

Government
Institute for
Economic Research

Working Papers 7

Voluntary pension savings:
the effects of the Finnish tax reform
on savers' behaviour

VATT WORKING PAPERS

7

Voluntary pension savings: the effects of the Finnish tax reform on savers' behaviour

Jarkko Harju

I would like to thank Seppo Kari, Leena Kerkelä, Tuomas Kosonen, Timo Silvola, Päivi Valdes, Takis Venetoklis and the participants in various seminars for their useful comments. I would also like to thank Federation of the Finnish Financial Services, the Nordic Tax Research Council and the Finnish Cultural Foundation for their financial support.

ISBN 978-951-561-868-9 (nid.)
ISBN 978-951-561-869-6 (PDF)

ISSN 1798-0283 (nid.)
ISSN 1798-0291 (PDF)

Valtion taloudellinen tutkimuskeskus
Government Institute for Economic Research
Arkadiankatu 7, 00100 Helsinki, Finland

Oy Nord Print Ab
Helsinki, June 2009

Voluntary pension savings: the effects of the Finnish tax reform on savers' behaviour

Government Institute for Economic Research
VATT Working Papers 7/2009

Jarkko Harju

Abstract

Many countries tax voluntary pension savings using the so-called EET model, based on tax-deductible savings and taxable withdrawals. In Finland the tax reform of 2005 changed the tax rate schedule from progressive to proportional, while the basic structure of the EET model was retained. This paper is an empirical study of changes in savers' behaviour as a result of the reform using individual level data. The econometric estimations indicate that the reform altered pension saving behaviour by reducing the labour income and age effects on saving contributions in a statistically significant way. Also, the reform reduced the number of pension savers among high income-earners.

Key words: voluntary pension savings, tax reform, tax incentives

Tiivistelmä

Monissa länsimaissa on käytössä EET-mallin mukaisesti verotettuja vapaaehtoisia eläkesäästökohteita, joissa säästöistä saa verovähennyksen ja tuotot kattuvat verovapaasti, mutta varojen nostoja verotetaan. Suomessa vuoden 2005 verouudistus muutti vapaaehtoisten eläkevakuutusten verokohtelun progressiivisesta ansiotuloverojärjestelmästä suhteelliseen pääomatuloverojärjestelmään säilyttäen kuitenkin EET-muotoisen verojärjestelmän. Tämän tutkimuksen tarkoituksena on arvioida empiirisesti uudistuksen aiheuttamia säästäjien käyttäytymismuutoksia käyttäen yksilöaineistoa. Tulokset tukevat sitä käsitystä, että veromuutos vaikutti eläkevakuutussäästäjien käyttäytymiseen, sillä uudistus vähensi ansiotulojen ja iän vaikutusta eläkevakuutussäästöjen määrään. Lisäksi havaitaan, että ansiotulojen vaikutus säästämisen todennäköisyyteen aleni.

Asiasanat: vapaaehtoiset yksilölliset eläkevakuutukset, verouudistus, verokannustimet

Contents

| | |
|------------------------------------------------------|-----------|
| 1. Introduction | 1 |
| 2. Voluntary pension plans in Finland | 4 |
| 2.1 Tax scheme applying to voluntary pension savings | 5 |
| 2.2 Measuring tax incentives | 7 |
| 3. Empirical analysis | 10 |
| 3.1 Hypotheses | 10 |
| 3.2 Methods | 11 |
| 3.3 Data | 12 |
| 4. Results | 17 |
| 5. Conclusion | 21 |
| References | 23 |
| Appendixes | 25 |

1. Introduction

Many western countries are facing increasing pressures in financing their current social security programmes because a decreasing proportion of the population is of working age. In response they have been scaling back the future scope of their public pay-as-you-go pension systems. In order to guarantee an adequate level of old-age income, they have tried to encourage individual pension savings by granting tax allowances. Well known examples of tax-favoured individual pension savings plans are the IRAs in the USA, the ISAs and Tensas in the UK and Riester pensions in Germany. Most OECD countries provide special treatment to some sort of individual saving plans (OECD 2005). A common system is to allow savings to be deductible from the income tax base, the accrued return on funds to be tax-exempt, but to tax the withdrawn funds (EET model).

The usual impetus behind tax-deferred voluntary pension plans is a desire to increase the aggregate saving rate and strengthen the provision of retirement income.¹ The paternalistic argument in favour of preferential tax treatment is that savers are myopic and start to make provision for their old age too late. Some economists also argue that the illiquidity of pension savings makes their elasticity differ from that of precautionary savings. This would justify a preferential tax treatment for pension savings (Fehr et al. 2008, p. 193). However, there are some counter-arguments too. Only a small proportion of additional pension funds are a result of new savings. The majority consists of transfers from other savings instruments to tax-preferred instruments.² Also, many front-loaded voluntary pension plan instruments are problematic in countries where some subpopulations can get larger tax advantages than others, especially if deductions are made based on progressive taxation.

The purpose of this paper is to analyse empirically how the tax reform of 2005 (TR2005) affected savers' behaviour in Finland. The main interest is in determining rates of participation and changes in the volume of voluntary pension plan savings. The reform changed the marginal tax rates applied to pension savings. Before the reform, savings were deducted from labour income and the benefits were taxed as labour income, subject to a steeply progressive tax rate schedule³. TR2005 moved the tax treatment to a flat-rate capital income taxation regime. We argue that this change affected saving incentives faced by

¹ Bernheim (2002) presents a comprehensive analysis on taxation and savings.

² General equilibrium models are used to estimate the effects of voluntary pension plan savings on the capital stock and incremental savings. Imrohoroglu et al. (1998) have concluded that there are increases in national net savings, capital stock and additional savings but the effects are not extensive. Fehr et al. (2008) estimated the additional savings to be 22% higher than in the Imrohoroglu et al. paper.

³ Finnish income taxation follows the Nordic dual income tax under which labour income is subject to a progressive tax schedule and capital income taxed using a flat tax rate. (See Sørensen 1994, 2005)

individuals in different ways, depending on factors such as income and age.⁴ Due to this variation, the reform seems to open up an interesting opportunity to measure the causal impacts of tax changes.

Engen et al. (1994) studied the effects of tax-deductible savings on aggregate savings and found that tax allowances do not significantly affect private savings. The total amount of such savings did indeed increase markedly, but funds were mainly shifted from other instruments. Venti and Wise (1992, 1995) presented different conclusions. They found that the IRAs increased new savings once tax allowances were granted by the government. In a more recent examination, Benjamin (2003) studied these same effects on 401(k) savings in the US. He found that approximately 25% of all voluntary pension savings represent new savings. The other main observation is that low income earners changed their behaviour more than high income earners.

Attanasio et al. (2005) studied the effect of tax deductions on saving behaviour in the UK. They examined the tax reform of 1999. The amount of tax-exempted savings increased in all age groups. The young in particular saved more in 2002. However, at the same time, the amount of aggregate savings decreased in all age groups and the largest decreases were among the young and low-income groups. Chung et al. (2005) studied the UK tax reform of 2001. The results did not indicate any clear growth in new private savings after the reform. However, in the case of low labour incomes the amount of savings increased. Another focus in Chung's study was the changes in the probability of persons having a retirement plan before and after the reform. There was no evidence to indicate an increase in the probability of saving as a result of tax deductions.

There is a recent study on Stakeholder Pensions in the UK by Disney et al. (2007). To put the study results in context, there was an underlying decline in voluntary retirement savings in the early part of this decade. Disney et al. argued that the drop would have been even greater had the tax changes not been introduced. The associated change in contribution ceiling benefited low and zero-earners; the number of savers in voluntary pension accounts within these groups increased. The results also provide evidence that as a result of the reform the number of women savers also increased a statistically significant way. In contrast to the rest of the sample, the level contributions among those who were benefiting from the higher contribution limit did not fall.

To conclude, empirical studies agree that tax-relieved instruments have grown in popularity among consumers. However, there is disagreement on the extent to which tax reforms have contributed to the development of aggregated savings. The studies cited above have also pointed out that some subpopulations react

⁴ Kari and Lyytikäinen (2004) and Määttänen (2005) have drawn attention to this incentive aspect of TR2005.

more actively to changed saving incentives than others. Hence there is some indication that the ability of tax incentives to produce new saving is larger among low-income earners. This suggests that, when aiming at efficient use of resources, tax deductions should perhaps be targeted at certain sub-groups such as the less educated or low income earners.

The Finnish reform changed the saving incentives in certain sub-groups. The main purpose was to make the taxation scheme neutral among different types of savers. An important feature of the change in the tax regime was that it decreased the incentive for high-income savers to save. Therefore it is worth attention to evaluate and estimate empirically the causal effect of this reform on savers by comparing their behaviour before and after the reform.

The empirical results support our hypotheses. The number of high labour income savers has decreased since the reform in 2006. Also, high labour income savers have contributed less than earlier. Furthermore, the age effect on savings contributions decreased in 2005 and in 2006.

The paper proceeds as follows. We first introduce the Finnish tax reform of 2005 and describe the model to assess the effective tax rate for savers. In the third section we present the key figures of our data, introduce our hypotheses and explain our econometric methods. Section four concentrates on the results. The last section concludes.

2. Voluntary pension plans in Finland

In the international literature it is common to describe pension systems in terms of three “pillars”. In Finland the pension system⁵ is based on a public first pillar, which is divided into two parts. First, the national pension is the basic tier and is a flat-rate benefit, financed by taxes and contributions. The second part is the earnings-related pension (TyEL), which is financed from contributions paid by employees and employers. Reforms were made to earnings-related pensions in 2005. The main changes in the reform were that the earnings over the entire working career were taken into account, a flexible retirement age between 63 and 68 was introduced, higher accumulation rates for older workers were applied, and increased life expectancy started to matter. At the same time there was a wide debate about the sustainability of the public pension system.

The second pillar complements the first pillar and includes voluntary collective industry-specific or employer-specific schemes. The third pillar comprises voluntary pension saving plans. The Finnish voluntary pension savings market is rather underdeveloped but recently the government has shown increased interest in exploring alternatives and the proposal of elaborating new tax-subsidized long term saving instruments is now under consideration⁶. However, at the moment, voluntary pension saving plans can only be offered by insurance companies in Finland, and they have long been the only direct pension saving option enjoying tax allowances. The taxation system applying to present pension savings is based on the EET system⁷.

The coverage of public provisions is comprehensive and public pension spending represents over 10 per cent of GDP. This share is expected to grow in the future. Total pension expenditure consists approximately of 95 per cent statutory pensions and 5 per cent voluntary pensions. Although voluntary pension saving plans have gradually grown in popularity in recent decades, these instruments still only have a minor role compared to other savings options⁸.

⁵ The Finnish Centre for Pensions (Handbook 2007:6) offers a wide and comprehensive description of the Finnish pension system.

⁶ In 2003 the so-called SIVA working group proposed developing new tax-deductible pension savings instruments, but the group’s proposal was not acted upon. The main parts of the proposal of 2009 follow the SIVA report from 2003.

⁷ There are several schemes for taxing voluntary pension plans in western countries. In the US voluntary pension plans are taxed both according to the EET system (IRA savings) and the TEE system (Roth IRA). In the UK there are also two types of taxation schemes that apply: ISAs are taxed according to TEE and private pensions are taxed according to EET. In Sweden the taxation of voluntary pension plans is based on ETT type taxation. Additional information about various tax-favoured retirement saving plans in western countries is given in OECD (2005).

⁸ Voluntary pension savings plans have a minor role in the Finnish pension system since only a small (13.1%) proportion of the working-age population save in these plans and annual mean contributions to

A notable feature of the Finnish income tax scheme is the Nordic-type dual income tax (DIT), which applies to the taxation of personal income. This tax system combines steeply progressive taxation of labour income and a flat-rate taxation of capital income. Interestingly, although this has received little attention in the tax literature, the DIT system offers two alternative ways to tax private pension savings. One way is for contributions and withdrawals to be taxed as labour income. The other option is to impose flat-rate capital income taxation on both contributions and withdrawals. It should be clear that the differences in tax rates will have different implications for saving incentives. Tax literature has paid some attention to progressive taxation applying an EET model (OECD 1994, 2005). According to the literature, a progressive tax scheme can lead to a wide variation in incentives for different types of contributors and may end up favouring savers in high-income classes. A solution to this problem could be to tax voluntary pension plans with flat rates of tax on capital income.

2.1 Tax scheme applying to voluntary pension savings

Tax-deductible savings instruments have been on the market in Finland for some time. Deductions have always been made on an EET basis. Only insurance companies are allowed to provide pension savings plans. They offer plans in the form of retirement insurance, family pension insurance, disability insurance and unemployment insurance. Life insurance contributions are not treated in the same way as voluntary pension saving plans for tax purposes.

The government has laid down conditions for contributions to be tax-exempt; to receive tax deductions, the saver must contribute to his/her plan half-yearly or more often during his/her remaining lifetime and for at least two years. Also, the withdrawal period must be spread over two years.

The level of deductions and the regulations governing pension plan tax-deductibility have changed many times in Finland. The following examination looks briefly at Finnish private pension plans before 2005, and the latter part of the section focuses specifically on the 2005 reform.

Taxation of private pension plans until 2004

Until 2004, the tax deduction regime applying to voluntary pension plans was based on labour income taxation; deductions were made from labour income and tax on withdrawals was paid as on labour income. Deductions were applicable if the saver undertook to keep his/her savings in the plan until the age of 60. If the time period commitment was not met or the annual upper contribution limit

the plans are relatively low (1700 €). The number of contributors and the mean savings come from income distribution data for 2002 to 2006. The data is produced by Statistics Finland.

(8500 euros) was exceeded, the deduction went down to 60 per cent of contributions and the maximum deduction was 5000 euros.

The basic pension regulation⁹ restricted the aggregate amount of pension withdrawals. Pensions received from the government and one's own voluntary saving plans in aggregate were not allowed to exceed 66 per cent of the person's income when working. Taxpayers were also entitled to deduct allowances from their spouse's labour income up to 5000 euros. In other words, the upper limit of personal deductions could be even higher than 8500 euros if payments were also deducted from a spouse's labour income.

The reform of 2005

The tax reform of 2005 changed the system (Ministry of Finance 2005). Capital income taxation was now applied. The upper limit of deductions was lowered from 8500 euros to 5000 euros. Also, the contractual age increased from 60 to 62 years, the upper ceiling in the basic pension regulation was removed and deductions can no longer be made directly from spouses' income. Only if savers' contributions exceed their capital and labour income can deductions be made from a spouse's labour income tax.

Voluntary pension insurance contributions are deducted from capital income after deduction of interest and any losses incurred. If the total amount of contributions is higher than the total amount of capital income, the taxpayer is entitled to apply for a separate investment income deficit from his/her labour taxes¹⁰.

If an employer has paid pension contributions on behalf of an employee, that person cannot make deductions exceeding 2500 euros from his/her own contributions. The personal right to deductions dropped from 5000 to 2500 euros regardless of the amount paid by the employer.

Transitional rules

The new law came into force in the beginning of 2005. However, it included transitional regulations. Firstly, contracts made before the government's first proposal (6 May 2004) could still apply the old rules in 2005. Secondly, the tax rules on pension plans included transitional provisions for savers entering into a contract between the government's first reform proposal and the end of 2004. Savers making their first contributions in that period deducted their contributions from labour income and withdrawals are taxed on the basis of capital taxation.

⁹ The basic pension regulation means that a supplementary personal pension plus the government-paid public pension is not allowed to exceed some particular share of the highest working-age income.

¹⁰ In Finland the upper level of deficit credits is 1400 euros ($0,28 \cdot 5000$) as a function of the current capital tax rate (28%).

This means that persons with high marginal labour income tax rates had a major incentive to save in pension plans in 2004. Thirdly, the contractual age remained at 60 years (or lower, depending on which age limit was valid when the contract was made) until 2009 if the contract with the insurance company was made before the first government proposal. As from 2006, all deductions have been made from capital income and withdrawals are taxed at the capital tax rate.

Government tax revenue effects

The government's proposal included both short-run and long-run calculations concerning the effects of the reform on tax revenue. It was estimated that tax revenue would grow. The government's tax income was also expected to increase a result of the change in capital income taxation, where the tax advantage is not so large for voluntary pension plan savers. The short-run effects here apply to years 2005 and 2006. Because of the transitional rules, the effects were assumed to be minor in 2005. In 2006 though, the changes in the government's tax revenue were expected to be larger.

2.2 Measuring tax incentives

A common way to compare tax incentives to save in a particular instrument is to calculate the Marginal Effective Tax Rate (METR), as was the case in the OECD (1994) report. The METR better illustrates the tax burden of an investment option versus the nominal tax rate because it allows one to take into account many other factors which interact with taxes (OECD 1994, p. 62). For example, inflation, tax base regulations and overlapping taxes can be included in the METR formula.

The following examination describes the effective tax rate to highlight the potential differences in voluntary pension saving incentives. Kari and Lyytikäinen (2004) introduced a simple way to measure the tax burden of different private investments in Finland. They also applied the METR approach to voluntary pension plans in the EET system. The method of Kari and Lyytikäinen is simpler than the OECD (1994) version, and under their approach the METR can be presented in just one formula. The pattern of the METR is based on

$$(1) \quad \tau_{ef} = \frac{1}{rT} \ln \left(\frac{1 - \tau_c}{1 - \tau_p} \right),$$

where r is the real interest rate¹¹, T is the saving period, τ_p is the marginal tax rate on pensions and τ_c is the marginal tax rate on labour income.

The model relies on the following assumptions. The contribution is set one euro out of the saver's disposal income in a private pension plan at time $t=0$. The holding period is T years and the withdrawal is made in the form of a lump sum. The real interest rate r is given and there is assumed to be perfect competition in the insurance market, so there are no management or other expenses.

The lower the METR, the better it is for the saver. There is a natural logarithm in (1) above, so if this part is between zero and one the whole expression is negative (when the net profits are positive). The saving incentive is affected by two different factors when the interest rate is fixed. The first is the difference in marginal tax rates (MTR) between the saving and the withdrawal periods. If the MTR is higher for the contribution period than for the withdrawal period, the tax authorities do not collect all the tax deductions back as tax income. Therefore, savers could derive an "extra benefit" by saving in pension plans. In a progressive tax scheme it is likely that some savers could benefit from this. Hence

$$\tau_{ef} \begin{cases} > \\ = \\ < \end{cases} 0 \Leftrightarrow \tau_c \begin{cases} < \\ = \\ > \end{cases} \tau_p.$$

Secondly, the length of the saving period affects the extent of the incentives. The METR on retirement savings approaches zero in the long term. Before the reform the effective tax rate could have been very low over a short saving period. In the new system the incentives are equal between different savers and the effective tax rate is zero, at least if the capital tax rate is the same over time. Therefore, the tax incentives to save in voluntary pension plans are the same over the life cycle.

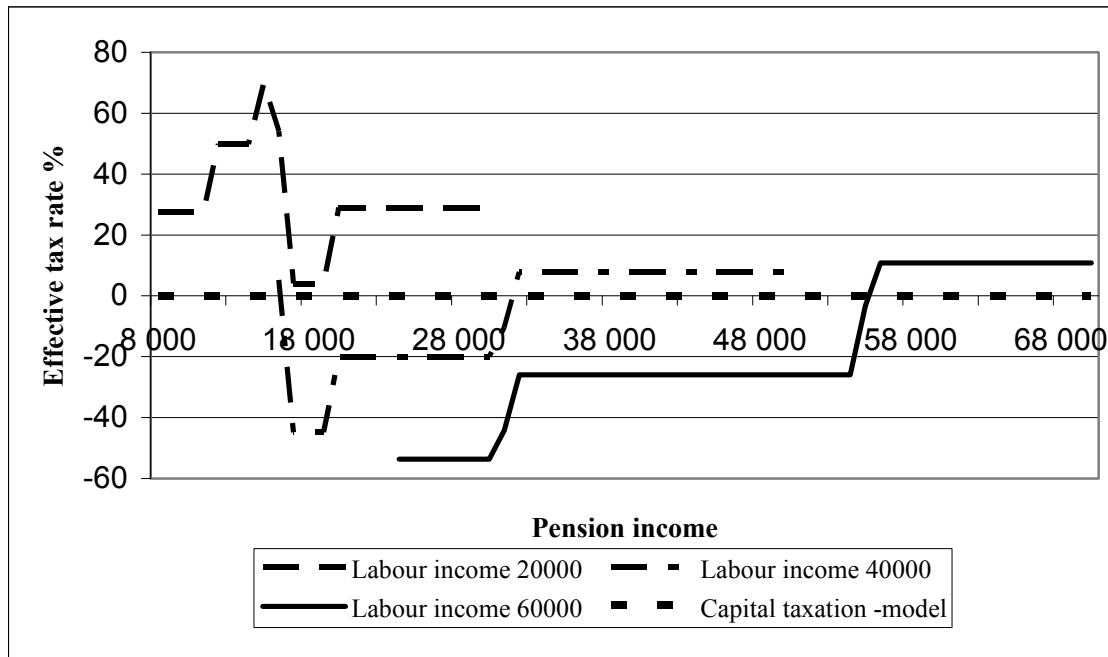
Kari and Lyytikäinen (2004) illustrate in more detail the effect of the reform by simulating METRs at different fixed wage levels. In their analysis they applied the TUJA model¹² (graph 2.1). The graph illustrates that persons with low annual labour income (20,000 €) and low annual pension income (below 15,000 €) had very high positive METRs. Therefore, for them it was not very profitable to invest in the pension plans. Persons with higher annual labour income (40,000 € and 60,000 €) could benefit from low METRs, thus it was very profitable for them to save. This was the case under the old system simply because of the progressive taxation of labour income. Up to approximately 8000 € annually,

¹¹ In this pattern, the only interest rate is the net profit of the investment.

¹² TUJA is a micro simulation model which is in use at VATT (Government Institute for Economic Research).

government-funded pension income is totally tax-free for single persons (Finnish Centre for Pensions 2007, p. 115). So the tax threshold applying to pension income causes a rapid rise in marginal tax rates for retired persons.

Graph 2.1 The effective tax rates on pension savings for different labour and pension income (the interest rate is assumed to be 4% and the saving period is 10 years)



Source: Kari – Lyytikäinen (2004)

The government's main aim with TR2005 was to create a non-discriminatory system where all savers would be treated equally. According to the theoretical presentation given, this goal has been achieved; taxation is now neutral between different investors. After the reform, a person's marginal tax rate and therefore his/her wages and pension income do not affect the METR.

3. Empirical analysis

3.1 Hypotheses

The tax reform of 2005 in Finland provides very interesting material for empirical study. The reform was unique in that it changed the incentives to save in voluntary pension plans.

The tax reform effects are estimated using dummy and interaction variables. The estimation model is

$$\ln P_{i,t} = \alpha_i + \varphi \ln INC_i + \eta AGE_i + \delta X_{i,t} + \phi D_t + \beta * D_t * \ln INC_i + \gamma * D_t * AGE_i + \varepsilon_{i,t}$$

where $P_{i,t}$ is the annual (t) aggregate amount of tax-deductible retirement savings per observation i (tax payer), INC is labour income, AGE is the age of individuals, X is a vector of control variables, D is a time dummy vector and φ , η , δ , ϕ , β and γ are vectors of parameters.

The way in which savings are related to labour income and age is interesting. The tax reform might have altered the behaviour of the typical saver or the socio-economic profile of the pension saver. We assume that in the new system the typical saver is not as positively dependent on labour income or age as in the former system. Also, we expect that the explanatory power of labour income for voluntary pension savings declined after the reform. The examination of these hypotheses is performed by interaction terms; the year dummies are multiplied by continuous labour income and age variables and the coefficients (β and γ) of the interaction variables reveal the potential effect of the reform.

As mentioned above, the tax reform included a transitional provision, which has to be taken into account. Because of the transitional provision, clear behavioural changes are unlikely in 2005. However, changes are much more likely to be visible in 2006 when the new tax scheme is fully effective. If changes have occurred across saving groups, the interaction term of 2006 and labour income would have a negative sign and be statistically significant. The same is anticipated to happen for the interaction of age and the 2006 year dummy.

The provision allowed existing savers to use the former system until the end of 2005. People could choose to make contributions up to the upper limit and gain the tax benefits. It was also possible to deduct contributions from labour income in 2004 and pay capital tax if the contract between saver and insurance company was signed between 6 May 2004 and the end of 2004; in other words, it was possible to receive an extra tax benefit.

3.2 Methods

The behaviour changes among savers caused by the reform can be estimated econometrically. Many people do not save in such plans, thus their savings are zero. Therefore, the dependent variable does not act linearly. A linear model might give the average effects approximately but it might not estimate the direct effects exactly for the entire group of independent variables. In our case, the dependent variable is the combination of discrete and continuous distributions because a large proportion of the observations have a value of zero¹³.

Our construct calls for a corner solution case. We initially introduce a censored regression approach, the Tobit model (Cameron and Trivedi 2006). The Tobit model can be restricted both at the upper or lower limit. In this case it is the lower limit that has to be limited so that the model can accommodate the zero values. However, there are problems with this model as well, because the restrictive assumptions about homoskedasticity and the normality of the error term impose limitations on its use. Secondly, the Tobit model assumes not only that a continuous variable has to have the same direction of impact on the participation decision, but also that the relative effects of any two variables are the same. The effects are not necessarily as strong for the various continuous variables we utilize, although the effects could be in the same direction. If, for example, a 1000 euro increase in labour income increases the probability of becoming a pension saver as much as a one-year increase in the saver's age, the Tobit model also assumes that 1000 euros of extra income and a one year age increase have the same relative effect on the amount of savings. In our case, this is not a very realistic assumption.

Because of the problems with our dependent variable we have to seek another, more flexible estimation method. The model which may fit well in our construct is the truncated normal hurdle model¹⁴. In this model the estimation is made in two phases: the first phase is a probit model¹⁵. Then the estimation is run once more on a truncated regression model. The truncation is made for zero savings. The model assumes that the probability of being a saver and the amount of savings are not correlated. The first estimation reveals the probability of being a pension saver; the second exposes the changes in the amount of savings. However, the effect of the whole model can also be calculated.

Formally the distinction between retirement savers and non-savers is depicted by a dummy variable:

¹³ In this case the OLS estimates would be biased and inefficient because of the omitted variable. OLS estimates without any correction of the truncation variable would be biased towards zero.

¹⁴ In international literature the model is also called Cragg's model or the Corner solution model. See Wooldridge (2002).

¹⁵ As is well known, the probit is a binary choice model which is based on a normal distribution.

$$d_i = \begin{cases} 0, & \text{if } P_i \leq 0 \\ 1, & \text{if } P_i > 0 \end{cases}.$$

The second phase is based on the assumption about the positive quantity of deductions ($d_i = 1$), where P_i is the amount of tax deducted pension plan savings. This estimation is simple because the model uses the assumptions of classical linear regression.

The expected average marginal effects are also calculated for this truncated normal hurdle model¹⁶. The calculation process is straightforward, and the semi-elasticity of $E(y|x)$ is obtained by using the coefficients from both the probit and the truncated estimations. These marginal effects show the total effects of the model. The standard errors are calculated by bootstrapping.

It is not surprising that the problems with heteroskedasticity and the non-normality of the error term are also present in this latter model. There has also been a debate on the interpretability of limited dependent variable models for analysing causal effects. Angrist (2001) has criticized these models and especially the interpretation of the coefficients in the truncation part of the model. He proposed that some other linear or non-linear models should be used in these corner solution cases. Therefore we also estimated a Tobit regression. However, the starting point of truncated normal hurdle model is much more reasonable and flexible than that of the Tobit model or OLS.

3.3 Data

The Income Distribution statistics, produced by Statistics Finland are a cross-sectional stratified sample of approximately 28,000 Finns (updated annually). We used the data from 2002 to 2006.

The data is in a repeated cross-section form and it is a representative sample of the Finnish population. Our dependent variable is the amount of private pension contributions deducted from income taxes between 2002 and 2006. The data contains many other relevant continuous variables, including labour income, capital income and age. Also, there are many important dummy variables like gender, place of residence, marital and socioeconomic status. Unfortunately, the data not have a variable representing the private wealth of a person, thus it is impossible to analyse the reform's induced changes on total wealth.

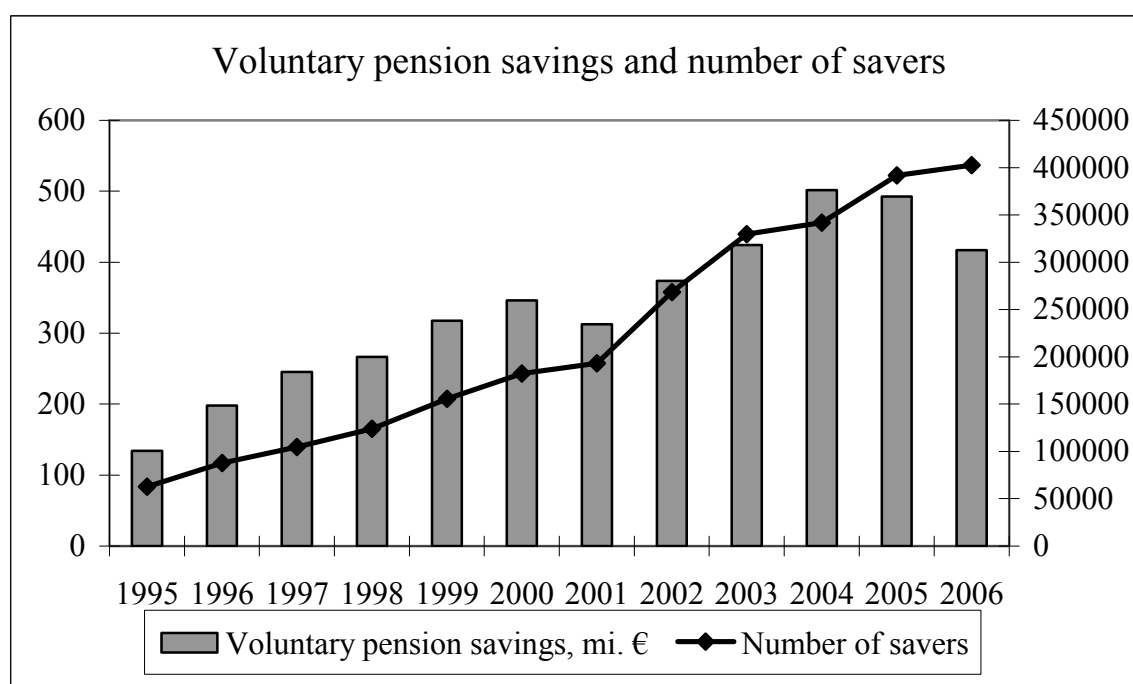
¹⁶ In appendix 2 contains more comprehensive description of the calculation of expected average marginal effects for the truncated normal hurdle model.

Voluntary pension savings in Finland

Graph 3.1 depicts the figures from the Income Distribution data. The sum of savings (left axis) and the number of savers (right axis) are weighted to represent the whole population of Finland from 1995 to 2006. The sum of savings is in millions of euros and at 1995 prices. The grey pillars are the sum of deductions per year and the thick line shows the number of savers.¹⁷

The number of savers has increased considerably. Growth was stable until 2001 but thereafter the number of savers exceeded the average trend growth. In 2004 there was just a small increase, which might be explained by the overall uncertainty regarding the new tax system (Federation of Finnish Financial Services 2008). However, the number of pension savers rose by almost 50,000 straight after the 2005 reform, which is indeed a considerable increase. Growth was not so large between 2005 and 2006 (just over 10,000 savers).

Graph 3.1 The sum of tax-deductible voluntary pension plan savings and the number of savers from 1995 to 2006



Source: Income Distribution data 1995–2006 (Statistics Finland)

¹⁷ The tax administration also produces annual aggregate statistics on tax-allowed retirement plan savings in Finland. The statistics include the number of savers and the amount of deducted savings. In these statistics the number of savers is not necessarily correct because there could be savers with taxes deducted both from capital and labour income in 2005; these savers may appear twice in the counts. Therefore, the weighted aggregate figures from the micro data are presented.

As we can see from graph 3.1, the sum of savings has increased in the last decade. The annual growth in savings has been fairly linear, except for year 2001 and just after the reform in 2005/2006. These were the years when there were changes to the taxation of pension savings in Finland. The poor economic cycle could also have affected the subnormal growth in savings in 2001. Savings growth picked up from 2001 to 2005. 2004 is also interesting because of the exceptionally high rate of savings. This could be an indicator that existing savers contributed more than usual to their plans so as to benefit from the old regime. In 2006 the aggregate amount of savings dropped approximately to the level of 2003. The drop is not necessarily surprising because the new regime lowered the upper limit of deductions and the number of savers grew only slightly.

Descriptive statistics of voluntary pension saving plans

Descriptive statistics of the main variables used in our estimations are given in table 3.1 below. All persons without voluntary pension savings in voluntary pension plans have been removed. Hence, these figures only refer to pension savers who have received tax allowances. All the values are given in present prices for each year.

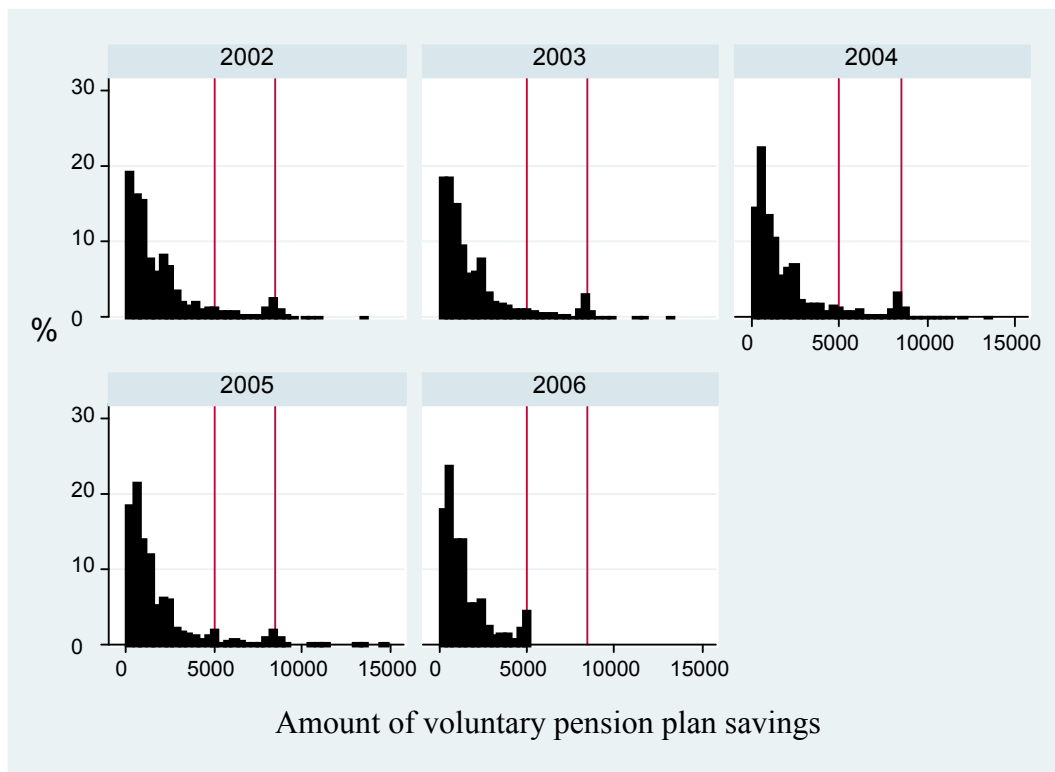
Table 3.1 Descriptive statistics, data from 2002 to 2006

| | Observations | Mean | Std. Dev | Min | Max |
|-----------------------------|--------------|-------|----------|-----|---------|
| 2002 | | | | | |
| Tax-allowed pension savings | 2137 | 1861 | 2087 | 2 | 13478 |
| Age | 2137 | 45 | 9 | 16 | 69 |
| Labour income | 2137 | 35679 | 64262 | 0 | 2285329 |
| 2003 | | | | | |
| Tax-allowed pension savings | 2404 | 1798 | 2032 | 2 | 13071 |
| Age | 2404 | 44 | 10 | 17 | 78 |
| Labour income | 2404 | 33629 | 29198 | 0 | 635684 |
| 2004 | | | | | |
| Tax-allowed pension savings | 2418 | 1929 | 2181 | 2 | 13500 |
| Age | 2418 | 44 | 9 | 4 | 79 |
| Labour income | 2418 | 34054 | 27694 | 0 | 369272 |
| 2005 | | | | | |
| Tax-allowed pension savings | 2584 | 1709 | 2021 | 2 | 13500 |
| Age | 2584 | 45 | 9 | 18 | 76 |
| Labour income | 2584 | 34421 | 27694 | 0 | 1340163 |
| 2006 | | | | | |
| Tax-allowed pension savings | 2642 | 1375 | 1278 | 2 | 5000 |
| Age | 2642 | 45 | 10 | 18 | 73 |
| Labour income | 2642 | 33772 | 33272 | 0 | 996458 |

Source: Income distribution data 2002–2006 (Statistics Finland)

The mean of voluntary retirement plan saving contributions has varied considerably. It is noteworthy that the mean of allowed savings is highest in 2004; this would support the view that savers anticipated the reform. The range of standard deviations is also high for allowed savings and is always higher than the mean. The highest standard deviation is also found in 2004. The mean of tax-allowed pension savings declines considerably after 2004, and in 2006 mean savings are at their very lowest.

Graph 3.2 Distribution of voluntary pension savings, 2002 to 2005



The distribution of voluntary pension savings is presented in graph 3.2. It shows that small savings have the highest weighting in every year. Approximately one fifth of all savings are very low contributions. The most interesting years of the study are 2004, 2005 and 2006. The proportion of very low contributions has declined and the upper limit of contributions increased in 2004. Also, the distribution in each year has small peaks at the point of the maximum tax allowance (8500 euros), except in 2006, when the maximum allowed sum was 5000 euros.

The transitional regulations make it more difficult to identify clear effects in empirical analysis as a result of the 2005 reform, but adding the data for 2006 the examination ought to facilitate matters. A small change can be seen already in

2005 but the effects are not very clear. The peak at the point of maximum allowances is lower in 2005 than before and there is another high contribution point at the level of 5000 euros, mostly caused by the reform. This peak at 5000 euros is higher in 2006 than in 2005.

4. Results

The baseline year in these estimations is 2002. This is the year when persons were logically not yet able to anticipate the reform, and so it can be used as the reference year in our estimations. The dependent variable is the annual aggregate amount of tax-allowed pension plan savings for a single person. The main independent variables are age, labour income, capital income and household income. Gender, residence area, level of education and marital status are also added to the specification as dummies. The year dummies control the yearly changes in aggregate savings. The most interesting coefficients are those of the interaction terms, which are derived by multiplying all-year dummies by labour income and age. The yearly changes in savers' behaviour and profile can be identified if the interaction terms end up with a statistically significant coefficient.

First, estimations were made using the Tobit model¹⁸. As mentioned above, this model has its weaknesses. Thus, the estimations presented here (table 4.1) are made using the truncated normal hurdle model¹⁹. From the left, the results from the probit model are in the first column. The second column from the left reveals the standard errors of the probit model coefficients. The third column represents the marginal effects of the probit model and the fourth column depicts the standard errors of the marginal effects. The fifth column contains the results of the truncated regression and the last column gives its standard errors.

The probit estimates are based on approximating the probability of saving in pension plans. The coefficients of the probabilities have the same signs as in the Tobit model. These results indicate, for example, that the probability of a pension saver being female is higher. It is more common for younger persons to have a voluntary pension plan than older persons. All income variables have a positive effect on pension saving probability (except for household income). The year dummies expose the changes in the coverage rate of aggregate savers. When we compare these years to the baseline year 2002, there are positive and statistically significant changes in the probabilities of saving in such plans in 2005 and in 2006. Therefore, the aggregate numbers of savers in 2005 and in 2006 increased in a statistically significant way.

¹⁸ The results with the Tobit model are given in appendix 3.

¹⁹ The likelihood ratio test reveals that the null hypothesis about the restrictions of the Tobit is rejected. The test is performed by comparing the likelihood ratios of the probit and truncated models to the likelihood ratio of the Tobit model. The calculated value of the test is 31320.52 which is well beyond the critical value at the level of 54 degrees of freedom (including the constant). In other words, the participation and the amount of savings elasticities are significantly different and therefore the Tobit model cannot be used.

The interaction term of labour income and the year 2006 dummy is negative and statistically significant. This means that the mean saver has lower labour income after the reform. On average, the magnitude of this effect is around a 0.3 per cent decrease in the probability of saving in pension plans for every one per cent of added earnings. The interaction terms of age and the year 2003 and 2004 are also negative and statistically significant. The interpretation is that the profile of savers became younger before the reform but not after it. Nevertheless, it is clear that the age of the mean saver did not change because of the reform. This could be a consequence of the transitional rule, which guaranteed that the contractual age would remain the same until 2009 if the pension plan contract had been made before the government's first reform proposal.

Table 4.1 Results for the truncated normal hurdle model²⁰; the dependent variable is the log of voluntary pension savings

| | Probit | | MFX | | Trunc | | MFX | |
|-------------------------------------|---------------|----------------|---------------|----------------|---------------|----------------|---------------|----------------|
| | Coeff. | Std. Err | E(y x) | Std. Err | Coeff. | Std. Err | E(y x) | Std. Err |
| Male | -0.151 | 0.013** | -0.009 | 0.001** | 0.047 | 0.024 | 0.004 | 0.010 |
| Age | -0.004 | 0.001** | -0.001 | 0.000** | 0.050 | 0.003** | 0.008 | 0.001** |
| Log(Labour income) | 0.176 | 0.012** | 0.011 | 0.001** | 0.150 | 0.020** | 0.028 | 0.011* |
| Log(Capital income) | 0.057 | 0.002** | 0.004 | 0.000** | 0.047 | 0.003** | 0.009 | 0.003** |
| Log(Household income) | -0.001 | 0.001 | 0.000 | 0.000 | -0.002 | 0.002 | 0.000 | 0.000 |
| Year 2003 | -0.182 | 0.168 | -0.011 | 0.084 | -0.511 | 0.331 | -0.085 | 0.073 |
| Year 2004 | -0.008 | 0.158 | 0.000 | 0.011 | 0.113 | 0.315 | 0.019 | 0.075 |
| Year 2005 | 0.357 | 0.142* | 0.027 | 0.013* | 0.572 | 0.298 | 0.102 | 0.072 |
| Year 2006 | 0.756 | 0.130** | 0.074 | 0.018** | 1.349 | 0.278** | 0.238 | 0.070** |
| Year 2003*Log(Labour income) | 0.047 | 0.016** | 0.003 | 0.001** | 0.047 | 0.041 | 0.009 | 0.008 |
| Year 2004*Log(Labour income) | 0.026 | 0.016 | 0.002 | 0.001 | 0.002 | 0.041 | 0.001 | 0.007 |
| Year 2005*Log(Labour income) | -0.011 | 0.014 | -0.001 | 0.000 | -0.014 | 0.041 | -0.002 | 0.007 |
| Year 2006*Log(Labour income) | -0.054 | 0.013** | -0.003 | 0.000** | -0.107 | 0.038** | -0.019 | 0.007** |
| Year 2003*Age | -0.005 | 0.002** | 0.000 | 0.000** | 0.001 | 0.004 | 0.000 | 0.001 |
| Year 2004*Age | -0.004 | 0.002* | 0.000 | 0.000* | 0.000 | 0.004 | 0.000 | 0.001 |
| Year 2005*Age | -0.002 | 0.001 | 0.000 | 0.000 | -0.009 | 0.003** | -0.002 | 0.001* |
| Year 2006*Age | 0.000 | 0.001 | 0.000 | 0.000 | -0.008 | 0.003* | -0.002 | 0.001* |
| Constant | -3.541 | 0.131** | | | 0.586 | 0.348 | | |
| | | | | sigma | 1.098 | 0.007** | | |
| Log likelihood | | -32211 | | | | -18429 | | |
| Prob chi2(54) | 18697 | 0.000 | | Wald(54) | 4146 | 0.000 | | |
| R square | | 0.225 | | | | | | |
| Observations | | 141876 | | | | 12186 | | |

One and two stars notify explanatory variable significance on five and one per cent level.

The model includes control variables residence and marital status (dummies).

The standard errors for the expected average marginal effects are bootstrapped with 1000 replications.

²⁰ Note, the difference in the age coefficient signs between the probit and truncated regressions. Also, the gender variable is negative and statistically significant in probit but positive and not significant in the truncated regression. This suggests and supports using a two-phase model to reveal changes in probability and amount separately. The interaction terms of year dummies and capital income were also included in the regression but none of those were significant. All the interpretations of the coefficients assume that the other factors are controlled.

The truncated regression estimates measure the effect of the independent variables on the amount of tax-allowed pension plan savings. The coefficients of the truncated regression are also the average marginal effects because the model is a linear prediction for the non-truncated part of the data. In these estimates, the gender variable is not statistically significant and age has a positive effect on the level of savings. It is also evident that older people contribute more to such plans. Furthermore, all the income variables are statistically significant and positive, just as in the probit model (again, except household income). The year 2006 dummy comes out statistically significant and positive (as in the probit model), revealing that there are more savers in that year. The truncated regression suggests that in 2006, after the reform, labour income has a clearly smaller effect on the overall amount saved than earlier. On average, the magnitude of this effect is a 10.7 per cent decrease in the amount of savings in pension plans for every one per cent of added earnings. This can be considered to be a substantial decrease in savings to voluntary pension plans. However, labour income still has a positive effect on savings but it is clearly smaller than before ($0.150 - 0.107 = 0.043$). The coefficient for the age variable in 2005 is negative; this indicates that younger savers contributed more in 2005. Also, in 2006 the interaction between the age variable is significant at the five per cent level. However, it should be noted that the magnitude of these effects is not very large.

The expected average marginal effects reveal the coefficients for the whole model. The age effect is positive and statistically significant, as are labour income and capital income. The year dummy in 2006 is also positive and significant. The interaction coefficient of labour income is negative and significant in 2006, as we assumed in our hypotheses section. For the whole model, the magnitude of the effect is around a 1.9 per cent decrease for every one per cent of added labour income, which is a notable change. The reported coefficient is the mean of marginal effects for all contributors. This effect is comparable to the marginal effect estimate from the Tobit model which is much lower (7.1 per cent in Tobit²¹). The interaction coefficients of age in 2005 and in 2006 are also significant and negative as we presumed but the magnitudes of these coefficients are low. Nevertheless, the age effect is not assumed to be very high because of the one transitional rule which guaranteed that existing²² savers could save in plans according to the old withdrawal rules until 2009.

The transitional provisions influence the results in 2005²³; the results may be biased because of these provisions. When we utilize the data for 2006 as well, our estimations reveal new evidence to support our hypotheses. The results in table 4.1 clearly indicate that the profile of pension plan savers changed after the

²¹ Results for the Tobit are in appendix 3.

²² Persons who made a pension plan contract before government's reform proposal.

²³ Appendix 4 includes a more precise examination of the effects of transitional rules on savers' behaviour.

reform. The typical saver does not have as much labour income as before the reform. Also the age of the typical saver decreased over the last few years, but all the changes occurred before the reform. To conclude, the statistically significant changes in savers' ages have occurred in 2005 and in 2006. In those years younger persons contributed more. In addition, labour income has a negative coefficient in 2006²⁴; lower-income savers contributed more. This conclusion supports our earlier hypotheses.

²⁴ It seems that labour income still has a positive effect on both savings and the propensity to save after the reform, but the effects are much smaller.

5. Conclusion

The Nordic-type dual income taxation offers two possibilities to tax voluntary pension savings in Finland. Steeply progressive labour income taxation is the first possible way and proportional capital income tax is the other option. In 2005 the basis of the taxation of voluntary pension saving instruments changed from labour income to capital income taxation. The reform made the taxation system neutral between different types of savers which was one of the main themes and proposals previously suggested by the OECD (1994). The new taxation rules also included other changes; the upper limit of tax allowances was lowered from 8500 to 5000 euros and the contractual withdrawal age rose from 60 to 62 years.

The empirical analysis of this reform was conducted using micro data and econometric methods in a before-after framework. Before the reform, high-income and older persons had the greatest incentive to save in voluntary retirement plans. Nowadays the incentives are neutral between different socio-economic groups. Therefore, the tax incentives to save in voluntary pension plans changed in different subpopulations, so it was reasonable to examine the causal effects of this reform on savers' behaviour.

Firstly, our empirical results clearly support the hypothesis that savers' behaviour changed in 2006; the results provide statistically significant proof of a shift towards lower labour income savers. The probability to save in voluntary pensions declined. Also, high labour income savers contributed less after the reform. The estimated effect on contributions decreased considerably (10.7%). The average expected marginal effect of labour income on voluntary pension plan savings was a 1.9 per cent negative change. This change can be seen as a result of the reform's effect on both the probability and the amount of savings. Also, although the age of the typical saver did not change, the age effect on savings contribution decreased in 2005 and in 2006. The magnitude of these observed effects are not extensive but are statistically significant. Because of the transition rules in the reform, the difference in savers' age profile is unlikely to have been caused by the reform.

With the proportion of working-age populations declining, governments are facing huge budgetary pressures, especially in countries like Finland where pensions are mostly government-funded. Previous literature on taxes and voluntary pension savings has offered mixed results about the effect of taxation on persons' savings. Our empirical examination has shown that it is possible to influence private pension savings through taxation. Savers changed their behaviour in the direction that was anticipated and intended by the government. Of course, the effects of added marketing of voluntary pension plans and the effect of the reform of earnings-related pensions cannot be fully controlled in our estimations. These effects cannot be ignored and the changes probably affect our

results positively. However, it is possible that the reform of earnings-related pension has indeed changed the behaviour of younger pension plan savers' behaviour, but it is unlikely to have changed savings in different income groups.

References

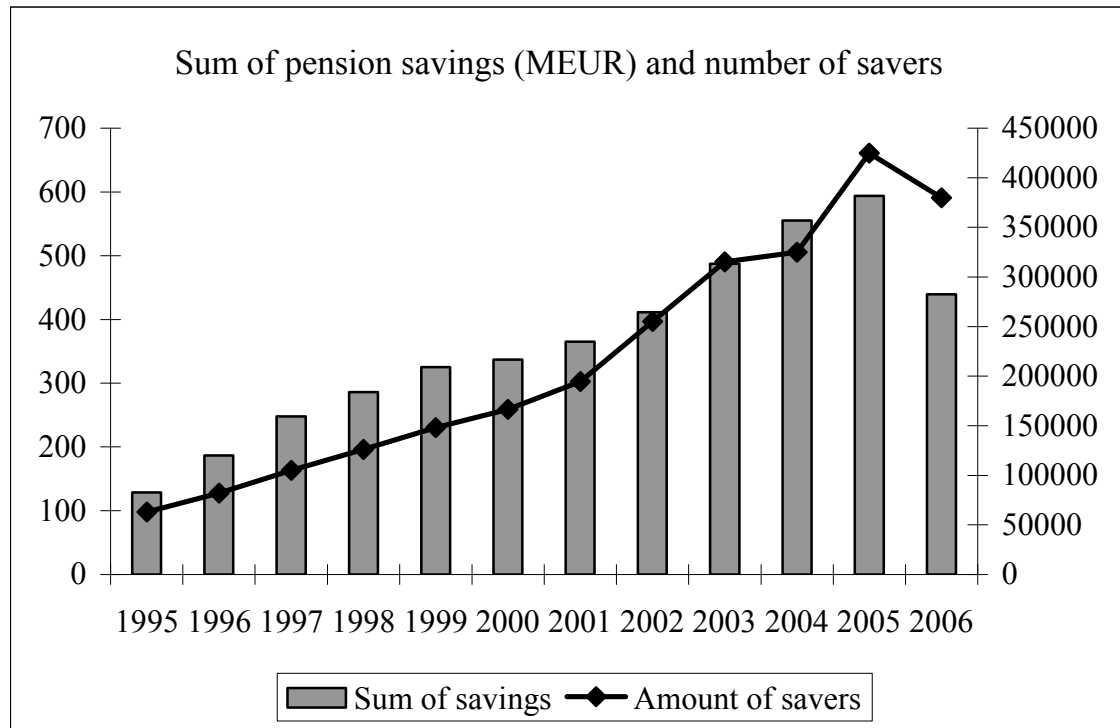
- Angrist, J. D. (2001): Estimation of Limited Dependent Variable Models With Dummy Endogenous Regressors: Simple Strategies for Empirical Practise. *Journal of Business and Economic Statistics*, Vol. 19, No.1 pp.2–28.
- Attanasio, O. – Banks, J. – Wakefield, M. (2005): Effectiveness of tax incentives to boost (retirement) saving: theoretical motivation and empirical evidence. *OECD Economic Studies*, Volume, issue, No 39, pp. 145–167.
- Benjamin, D. J. (2003): Does 401(k) eligibility increase saving? Evidence from propensity score subclassification. *Journal of Public Economics* 87, 1259–1290.
- Bernheim, D. B. (2002): Taxation and Saving. In Auerbach, A. – Feldstein, M.: *Handbook of Public Economics*, Volume 3, Chapter 18. Elsevier Science B. V. Amsterdam, 1173–1250.
- Cameron, C. A. – Trivedi, P. K. (2006): *Microeconometrics: methods and applications*. Cambridge University Press, New York.
- Chung, W. – Disney, R. – Emmerson, C. – Wakefield, M. (2005): Public policy and saving for retirement: Evidence from the introduction of Stakeholder Pensions in the UK. CPE Working Paper 5/05.
- Disney, R. – Emmerson, C. – Wakefield, M. (2007): Tax reform and retirement saving incentives: evidence from the introduction of stakeholder pensions in the UK. IFS Working Papers, W07/19.
- Engen, E. M. – Gale, W. G. – Scholtz, J. K. (1994): Do Saving Incentives Work? *Brookings Papers on Economic Activity* 1.
- Federation of Finnish Financial Services (2008):
<http://www.fkl.fi/asp/system/empty.asp?P=2437&VID=default&SID=678679730332895&S=1&C=22680>.
- Fehr, H. – Habermann, C. – Kindermann, F. (2008): Tax-Favored Retirement Accounts: Are they Efficient in Increasing Savings and Growth? *Finanz Archiv*, vol. 64 no. 2.
- Finnish Centre for Pensions (2007): *The Finnish Pension System*. Finnish Centre for Pensions, Handbooks 2007:6. Available
<http://www.elaketurvakeskus.fi/Binary.aspx?Section=44670&Item=60250>
- Finnish Tax Administration: *Tax Statistics from year 1995–2005*. Tax Administration publishing, Helsinki.
- Greene, W. H. (2003): *Econometric Analysis*. Fifth edition, Prentice Hall, New York.

- Imrohoroglu, A. – Imrohoroglu, S. – Joines, D. H. (1998): The Effects of Tax-Favored Retirement Accounts on Capital Accumulation. *The American Economic Review*, Vol 88. No.4.
- Kari, S. – Lyytikäinen, T. (2004): A method to calculate the effective tax rate on private pension savings with an application to Finnish tax reform. Paper presented at the IIPF annual congress in Milan, 2004. Available https://editorialexpress.com/cgi-bin/conference/download.cgi?db_name=IIPF60&paper_id=286
- Määttänen, N. (2005): Voluntary saving plans, taxation and savings (in Finnish). ETLA Discussion Papers no 1018. The Research Institute of the Finnish Economy, Helsinki.
- Ministry of Finance (2005): Taxation in Finland 3/2005. Ministry of Finance, Tax Department, Helsinki. Available also <http://www.vero.fi/nc/doc/download.asp?id=4151;1035296>
- OECD (1994): Taxation and Household Saving. Organisation for Economic Co-Operation and Development, Paris.
- OECD (2005): Tax-Favoured Retirement Saving, OECD Economic Studies, No. 39, 2004/2, Paris.
- Sørensen (1994): From the Global Income Tax to the Dual Income Tax: Recent Tax Reforms in the Nordic Countries, *International Tax and Public Finance* 1.
- Sørensen (2005): Dual Income Tax: Why and How? *Finanz Archiv*, vol. 61 no. 4.
- Venti, S. F. – Wise, D. A. (1995): Individual Response to a Retirement Saving Program: Results from U.S. Panel Data. *Ricerche Economiche*, vol. 49.
- Venti, S. F. – Wise, D. A. (1992): Government Policy and Personal Retirement Saving. *Tax Policy and the Economy*, vol. 6. MIT Press, Cambridge.
- Wooldridge, J. M. (2002): *Econometric Analysis of Cross Section and Panel Data*. MIT Press, Cambridge.

Appendixes

Appendix 1.

Sum of voluntary pension plan savings and number of savers in Finland from 1995 to 2006



Source: Finnish Tax Administration 1995–2006

Appendix 2.

The expected average marginal effects for the truncated normal hurdle model

The expected average values for the truncated normal hurdle model are an extension of the Tobit model. The conditional distribution for positive dependent values is as in the Tobit model and therefore,

$$E(y | x, y > 0) = x\beta + \sigma\lambda(x\beta / \sigma).$$

The unconditional distribution differs from the Tobit model because it also takes account of the estimated participation (probit) estimates (γ)

$$E(y | x) = \Phi(x\gamma)[x\beta + \sigma\lambda(x\beta / \sigma)].$$

Deriving this respect to x , we can achieve marginal effects for the whole model.

$$(1) \quad \frac{\partial E(y | x)}{\partial x_j} = \gamma_j \phi(x\gamma)[x\beta + \sigma\lambda(x\beta / \sigma)] + \Phi(x\gamma)\beta_j \theta(x\beta / \sigma), \text{ where}$$

$$\theta(x\beta / \sigma) = 1 - \lambda(x\beta / \sigma)[x\beta / \sigma - \lambda(x\beta / \sigma)].$$

All the estimates can be inserted from the estimation so the expected average marginal effects are easily calculated. The valid standard errors are calculated using bootstrapping with 1000 replications.

Appendix 3.**Results for the Tobit model; the dependent variable is the log of voluntary pension savings**

| | Tobit | | MFX | |
|-------------------------------------|---------------|-----------------|---------------|-----------------|
| | Coeff. | Std. Err | dy/dx | Std. Err |
| Male | -1.465 | 0.131** | -0.177 | 0.015** |
| Age | -0.022 | 0.012 | -0.003 | 0.001 |
| Log(Labour income) | 1.812 | 0.116** | 0.218 | 0.013** |
| Log(Capital income) | 0.580 | 0.018** | 0.070 | 0.002** |
| Log(Household income) | 0.000 | 0.012 | 0.000 | 0.002 |
| Year 2003 | -1.951 | 1.672 | -0.228 | 0.190 |
| Year 2004 | -0.015 | 1.573 | -0.002 | 0.189 |
| Year 2005 | 3.817 | 1.418* | 0.489 | 0.192* |
| Year 2006 | 8.005 | 1.291** | 1.105 | 0.202** |
| Year 2003*Log(Labour income) | 0.483 | 0.167* | 0.058 | 0.020 |
| Year 2004*Log(Labour income) | 0.259 | 0.157 | 0.031 | 0.019 |
| Year 2005*Log(Labour income) | -0.118 | 0.141 | -0.014 | 0.017 |
| Year 2006*Log(Labour income) | -0.585 | 0.129** | -0.071 | 0.015** |
| Year 2003*Age | -0.049 | 0.015** | -0.006 | 0.002** |
| Year 2004*Age | -0.041 | 0.015* | -0.005 | 0.002** |
| Year 2005*Age | -0.020 | 0.015 | -0.002 | 0.002 |
| Year 2006*Age | -0.010 | 0.015 | -0.001 | 0.002 |
| Constant | -26.117 | 3.647** | | |
| sigma | 10.372 | 0.083 | | |
| Log likelihood | | 66201.1 | | |
| Prob chi2(54) | 19552.6 | 0.000 | | |
| R square | | 0.129 | | |
| Observations | | | 141876 | |

One and two stars signify explanatory variable significance at five and one per cent level. The model includes the control variables residence and marital status (dummies).

Appendix 4.

The effect of transitional rules on savers' behaviour

The effect of the transitional rules can be considered if we look only at the data for new savers²⁵. That is because all new savers were faced with the new tax system in 2005, whereas in 2004 payments might have been higher than normal due to the transitional provisions. If anticipation did take place, the interaction terms of the estimation for the new savers' data would reveal some behavioural changes. In 2004 persons with high labour income are assumed to contribute more than usual, so the coefficient is presumed to be positive. On the other hand, the labour income and age interaction coefficients are presumed to be negative in 2005 and 2006 because of the new taxation system.

The estimations are made using data for the years 2002 to 2006. These estimations can give a clearer view of the anticipation effect of savers in 2004. In the estimations the specification of the model the same as earlier and the truncated normal hurdle method is used. The baseline year is still 2002.

The estimates are shown in next table. The figures that they yield are similar to the previous estimations for the whole data set. The probit model suggests that the typical new pension saver is female and that age is negatively associated with the probability of saving in such an instrument. Labour income and capital income have a positive effect on the probability of saving in pension plans. 2003 is the only year dummy which is statistically significant, indicating that new savers are represented less in 2003 than in the previous year. The labour income and 2003 year dummy interaction term is positive and statistically significant. This means that new savers in 2003 were likely to have a high labour income. The interaction term of labour income and the year 2005 is negative; the typical new saver had statistically significant lower labour income in 2005 than in 2002. Also, the year 2003 and the age interaction term is negative and statistically significant.

Furthermore, the truncated regression reveals that males and age have a positive effect on the amount of savings. All the income variables used (except household income) also have a positive effect on the amount of savings. A significant (negative) year dummy is that for 2004, indicating that there were less new savers in 2004. This effect can also be seen in data produced by the Federation of Finnish Financial Services (2008) showing the number of new contracts made between persons and insurance companies. This effect may be the result of people ignorant of what was about to happen in the tax system.

²⁵ The data set is edited by constructing two-year panel data sets. New savers are defined as people who have not saved in voluntary retirement plans at period t-1 but have saved at period t. After the separation, all the information about these new savers is linked in a cross-section format for the years 2002 to 2005. This definition has weaknesses because there could be savers who did not contribute in that particular year but contributed earlier and later, so not all of the actual new savers are necessarily really new.

Table Results for the truncated normal hurdle model of new savers, the dependent variable is the log of voluntary pension savings

| | Probit | | MFX | | Truncreg | | MFX | |
|-------------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|----------------|
| | Coeff. | Std. Err | E(y x) | Std. Err | Coeff. | Std. Err | E(y x) | Std. Err |
| Male | -0.164 | 0.031** | -0.006 | 0.001** | 0.178 | 0.085* | 0.009 | 0.013 |
| Age | -0.016 | 0.003** | -0.001 | 0.000** | 0.043 | 0.009** | 0.009 | 0.001** |
| Log(Labour income) | 0.111 | 0.034** | 0.004 | 0.001** | 0.224 | 0.080** | 0.030 | 0.013* |
| Log(Capital income) | 0.019 | 0.004** | 0.001 | 0.000** | 0.044 | 0.012** | 0.009 | 0.004* |
| Log(Household income) | -0.005 | 0.003 | 0.000 | 0.000 | -0.012 | 0.008 | 0.000 | 0.000 |
| Year 2003 | -1.167 | 0.418** | -0.017 | 0.003** | -0.876 | 1.240 | -0.107 | 0.147 |
| Year 2004 | -0.657 | 0.509 | -0.016 | 0.009 | -4.205 | 1.665* | 0.049 | 0.107 |
| Year 2005 | 0.673 | 0.411 | 0.036 | 0.032 | 2.150 | 1.244 | 0.115 | 0.103 |
| Year 2006 | 0.096 | 0.397 | 0.003 | 0.015 | 1.508 | 1.147 | 0.328 | 0.092** |
| Year 2003*Log(Labour income) | 0.211 | 0.044** | 0.007 | 0.002** | 0.067 | 0.119 | 0.015 | 0.020 |
| Year 2004*Log(Labour income) | 0.043 | 0.052 | 0.001 | 0.002 | 0.384 | 0.161* | 0.000 | 0.011 |
| Year 2005*Log(Labour income) | -0.087 | 0.043* | -0.003 | 0.001* | -0.186 | 0.104 | 0.000 | 0.010 |
| Year 2006*Log(Labour income) | 0.012 | 0.041 | 0.000 | 0.001 | -0.082 | 0.109 | -0.023 | 0.008** |
| Year 2003*Age | -0.011 | 0.004** | 0.000 | 0.000** | 0.009 | 0.011 | 0.000 | 0.001 |
| Year 2004*Age | -0.001 | 0.004 | 0.000 | 0.000 | 0.018 | 0.012 | 0.000 | 0.001 |
| Year 2005*Age | 0.001 | 0.003 | 0.000 | 0.000 | -0.006 | 0.012 | -0.002 | 0.009 |
| Year 2006*Age | 0.000 | 0.003 | 0.000 | 0.000 | -0.006 | 0.010 | -0.002 | 0.001** |
| Constant | -2.766 | 0.357** | | | 3.013 | 1.011** | | |
| | | | | sigma | 1.231 | 0.024** | | |
| Log likelihood | | -5309 | | | | -2147 | | |
| Prob chi2 | 2150 | 0.000 | | Wald chi2 | 429 | 0.000 | | |
| R square | | 0.271 | | | | | | |
| Observations | | 61845 | | | | 1320 | | |

One and two stars notify explanatory variable significance on five and one per cent level.

The model includes control variables like place of residence and marital status (dummies).

The standard errors for the expected average marginal effects are bootstrapped with 1000 replications.

Only one interaction term has a statistically significant coefficient in the truncated regression; the labour income and year 2004 dummy interaction is positive and this supports our previous hypothesis about consumers making use of the exceptional tax rules. Those people who had the highest incentive to save in pension plans actually contributed more. Besides, the effect is large if we compare the magnitude of the coefficient to the other interaction terms. For pension plans made after the government proposal, the allowances were made from labour income taxation and the withdrawals were taxed as capital income. This may have attracted even more investments by high labour income-earners in 2004. These savers were attracted to the tax benefits in the transition years by making bigger contributions. It is also important to remember that overall savings from new savers decreased in 2004 but the high labour income of new savers increased their contributions. Another noticeable interaction term is labour income and the year 2005. The coefficient is negative but statistically significant only at the 10 per cent level. The interaction term between labour income and the year 2006 is not statistically significant; these results do not support our earlier hypothesis. The reform did not affect the age of new savers.

The signs and the significance levels of the calculated expected average marginal effects are similar to the results from the estimations for the whole data set. Also, the magnitudes of the estimates do not deviate considerably compared to the whole data set. The only difference in statistical significance between the earlier estimates and these coefficients is the interaction coefficient of age and the year dummy for 2005 (is not significant for this data). Age has a positive effect; the coefficients of labour income and capital income have positive signs; the 2006 year dummy is positive; the interaction coefficient of labour income has a negative sign in 2006 and age has a negative sign in 2006.

IN VATT WORKING PAPERS SERIES PUBLISHED PUBLICATIONS

1. Tomi Kyyrä – Pierpaolo Parrotta – Michael Rosholm: The effect of receiving supplementary UI benefits on unemployment duration. Helsinki 2009.
2. Tuomas Pekkarinen – Roope Uusitalo – Sari Kerr: School tracking and development of cognitive skills. Helsinki 2009.
3. Essi Eerola– Niku Määttänen: The optimal tax treatment of housing capital in the neoclassical growth model. Helsinki 2009.
4. Sanna-Mari Hynninen – Aki Kangasharju – Jaakko Pehkonen: Matching inefficiencies, regional disparities and unemployment. Helsinki 2009.
5. Jari Ojala – Jaakko Pehkonen: Technological changes, wage inequality and skill premiums: Evidence over three centuries. Helsinki 2009.
6. Elina Berghäll: R&D, investment and structural change in Finland: Is low investment a problem? Helsinki 2009.



VALTION TALOUDELLINEN TUTKIMUSKESKUS
STATENS EKONOMISKA FORSKNINGSCENTRAL
GOVERNMENT INSTITUTE FOR ECONOMIC RESEARCH

Valtion taloudellinen tutkimuskeskus
Government Institute for Economic Research
P.O.Box 1279
FI-00101 Helsinki
Finland

ISBN 978-951-561-868-9
ISSN 1798-0283