxes describing assumptions are white. Functionalities that are being planned are also presented on dash lines. As a concrete example, a national pension module and a simple tax module can easily be added later to the calculation of total earnings-related pension, prior to results being gathered.

Figure 3.1.
Structure of the ELSI model.



3.2 Population and education dynamics

The data on an individual may be divided into four groups in the model: permanent personal data, changing qualitative data, earnings data and pension data. Qualitative data is entered in the population module, earnings data and data on social benefits in the earnings module, and pension data in the earnings-related pension module.

The population module reads the source information and simulates a sample for the individuals for the simulation years of, for instance, population state and education level. Based on the population state we know which individuals in the sample are working,

unemployed, deceased or e.g. in different states of retirement during each year. New age cohorts and new immigrants will also be added to the data by this module.

The module contains 20 population states into which the individuals are placed. A new state is annually simulated for each individual, based on the state of the previous year. Hence, the model has Markovian structure. Transition probabilities are estimated based on age, gender, education level and residential status (resident, non-resident).

We have agreed on the following solutions in the model: The active state has been divided into three separate states based on the duration of the working period. These transition paths make it possible to preserve the Markovian structure and differentiate the unemployment risk based on previous breaks in the working life (compare Hämäläinen 2003; TEM 2013). A corresponding arrangement exists in the model for individuals receiving a full disability pension. The model shows that the first year on disability pension holds a significantly higher probability of both rehabilitation and death. See e.g. Blomgren *et al.* 2011; Laaksonen *et al.* 2014.

The population model contains four socioeconomic groups for both sexes. All residents of Finland have been divided into three education level groups. The fourth group consists of persons living abroad. The transition probabilities of non-residents are not dependent on the education level.

The ELSI model has a dynamic education structure. In some models, the individual is attached to a permanent education level already at the start of the career (e.g. Määttänen 2013). In the case of ELSI, the final education level is impossible to determine, especially for the younger age cohorts in the simulation. The comprehensive Nordic simulation models MOSART (Gjefsen 2014) and SESIM (Flood 2008) constitute fairly sophisticated education structures, where the education systems of the countries, including time lags, are taken into account at a fairly detailed level. For the ELSI model we have decided on a simple solution that produces fairly similar education structures as the statistics (compare The Official Statistics of Finland 2012a) and projections by others (Kalenius 2014).

Educational probabilities have been estimated using the source information. The education level of an individual never drops. Educational probabilities contain a similar Markovian structure as the transition probabilities between different states in the model. In practice this means that, in addition to age and gender, educational probability only depends on the education level of the previous year and not on when the current degree is from. The educational probabilities also do not depend directly on the population state of a person.

In the future, education levels will grow also in the older age cohorts. In the younger age cohorts, on the other hand, education levels will remain fairly stable. Women are on average more highly educated than men.

Education level data is used for grouping individuals at the core of the simulation. Matrices for transition probabilities as well as the age-wage profiles vary depending on the education level. In addition, certain social security benefits are targeted to the correct individuals based on education level.

In simulating earnings, the education levels are the following (ISCED):

1. Up to lower secondary education (0–3)
2. Bachelor’s level degree, vocational college degree or lower degree in post-secondary non-tertiary education (4, 5B)
3. Higher academic degree (5A, 6)

A change in education level leads to a clear change in structure. Table 3.1 shows how the education structure changes during the simulation period.

Table 3.1.

Education structure of the working-age (18–67-year-old) population of Finnish residents, in %.

Gender	Education level (ISCED)	2010	2015	2020	2030	2040	2050	2060
Female	0–3	63	60	57	54	53	53	53
Female	4, 5B	26	28	29	30	30	30	30
Female	5A, 6	11	12	14	16	17	17	17
Male	0–3	73	73	71	70	70	70	71
Male	4, 5B	18	18	18	18	18	18	18
Male	5A, 6	9	10	11	12	12	12	11

3.3 Population projection

The population projection used in the micro and macro models of the Finnish Centre for Pensions is primarily based on the population projection of the Statistics Finland (Official Statistics of Finland 2012b), which differs somewhat from the Eurostat projection (EUROPOP2010) when it comes to projecting mortality rates. Overall mortality assumptions and migration assumptions are the same in both micro and macro models. The life expectancy coefficient projection is also based on the population projection, and is thus the same in both models.

Family benefits are determined based on the birth rate assumptions of the population projection. In the model we presume that children are as likely to be born in equal numbers in all different states, which does not necessarily hold true. The same kind of fertility figures are applied to men as to women. This likely means an emphasis on male fertility in age cohorts that are realistically too young (see e.g. Nisèn *et al.* 2014), but this factor will not significantly impact results as men generally take out only a fairly small share of the parental leave.

In the model, overall mortality has been adjusted to correspond to the figures of the population projection. The relative differences in mortality between different educational groups and states in the model are preserved for the duration of the simulation.

New 18-year-olds and immigrants will be added to the simulation data based on the population projection. The characteristics of immigrants under 18 that move to Finland will parallel those of the original population. It is slightly more difficult for immigrants to find

employment than it is for the original population. We therefore use empirical data on the employment of immigrants (Eronen *et al.* 2014).

Although the number of persons resident in Finland is known, there are currently no plans for spatial microsimulation or regional groupings of results.

3.4 Earnings dynamics

The earnings module produces the earnings necessary for the calculation of pensions (gross earnings). Earnings data include the annual earnings and, for unsalaried periods, the sums of earnings on which benefits are based. Earnings include all gross wages and income from work that accrue pension. The source information used is the income data of the population module. In addition to income from earnings, this module also simulates social benefits that accrue a pension (in practice, the earnings forming the basis of the pension).

The simulation of earnings is based on the individual's population state, education level, age and earlier earnings. A random component is also included, ensuring that wage distribution remains credible as the simulation progresses. Similar wage processes have also been used elsewhere (Floden and Lindé 2001; Määttänen 2013). However, in the ELSI model the parameters have been differentiated based on education level. In the ELSI model, a share of the change in earnings comes through population states as well as the rise of a dynamic education level. As a result, the interpretation of parameters is slightly different than in e.g. the report by Floden and Lindé (2001).

The wage process is in the shape of:

$$w_j = \exp(h_j^s + z_j), \text{ where}$$

$$z_j = \rho^s z_{j-1} + \epsilon_j^s.$$

The wage of a person in age, gender and education group s in relation to the average wage of the year in question at age j is depicted in process w , whereas process z depicts (on a logarithmic scale) the deviation in cohort-specific wage profile h_j^s . Shock terms ϵ_j^s are independent of each other. The distributions of shock terms and values of the correlation parameters can be found in Table 3.2.

Table 3.2.

Parameters of the wage process.

Education level	Shock term: ϵ_j^s	Correlation: ρ^s
Master's or higher	N(0, 0.01)	0.9
Lower than Master's	N(0, 0.01)	0.89

Parameter h_j^s comes from a wage profile based on age, gender and education level. If earnings data from the five previous years is not available to the individual, the earnings forming the basis will be estimated according to the wage profile. There is greater dispersion for young employees in the model.

The dynamics of the wage process lead to slightly weaker earnings on average among new employees. This feature of the model has been taken into account by raising the age-wage profile of younger persons, as a great many of them can be considered new individuals in this respect. The wage profile has been correspondingly lowered at the older end. There are two reasons for this. First of all, the wage profile compensates for the fact that the wage process is more likely to generate large earnings for those who have a long and uninterrupted working life behind them. This is very typical in the older age cohorts. Secondly, the wage profile takes into account that those on the verge of retirement do not necessarily put in as many working hours as the younger age cohorts (compare Nummi *et al.* 2010).

Earnings develop according to gender and education level, on average according to earnings profiles. The earnings of both genders are proportioned to gender-specific parameters of average earnings. Defined in this manner, the parameters for average earnings for women is 76 per cent that of men. The wage gap between men and women does not narrow significantly over the simulation period.

Earnings from work carried out alongside receiving a pension will be determined by simpler rules than those described above. Wages paid for work carried out alongside receiving a pension are clearly lower than the wages paid for full-time work (see Kannisto 2014a).

3.5 Earnings-related pension module

The earnings-related pension module is fundamentally deterministic, and its logic is based on currently valid legislation to as detailed an extent as possible (Kujanpää *et al.* 2012). It no longer really simulates anything, rather, earnings-related pensions are calculated for the individuals of the simulation based on earnings and population states simulated in previous modules. In this module we calculate the pension accrual and pensions in payment of each person, as well as raise the accruals and pensions to be paid to the level of the current year, using the appropriate indices. The module calculates pension in one's own right of the earnings-related pension system, in other words the pension based on a person's own working life.

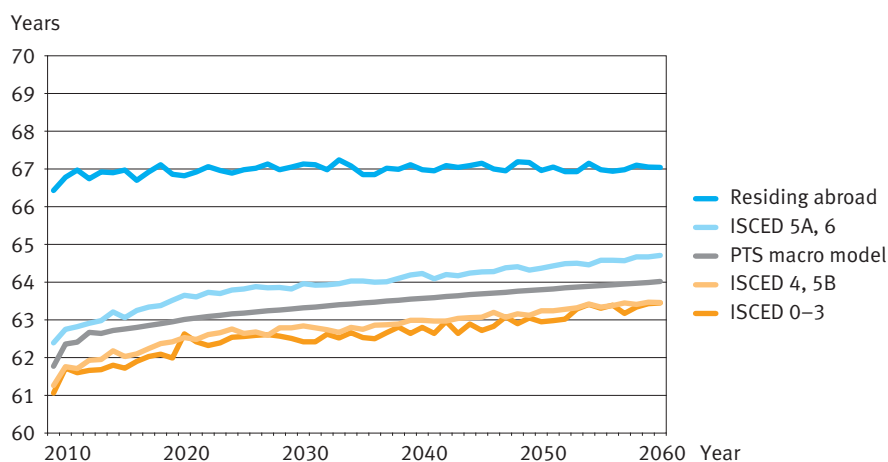
4 Main results

Within some limitations results may be compared to Finnish statistics and research that describe the earnings-related pension provision (Official Statistics of Finland 2013). At the macro level it is natural to compare with reports by Risku *et al.* 2013 and Työeläkeindikaattorit (“Earnings-related pension indicators”, report in Finnish). The expected effective retirement age may be compared to the report Kannisto 2014b. Results regarding pension recipients may be compared to the 2012 Statistic on Finnish pension recipients. However, comparing the replacement ratio to, for instance, the figures of the report “Earnings-related pension indicators” or other research by the Finnish Centre for Pensions (e.g. Rantala & Suoniemi 2010) is best avoided, since the concepts used differ quite a lot based on definitions and earnings.

The expected effective retirement age depicts the average retirement age for insured persons of a certain age when assuming that starting pensions and mortality per age cohort remain at the level of the year under review. Typically, the expected effective retirement age is calculated for e.g. 25 and 50-year-olds. Age-specific expectations for retirement age have been virtually the same in the PTS and ELSI models. Once the education level has stabilized for older age cohorts, the ELSI model can be used to acquire more detailed information about the expected effective retirement age.

Figure 4.1 shows the expected effective retirement age for 50-year-olds. The expectancy has been calculated for Finnish residents per education level, and separately those insured who live abroad. For the sake of comparison we also present the expected effective retirement age for 50-year-olds as produced by the PTS model.

Figure 4.1.
Expected effective retirement age of 50-year-olds.



The expected effective retirement ages of 50-year-olds, calculated for the entire population ensured for earnings-related pension, correspond quite well to the figures of the PTS model. However, when it comes to education there are clear differences between the groups. Finnish residents with a university education have clearly higher expectancies. The expectancies of those with primary and intermediate level education are virtually at the same level.

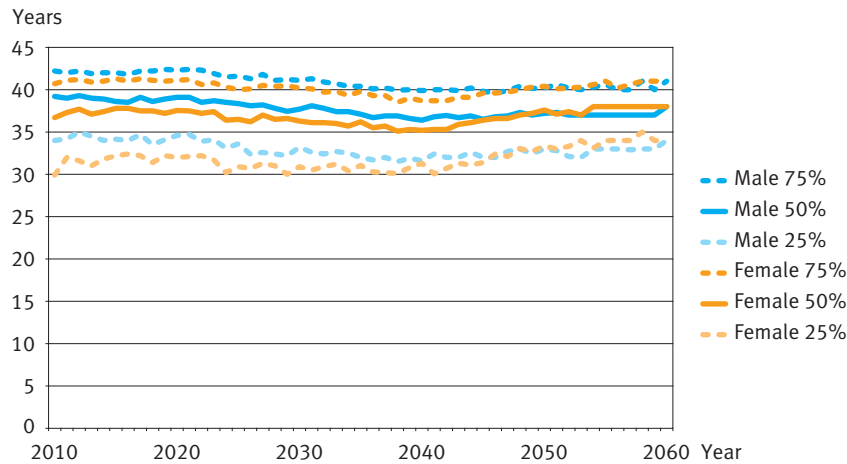
The expectancies of non-residents are in class of their own. Also in reality, the expectancies of those living abroad are very high. The pensions of non-residents are typically quite small, and the pensions of the Finnish earnings-related pension scheme do not necessarily form a significant share of the total pension security of these individuals. For this reason, many choose not to apply for their pension immediately when entitled to. It is also typical for these cases that the pension is less than the single instalment minimum.

Length of working life is here calculated from the start of an individual's 18th year until the start of the old-age pension. Based on register information, the accrued working life may be determined by the end of 2007. The ELSI model simulates working life from 2008 onwards. By combining working life history and a future simulated by the model, it is possible to get an impression of working lives as they will look in the future. Some limitations are in order, however. First of all, the population group whose career is sensible to show is one with Finnish residents that have retired on a regular old-age pension from work. Secondly, when calculating working life, full-time and part-time work is valued the same concerning both history and the simulated future. Thirdly, transferring from work into retirement means that the person in question is labelled among the working during the year preceding old-age pension.

According to Figure 4.2, working lives are not significantly extending. The extending of working lives that could be seen in the statistics of the last few years will even out for both men and women over the next few years. As a matter of fact, according to the model working lives may even shorten over the period 2020–2035. The length of working lives stabilizing is due to several factors. First of all, there will be cohorts retiring on old-age pension in the time period 2020–2040 whose working life histories will be more fragmented than those of previous cohorts. From the registers it becomes clear that those born in the 1970s and later have experienced a shift in the way we work in ways that contribute a great deal to shortening working lives. Another explanation has to do with the simulation technique used in the model. The model simulates breaks in careers fairly mechanically. This means that the model does not necessarily show enough selection compared to real life, in that those retiring on old-age pension from work would have a more uniform working life behind them than other groups.

Figure 4.2.

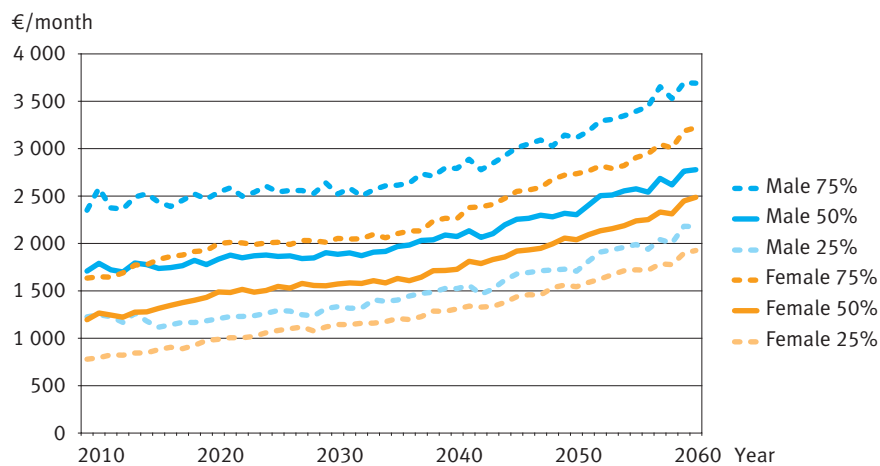
The working lives of retirees on an old-age pension from work.



Pension distribution may be reviewed in multiple ways and in different population groups. In the following we present the pension distribution according to gender among old-age retirees at the age of 68 (Figure 4.3). This age is a natural choice as the focus of reviews, as most people of this age are already in old-age retirement and no longer accrue new pension rights.

Figure 4.3.

Pension distribution, men and women aged 68 years of age. The 2014 price level.

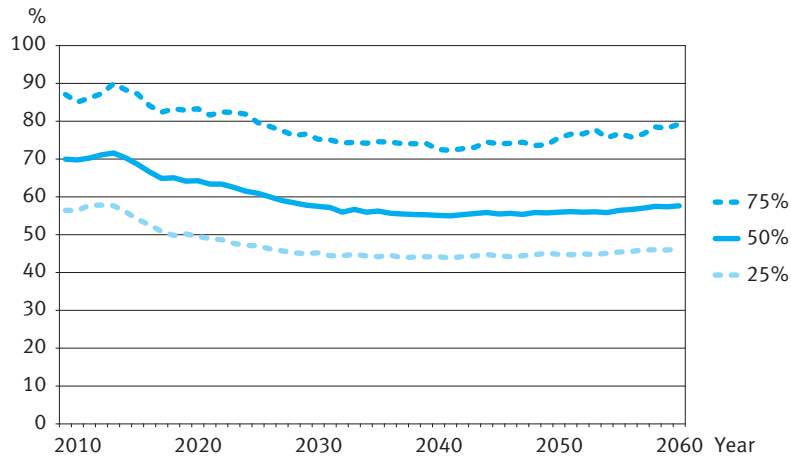


The replacement rate for all new pensions has been calculated by dividing the new pension with previous earnings for the individual in question. This review (Figure 4.4) thus also includes the projected share of earnings-related income from unsalaried periods in the earnings. In this review we have also not drawn any corresponding lines regarding time spent working prior to retirement, such as for instance in the report “Earnings-related pension indicators”, where roughly half of all new pension recipients have been omitted. In

order to avoid having to divide by zero we have, however, been forced to exclude those who had no earnings at all during the period under review.

Figure 4.4.

Replacement rate distribution of all starting old-age pensions (in the earnings-related pension scheme). As earnings preceding pension have been used the projected earnings.



Measuring the characteristics of the income distribution or the replacement rate is not unproblematic (see e.g. OECD 1998). There are also problems at the individual level when it comes to determining the replacement rate. In the end it is a question of what one wants to signal with the replacement rates. Large or small replacement rates can be found equally among those with large or small incomes, depending on the earnings in the years preceding pension. The distribution of the replacement rate is extremely sensitive to the selection of earnings for the period preceding pension, as well as to various limitations being made. This being the case, results will differ depend on the limitations chosen. The largest replacement rates typically occur for individuals whose earnings prior to retirement, for one reason or another, are very small. The sensitivity of the indicator, especially in relation to earnings preceding pension, highlights the difference between simulated and actual data.

5 Conclusions

The aim of microsimulation is to support and expand the PTS macro model analysis, already long time in use. Nowadays decision-makers demand multi-faceted information on the effects that pension policies will have at the individual level. The microsimulation model ELSI has been constructed and developed for this very purpose. It brings out new information on the income distribution effects of the pension system in support of decision-making.

Based on the extensive register data, the ELSI model calculates the earnings-related pensions of the future, specifically earnings-related pension based on the individual's working life. Thanks to the large sample, it is possible to analyse the impact of pension policies on several different population groups. The results are based on gender, age and type of pension benefit. The population may also be divided into residents and non-residents of Finland, and grouped based on education level. The model includes a dynamic education structure that aims to take into account the changing educational structure as it will appear in the labour market in the coming decades. The education level also affects the earnings level. This impact is included also in the earnings dynamics of the model, in addition to the career impact.

In developing the model we have sought to maintain a fairly close link between micro and macro calculations. This means that the comparability of results at the macro level remains good. The core parameters of the population model are the transition probabilities. These parameters are updated at the year level, in order for macro level quantities to align with the figures of the PTS macro calculation. In the same way, the wage sum derived from the wage process of the micro model has been adjusted to broadly correspond to the wage sum of the PTS model.

The microsimulation model is a good tool for analysing the impact that policies have on the individual. However, it is still necessary to present certain qualifications. First, system-level reviews regarding pension acts are excluded from the model. The ELSI model cannot be used to calculate pensions according to pension act. Another limitation is to do with the self-employed. The model includes work income currently insured under YEL (the Self-Employed Person's Pensions Act) and MYEL (The Farmers' Pensions Act), but there are no simulations for the self-employed of the future. In other words, in the simulation the self-employed merge into wage earners where income and pension calculations are concerned.

The ELSI model is in the early days of development and it certainly requires further work. The main focus of development is on the calculation of Kela (the Social Insurance Institution) pensions and taxation. The population states of the model could also be expanded further. A longer-term point of development would be optimisation in connection with the decision to retire, as well as survivors' pensions. Modelling family dynamics is key in order to enable the calculation of survivors' pension and being able to more comprehensively refer to the total pension of an individual.

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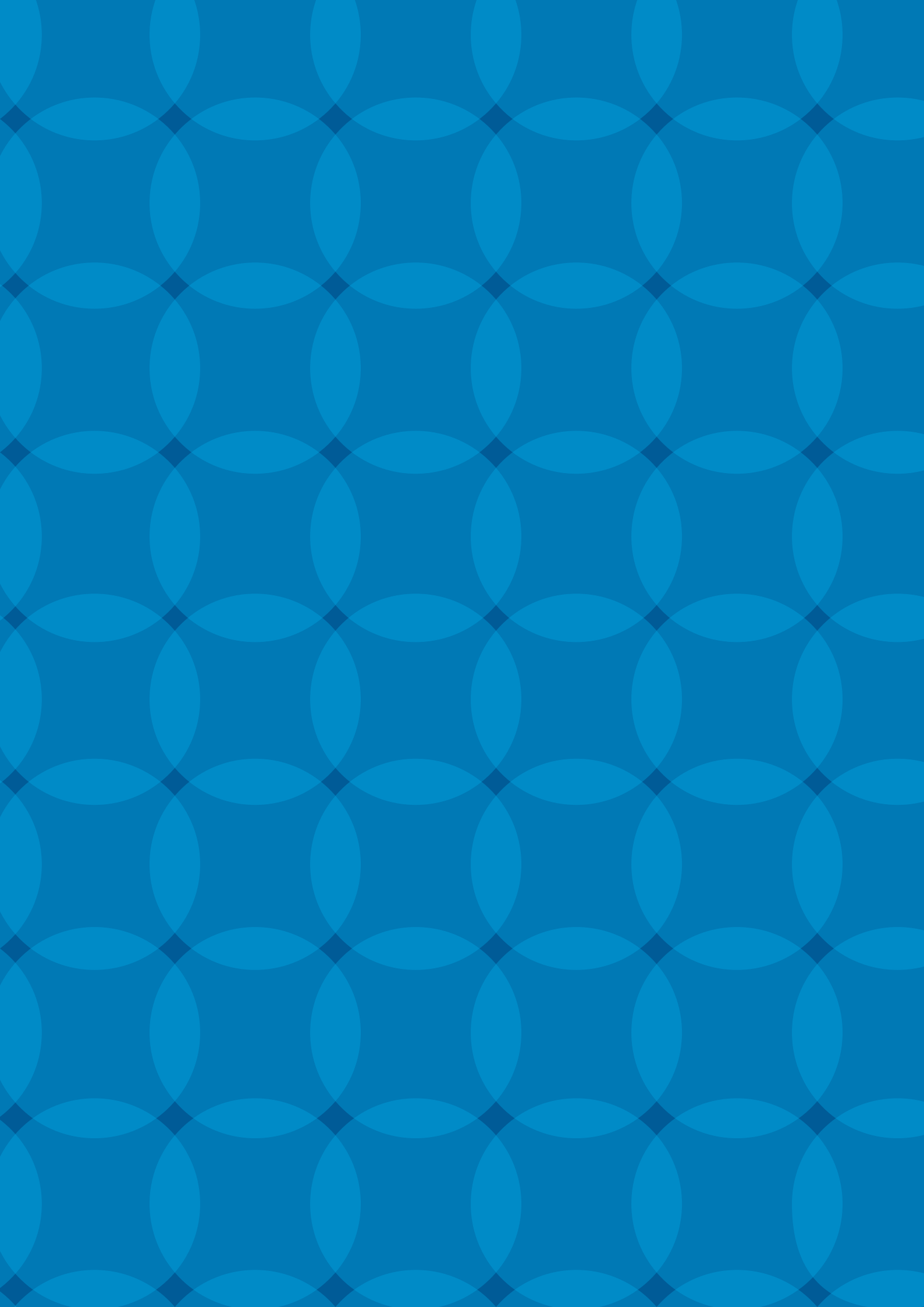
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The Finnish Centre for Pensions is a statutory co-operation body, expert and producer of joint services for the development and implementation of earnings-related pension provision.

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.

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