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VOLUNTARY PENSION SAVINGS: THE EFFECTS OF THE FINNISH TAX REFORM ON SAVERS' BEHAVIOUR [*]

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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 studies empirically the savers' behavioural changes 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.

JEL Codes: H2, H30, C24

Keywords: voluntary pension savings, tax reform, tax incentives

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1. Introduction

Many western countries are facing increasing pressures to finance their current social security programmes due to the decreasing proportion of the working-age population. As a response they have been cutting down 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 Tessas 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 the savings to be deductible from the income tax base, the accrued return on funds to be tax exempt, but to tax the withdrawn funds (EET model).

Tax-deferred voluntary pension plans are usually motivated by increasing the aggregate saving rate and strengthening 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 to 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 part of increased pension funds are a result from new savings. The main parts are the transfers from other savings instrument 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 the 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 focus is to find the participation and the amount changes in 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 schedule[3]. TR2005 moved the tax treatment to a flat rate capital income taxation regime. We argue that this change affected saving incentives faced by individuals differently, depending on factors such as income and age.[4] Due to this

[1] Bernheim (2002) presents a comprehensive analysis concerning taxation and savings.

[2] General equilibrium models are used to estimate the effects of voluntary pension plan savings to 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 higher by 22% than in the Imrohoroglu et al. paper.

[3] The 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)

[4] Kari and Lyytikäinen (2004) and Määttänen (2005) have paid attention on this incentive aspect of TR2005.

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 to aggregate savings and reported that tax allowances do not significantly affect private savings. The total amount of these savings indeed increased a lot, but the funds were shifted mainly from other instruments. Venti and Wise (1992, 1995) presented different conclusions. They found that the IRAs clearly increased new savings once tax allowances were granted by the government. In a more recent examination, Benjamin (2003) studied these same effects concerning 401(k) savings in the US. He found that approximately 25% of all voluntary pension savings represent new national savings and one half of contributions represent new private 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. Particularly the young 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 indicating increase in the probability of saving caused by tax deductions.

A recent study concerning the Stakeholder Pensions in the UK is 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; this group added the coverage of savings in voluntary pension accounts. The results also provided evidence that women added coverage in a statistically significant way because of the reform. In contrast to the rest of the sample, the level of contributions among those who were benefiting from the higher contribution limit did not fall.

To conclude, the 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. Previously mentioned studies have pointed out also that some subpopulations react more actively on 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, the tax deductions should perhaps be targeted to some sub groups such as 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 the different types of savers. An important feature of the change in the tax regime was that it decreased a high income saver incentive to save. Hence, we can try to evaluate and estimate empirically the causal effect of this reform on the savers by comparing their behaviour before and after the reform.

The empirical results support my hypotheses. The number of high labour income savers has decreased after the reform in 2006. Also, high labour income savers have contributed less than earlier. Furthermore, the age effect on savings contribution 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 data, introduce hypotheses and explain 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 the pension systems with three "pillars". In Finland the pension system[5] 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. In 2005 there were reforms in earnings-related pensions. The main changes of the reform were that the earnings of the whole 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 the 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 consideration[6]. However, at the moment, voluntary pension

[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.

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 of present pension savings is based on the EET system[7].

The coverage of public provisions is comprehensive and public pension spending represents over 10 per cent of the GDP. This share is expected to grow in the future. Total pension expenditure consists approximately of 95 per cent of statutory pensions and 5 per cent of voluntary pensions. Yet, voluntary pension saving plans have gradually grown in popularity in recent decades, but these instruments still have only a minor role compared to other savings options[8].

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 a steeply progressive taxation of labour income and a flat-rate taxation of capital income. Interestingly, although in tax literature this has received little attention, 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 of incentives between different 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 of voluntary pension savings

Tax-deductible savings instruments have been on the market for a long time in Finland. 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.

[7] There are several schemes to tax voluntary pension plans in western countries. In the US the voluntary pension plans are taxed both according to the EET system (IRA savings) and TEE system (Roth IRA). In the UK the taxation schemes are also divided into two ways: ISAs are taxed with TEE and Private Pensions are taxed based on the EET. In Sweden the taxation of voluntary pension plans is based on ETT type taxation. Additional information more about different tax-favoured retirement saving plans in western countries is found 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 the annual mean contributions to the plans are relatively low (1700 €). The quantity of contributors and the mean savings come from income distribution data for 2002 to 2006. The data is produced by Statistics Finland.

The government has laid down conditions for contribution to become 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 the 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

The law on voluntary pension plans tax deductions was based on labour income taxation until 2004; deductions were made from labour income and tax on withdrawals was paid as on labour income. Deductions were applicable if the saver has undertaken to keep his/her savings in the plan until the age of 60. If the time period commitment or the annual upper contribution limit (8500 euros) was exceeded, the deduction went down to 60 per cent of the contributions and the maximum deduction was 5000 euros.

The basic pension regulation[9] restricted the aggregate amount of pension withdrawals. Pensions received from the government and one's own voluntary saving plans together were not allowed to exceed 66 per cent of the person's income when working. Taxpayers were also entitled to deduct allowances from his/her 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. Additionally the contractual age increased from 60 to 62 years. The reform removed the basic pension regulation and deductions can no longer be made directly from spouses' income. Only if the 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 her labour taxes[10].

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

[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*5000) as a function of the current capital tax rate (28%).

personal right to deductions drops from 5000 to 2500 euros regardless of the amount paid by the employer.

Transitional rules

The new law came into force at 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. 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 the short-run and long-run calculations about the effects of reform to the tax revenue. The tax revenue was estimated to grow. The government's tax income was also expected to accrue mainly because of the change in capital income taxation where the tax advantage is not so large for the voluntary pension plan savers. The short-run effects refer here to the 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

The 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 illustrates better 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 formula of the METR.

The following examination describes the effective tax rate to emphasize 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) $$\tau_{ef} = \frac{1}{rT}\ln\left(\frac{1-\tau_c}{1-\tau_p}\right),$$

where r is the real interest rate[11], T is the saving period, τ_p is the marginal tax rate for pensions and τ_c is the marginal tax rate for labour income.

The model relies on the following assumptions. The contribution is to be 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

(2) $$\tau_{ef} \left\{\begin{matrix} > \\ = \\ < \end{matrix}\right\} 0 \quad \Leftrightarrow \quad \tau_c \left\{\begin{matrix} < \\ = \\ > \end{matrix}\right\} \tau_p .$$

Secondly, the length of the saving period affects the extent of the incentives. The METR on retirement savings approaches zero in the long horizon. Before the reform the effective tax rate could have been very low during 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 reform when they simulate METRs at different fixed wage levels. In their analysis they applied the TUJA model[12] (figure 1). The figure 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 approach in the

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

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

old system simply because of the progressive taxation of labour income. Up to approximately 8000 € annually, 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.

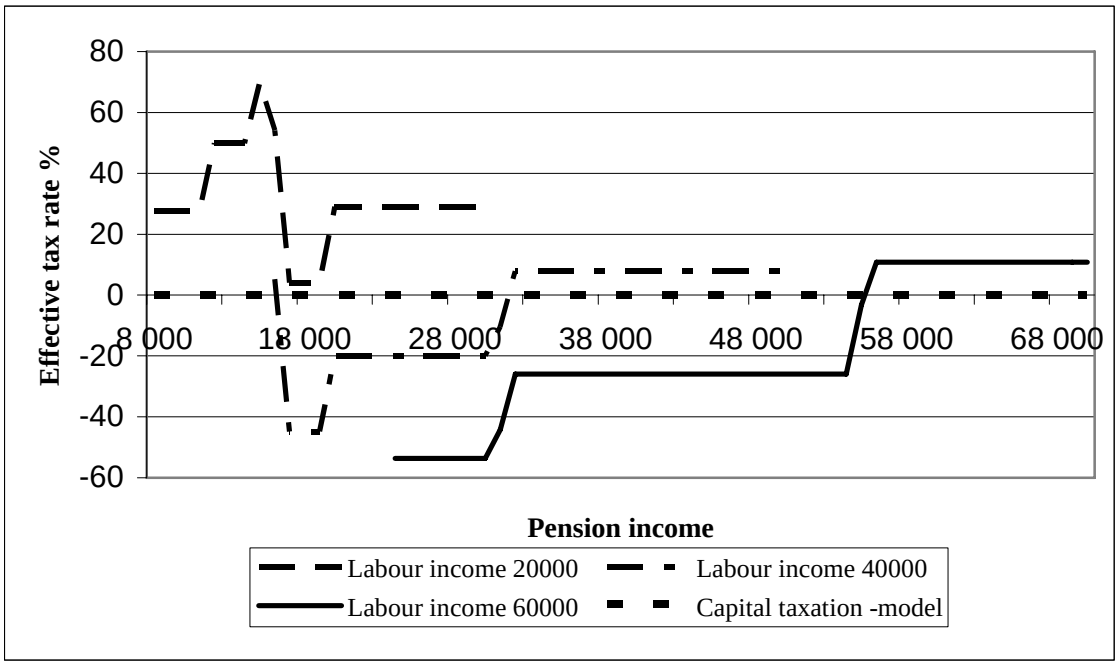

Figure 1. The effective tax rates on pension savings for different labour and pension income (the interest rate is assumed to be 4% and the saving period is 10 years)

The government's main purpose with the 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 gives a very interesting possibility for the 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 difference-in-difference strategy. The estimation model is

$$\ln P_{i,t} = \alpha_i + \varphi \ln INC_i + \eta AGE_i + \delta X_{i,t} + \phi D_t + \beta * D_t * \ln INC_i + \gamma * D_t * AGE_i + \varepsilon_{i,t} \quad (3)$$

where $P_{i,t}$ is the annual (t) aggregate amount of tax-deductable 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 differences in savings between labour income and age are interesting. The tax reform might have altered the behaviour of typical saver or the socio-economic profile of the pension saver. We assume that in the present 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 before, 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. Changes nonetheless are much more likely to be visible in 2006 when the new tax scheme is fully effective (except the transitional contractual age rule). If changes across saving groups have occurred, the interaction term of 2006 and labour income would come out with a negative sign and 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; said differently, there was a possibility 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 this case, the dependent variable is the

combination of discrete and continuous distributions because a large proportion of the observations have a value zero[13].

The 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 normality of the error term put limitations on using it. 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 the one-year increase in the saver's age, the Tobit model assumes also that 1000 euro of added 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 estimation method which would be more flexible. The model which may fit well in our construct is the truncated normal hurdle model[14]. In this model the estimation is made in two phases: the first phase is a probit model[15]. 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 be calculated also.

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

$$d_i = \begin{cases} 0, if\ P_i \le 0 \\ 1, if\ P_i > 0 \end{cases}. \tag{4}$$

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.

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

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

[15] As an well known, the probit is a binary choice model which is based on a normal distribution. The interaction effects for probit model are calculated as Ai and Norton (2003 and 2004) proposed.

The expected average marginal effects are also calculated for this truncated normal hurdle model[16]. 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 non-normality of the error term are also present in this latter model. There has been also a debate how well limited dependent variable models can be interpreted when we are concentrating causal effects. Angrist (2001) has criticized these models and especially the interpretation of the coefficients from 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 have estimated the Tobit regression also. 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

Income Distribution statistics, produced by Statistics Finland is a cross-sectional stratified sample of approximately 28,000 Finns (updated annually). We have 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. The 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.

Voluntary pension savings in Finland

Figure 2 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]

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

[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

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).

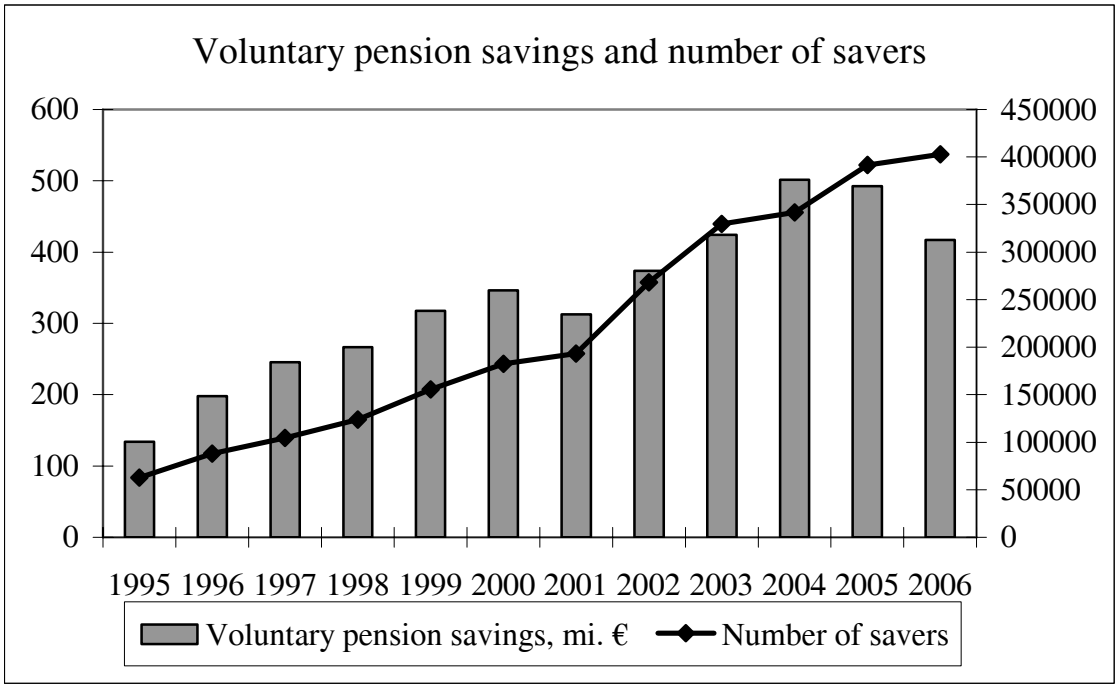

Figure 2. The sum of tax-deductible voluntary pension plan savings and the number of savers from 1995 to 2006 (Source: Income Distribution data 1995–2006 (Statistics Finland))

As we can see from figure 2, the sum of savings has increased in the last decade. The annual growth in savings has been fairly linear, except for the 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.

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both from capital and labour income in 2005; these savers may appear twice in the counts. Therefore, it is justified to present the weighted aggregate figures from the micro data.

Descriptive statistics of voluntary pension saving plans

Descriptive statistics of the main variables used on our estimations are given in table 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 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 the mean savings are at their very lowest.

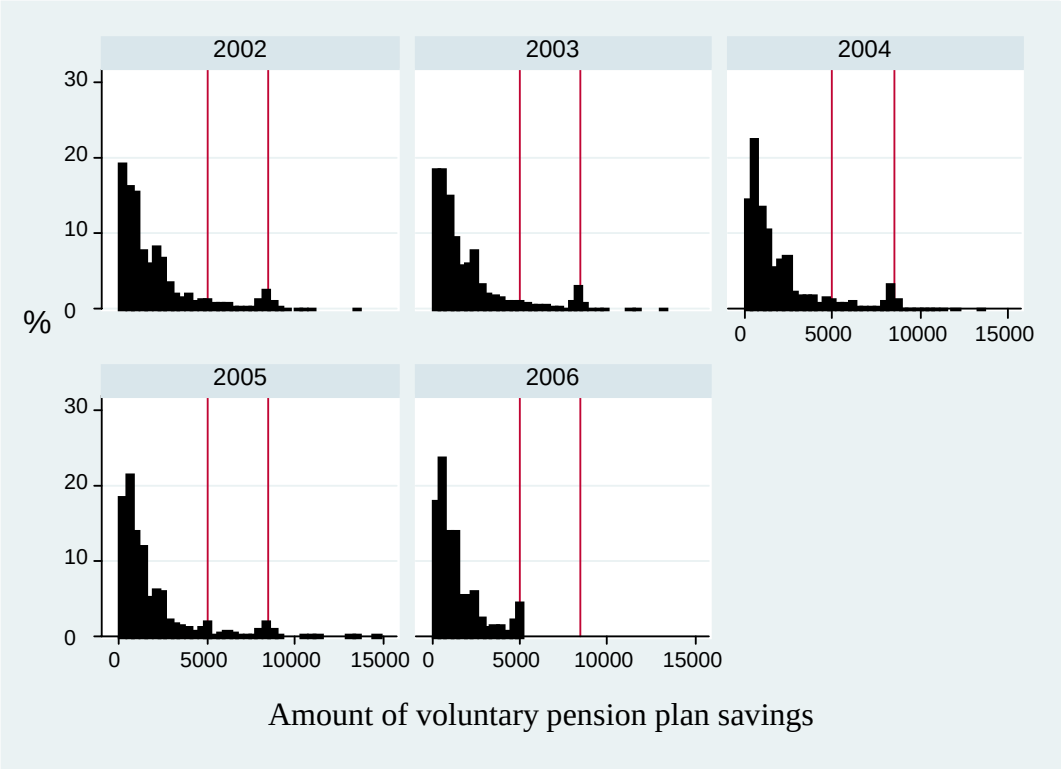

Figure 3. Distribution of voluntary pension savings, 2002 to 2006

The distribution of voluntary pension savings is presented in figure 3. 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 should facilitate things. 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 the persons were logically not yet able to anticipate the reform and so, it can be used as the reference year

in 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, rate of schooling 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, formulated by multiplying all-year dummies by the labour income and age. The yearly changes in savers behaviour and profile can be identified if the interaction terms end-up with a statistical significant coefficient.

First, estimations were made by using the Tobit model[18]. As already mentioned above, this model has its weaknesses. Thus, the estimations presented here (table 2) are made using the truncated normal hurdle model[19]. 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 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 the older persons. All income variables have a positive effect on pension saving probability (except for the 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 probabilities to save in such plans in 2005 and in 2006. Therefore, the aggregate amounts of savers in 2005 and in 2006 have increased in a statistically significant way.

Labour income and the year 2006 dummy interaction term is negative and statistically significant. This means that the mean saver has lower labour income after the reform. The magnitude of this effect on average is around 0.3 per cent decrease in probability to save in pension plans per every one per cent added earnings. The interaction terms with age and year 2003 and 2004 are also negative and statistically significant. The interpretation is that the profile of savers has 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 can be a consequence of transitional rule which guaranteed the

[18] The results of Tobit model are found 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 probit and truncated models likelihood ratios to the Tobit model's likelihood ratio. The calculated value of the test is 31320.52 which is well beyond the critical value at the level for 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.

contractual age remain the same until 2009 if the pension plan contract is made before the governments first proposal of reform.

Table 2. Results for the truncated normal hurdle model[20], 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.

The truncated regression estimates measure the effect of the independent variables for 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 size of savings. It is also evident that older people contribute more to the 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 during that year. The truncated regression suggests that in 2006 after the reform labour income has

[20] Note, the difference in the age coefficient signs between probit and truncated regression. 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 term of year dummies and capital income were also included in the regression but none of those were significant. All the interpretations of coefficients include the assumption that other factors are controlled.

clearly a smaller effect on the overall amount to save than earlier. The magnitude of this effect on average is 10.7 per cent decrease in the amount of savings in pension plans per every one per cent added earnings. This can be considered to be a substantial decrease in savings to voluntary pension plans. However, labour income has still 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 the 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 1.9 per cent decrease per every one per cent of added labour income per cent when the whole effect of labour income is 2.8 per cent. Therefore, the magnitude of the decrease in the explanatory power of labour income for voluntary pension savings is, in my view, quite considerable. 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 Tobit[21]). 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 'old'[22] savers to save in plans according to old rules until 2009.

The transitional provisions influence the results in 2005; the results may be biased because of these provisions. When we utilize the data for 2006 as well, the estimations reveal new evidence to support our hypotheses. The results in table 2 clearly indicate that the profile of pension plan savers changed after the reform. The typical saver does not have as high labour income as before the reform. Also the age of the typical saver has decreased during last few years but all changes have occurred before the reform. To conclude, the statistically significant changes in savers' ages have occurred in 2005 and in 2006. During those years younger persons contributed more after the reform. In addition, labour income has a negative coefficient in 2006[23]; lower-income savers contributed more.

[21] Results for the Tobit are in appendix 3.

[22] Persons who have made the pension plan contract before government's proposal related to the reform.

[23] It seems that the labour income has still positive effect on both savings and propensity to save after the reform but the effects are remarkable smaller.

5. Conclusion

The Nordic type dual income taxation offers two possibilities to tax voluntary pension savings in Finland. Steeply progressive labour income taxation present the first possible way and the proportional capital income tax is the other option. In 2005 the basis of the taxation of voluntary pension saving instrument 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 already suggested by OECD (1994). The new taxation rules included also 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 the savers' behaviour.

Firstly, empirical results clearly supported the hypothesis of change in savers behaviour in 2006; the results gave statistically significant proof of a shift towards lower labour income savers. The probability to save in voluntary pensions declined. Also, the explanatory power of labour income to contributions is considerable lesser after the reform. The estimated effect to contributions decreased considerably (10.7%). The average expected marginal effect of labour income to voluntary pension plan savings was a 1.9 per cent negative change. This change can be seen a result of the reform's effect on both the probability and amount of savings. Also, the age of the typical saver has not changed but the age effect on savings contribution decreased in 2005 and in 2006. The magnitude of these observed effects are not extensive but are, however, statistically significant. The difference in savers age profile is hardly caused by the reform because of the transitional rules of 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 concerning taxes and voluntary pension savings has offered mixed results about the effect of taxation on persons' savings. Empirical examination has shown that it is possible to influence private pension savings with taxation. Savers changed their behaviour in the direction that was anticipated and aimed by the government. Of course, the effects of added marketing of voluntary pension plans and the effect of the reform of earning-related pensions cannot be fully controlled in our estimations. These effects cannot be ignored and the changes probably affect positively our results. However, it is possible that the reform of earnings-related pension has indeed changed younger pension plan savers' behaviour but it has hardly changed

savings in different income groups. Therefore, we can conclude that, at least, well allocated tax deductions can influence savers' behaviour across labour income groups.

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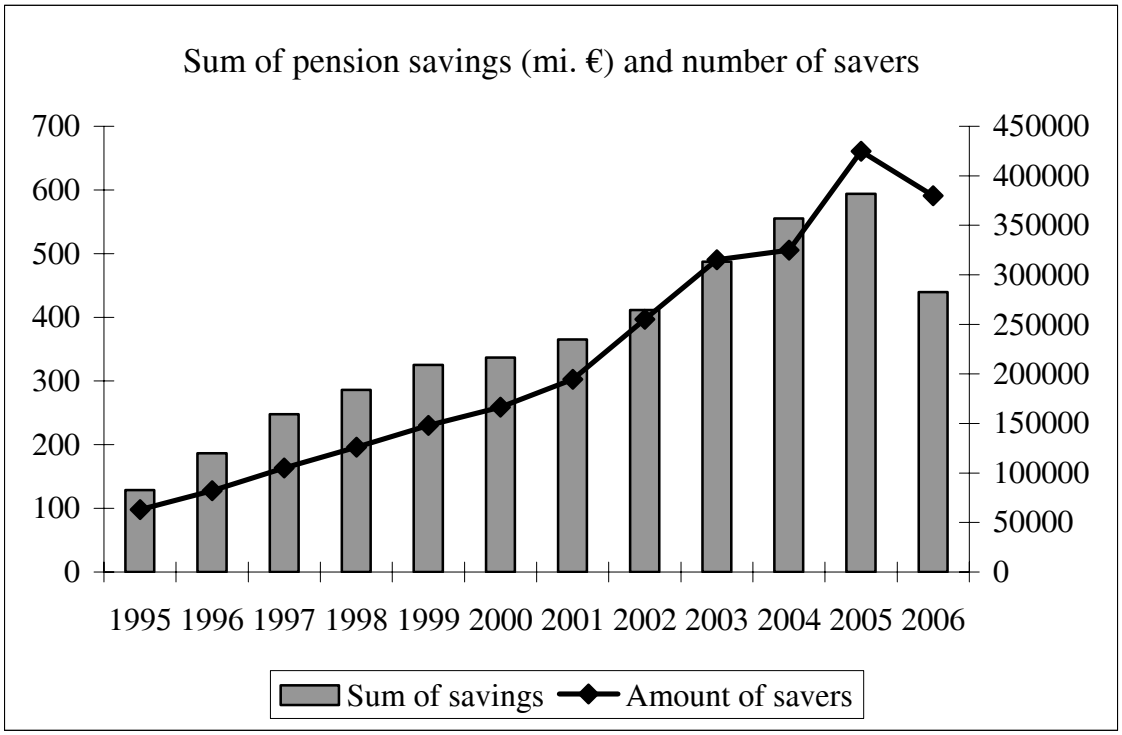
Appendixes

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 extension of the Tobit model. The conditional distribution for positive dependent values is as in the Tobit model and therefore,

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

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

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

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

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

All the estimates can be inserted from the estimation so the expected average marginal effects are easily calculated. The valid standard errors are calculated by 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).

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