Targeting Risk Lovers?
Incentives for Voluntary Pension Savings with Heterogeneous Risk Preferences

Bo Larsson
Department of Economics,
Högskolan Dalarna,
SE-781 88 Borlänge, Sweden
email: blr@du.se

Jenny Säve-Söderbergh
Swedish Institute for Social Research,
Stockholm University,
SE-10691 Stockholm,
Sweden
email: jenny.save-soderbergh@sofi.su.se.

Abstract
Many countries need to stimulate voluntary pension-planning to meet the demands of an ageing population. Sweden has been a front-runner in introducing tax-deferred designated pension savings accounts along with self-directed individual public pension accounts. A particular feature is that savings are taxed by a presumptive return. In this paper, we show that with heterogeneous risk preferences, this tax-policy makes designated pensions unattractive for individuals with a high level of risk aversion. Using data on self-directed choices and designated pension-savings, we also empirically confirm our result. This paper sheds light on the importance of coherent policy-making in stimulating adequate pension planning and also on the negative consequences of a presumptive tax-design like e.g. the Dutch "Box-III" tax system.

Keywords: Presumptive taxation, Portfolio choice, Designated Pension Savings, Dutch Box-III Tax, Individual Accounts.

JEL-Codes: H55, H24, G11, G23

I. Introduction

In the design of tax policies, regulators often focus on simplicity and tax neutrality across comparable objects for a given expected tax revenue. However, both the neutrality and the simplicity aspect only consider the expected outcome and not the full alteration of the incentive scheme when risk is incorporated. Ignoring risk in the design of taxes, however, is likely to have adverse and unintended effects.

By studying a special case of taxation in Sweden we can analyse and quantify the "costs" of ignoring risk when forming tax policies. Following a large tax reform in 1991 the government introduced a specific tax-incentive system to stimulate voluntary private pension saving. The basic idea was to allow deductions from taxable earnings for contributions to tax-deferred retirement savings accounts, i.e. designated pension savings accounts. More important, a unique feature of the tax-policy was a decision to tax the returns at a presumptive rate and not on the actual rate.[1] Consequently, contributions are taxed yearly regardless of the actual outcome of the savings.

Few countries, except Sweden, tax pension savings this way, or for that matter at all. However, taxation with presumptive returns is used in the Netherlands to tax capital income i.e. the Dutch "Box-III"-tax[2] (for an evaluation see Cnossen and Bovenberg 2003). Presumptive taxation has also currently received a lot of attention as an interesting solution among regulators (Lodin, 2009) but then with no account taken to the effects of heterogeneous risk preferences. Thus, our results from analyzing the taxation of designated pension savings in Sweden can be directly used to draw conclusions about systems like the Dutch Box-III tax system.

In this paper we show theoretically that presumptive taxation creates a wider outcome distribution, which causes more weight in the tails of the distribution. This makes the investments under a presumptive tax-scheme unattractive for risk-averse individuals, making less risk tolerant individuals prefer to refrain from adopting investment schemes taxed with

[1] Tax policies are a popular area for economic research, but the specific topic of taxes and risk alteration is less investigated, although not ignored. Already in 1944 Domar and Musgrave established that the risk sharing that prevails from losses being tax deductible is an attractive feature for investors. Later both Mossin (1968) and Stiglitz (1969) have studied this but with expected utility. Agnar Sandmo (1977) extended Mossin and Stiglitz results to include several assets along with welfare analysis in Sandmo (1980).

[2] The Dutch Box-III tax is capital income tax for all personally held assets like deposits, stocks, bonds and real estate set at a presumptive rate of 4 percent, which is taxed yearly with 30 percent, see Cnossen and Bovenberg (2003).

presumptive returns. As previous studies (Agnew et al. 2000; Bajtelsmit and VanDerhei 1997; Hinz et al. 1997; Sundén and Surette 1998; Jianakoplos and Bernasek 1998) have found that low-wage workers or women tend to adopt more conservative investment strategies this result suggests that applying a presumptive tax-scheme may discourage those who actually may need tax-induced voluntary pension-savings the most.

We also test empirically if the tax-incentive for designated pension savings is equally adopted along the distribution of risk preferences. Using unique data on portfolio choices in individual accounts introduced following a Swedish reform in 2000 we derive a measure of risk-taking.[3] The data also contain deposits to designated pension savings accounts along with vital register-based data on important economic background variables. Moreover, since the reform of the pension system covered the entire work force of approximately 4.4 million individuals, the study does not suffer from selection bias, sometimes plaguing other research on e.g. self-directing in occupational pension schemes.

The empirical analysis first confirms that individuals believed to have lower familiarity or with low levels of assets are more conservative investors. With a two-step estimation, we find a variable for risk-taking that is not explained by typical socio-economic factors and then estimate the correlation of this unexplained risk-taking with the use of the tax incentive. The estimates confirm that the tendency to use designated pension savings is clustered in groups that are more risk tolerant, even when controlling for economic background and other risk exposure.

In sum, this paper shows, theoretically and empirically, that a presumptive tax system deteriorates the situation of exactly those individuals who may already be in danger of obtaining insufficient pension incomes because of two effects. First, the possibility of self-directing pension contributions creates a lower pension-wealth with lower expected returns for those who are not willing to take on large risk exposure. Second, an unintended effect of the tax-incentive is that those groups with a low level of risk tolerance also lack incentives for voluntary designated pension savings, along with having lower expected returns on their individual accounts. These two proposed effects create a worsened situation for those who may be in the largest need of providing for their future pensions. Moreover, we show that implementing a Dutch "Box-III"-tax also for capital incomes, as suggested by Lodin (2009), could then potentially lead to larger

[3] Other papers analyzing the Swedish initiative of self-directing investments, but with focus on other issues, are e.g. Cronqvist and Thaler (2004), Engström and Westerberg (2003), Säve-Söderbergh (2007).

income differences as Roine and Waldenström (2008) show that capital income constitutes a large share of total income differences.

The paper is organized as follows. In Section II we describe the tax policy for pension savings. Section III outlines the model. In Section IV we give a summary of the data. In Section V we present the empirical model and results are given in Section VI. Finally, Section VII concludes.

II. The Design of the Tax Policy

In 1991, Sweden underwent a major tax-reform in order to reduce distortions created by the old tax system and to create neutrality between different sources of income. The system strived to create an equal tax treatment for similar types of investments. Sweden has a dual income structure where labor income and capital income are taxed under separate schemes. As a consequence of an ageing population, the government also created a tax set to promote designated pension savings.

Savings are taxed under essentially three different forms: as "general"-savings, as designated pension savings or as "endowment-insurance"-savings. Table I presents the tax rules for the different types of savings. The first form is general savings, like a bank account or shares in mutual funds, which are taxed at a level of 30 percent on their actual rate of return. Losses on general savings can also be used to lower current labor income tax. For losses made on stocks, 70 percent of losses are deductible, while hundred percent of the losses on interest-bearing instruments are deductible against other labor income. The deposits into general savings are not deductible from the labor-income base for taxation.

Designated pension savings can be invested under two types of investment options. The first is a traditional insurance and the second is a pure investment portfolio that can consist of either a portfolio of mutual funds or a fixed portfolio consisting of any type of security. Both types can be annualized at the earliest when the investor reaches 55 years of age.

In contrast to general savings, deposits into designated pension savings can be used to lower current labor income tax. The tax rule allows a deposit into designated pension savings of SEK 18 200 (US $2 244) to be deducted from the labor-income base for taxation for labor

incomes in the interval of 0 to SEK 364 000 (US $ 44 883).[4] For labor incomes above SEK 364 000 but below SEK 728 000 (US$ 89 766), a deduction equal to five percent of incomes above SEK 364 000 can be made for designated pension savings, along with the SEK 18 200. For labor incomes above SEK 728 000 the maximum deduction is five percent of SEK 728 000, which is equal to SEK 36 400. The annuities from the designated pension savings are taxed as income when annualized.[5]

Designated pension savings are taxed under a special capital-gains tax, which is based on a presumptive return given by the average market interest rate on Swedish government bonds (with a remaining maturity of at least five years), *Statslåneräntan*. Regardless of the investment resulting in a gain or loss, the value of the savings is assumed to have grown at the same rate as the interest on government debt. The presumptive return is also taxed yearly at a rate of 15 percent.

The third type of savings is "endowment insurance"-savings, "kapitalförsäkring", which is taxed according to the same principle as designated pension savings. This is an investment that has to be locked for a minimum of five years and exists in two forms. First, a traditional insurance with a fixed minimum return, which can not exceed 3 percent, a limit set by the Finance Inspection Board (Finansinspektionen). The second is a unit link savings, which is invested in mutual funds. Since this investment has a shorter horizon and may have a different objective compared to designated pension savings, the presumptive return is taxed at a higher rate of 27 percent.

In sum, the noteworthy difference between the taxation of designated pension savings and general savings is that taxes are only paid when actual gains occur for the general savings, whereas for designated pension savings a presumptive growth tax is paid.

III. Theory

In this section we show how the taxation of a presumptive return for designated pension savings and similarly endowment-insurances, affect investors' utility and the implications for choosing the optimal pension investment strategy. We first show the effect of presumptive taxation when

[4] The exchange rate is approximately SEK 8.11 per US $ 1.
[5] This could be beneficial if taxes are much lower when the agent reach retirement age, but it will not be analyzed further in this paper. A more thorough discussion on why we chose not to model this artifact is found in section III.

ignoring risk. Then we incorporate the effect of differences in risk preferences and stochastic investment returns. Both analyses are performed under a buy-and-hold assumption for simplicity.[6] Finally, we incorporate effects on general savings which come from risk-sharing given by the design of the tax system where capital losses are tax-deductible while capital gains are not (see the seminal paper by Domar and Musgrave, 1944, or a newer overview by Sandmo, 1985, for analysis of such risk-sharing). Note that in Sweden, the risk sharing between the government and investors is not one-to-one as only 70 % of losses can be deducted against labor income.[7]

III a. A comparison of the Designated Pension Savings Tax with the General Savings Tax based on Expected Returns

Much analysis, policy making, investment advice and discussion regarding pension savings are commonly based solely on expected values. Here we show how a presumptive taxation scheme only raises incentives to invest for those with high risk tolerance.

The net growth of a one unit investment with the designated pension savings tax is:

$$\frac{1}{1-t_c}\left(1+r-bt_p\right)^n\left(1-t_f\right), \qquad [1]$$

where t_c denotes the current income tax, r is the return on the investment and b denotes the interest rate on long-term government debt i.e. the fictitious return, t_p denotes the yearly tax on pension savings, t_f is the future income tax and n is the number of years.

The first term in expression [1] comes from designated pension savings being deductible in the present, which means that you get "more bang for the buck" initially. The second term is the growth rate and the third term is the income tax that the designated pension savings is subjected to in the future, as savings were deductible initially. Note that the relation in equation [1] shows that if we assume the future tax rate t_f to be equivalent to the current tax rate t_c, the two tax terms cancel. This would be applicable especially for individuals who are not expected to have significantly higher (or lower) incomes in the future compared to the current incomes.

---

[6] This should be a rather innocent assumption as most investors do not rebalance frequently. Further, Kritzman (2000), shows that your timing ability has to be a lot better than the market in order to benefit from rebalancing. Anderson (2007) also shows that investor performance deteriorate with degree of activity.

[7] 70 % of losses up to 100 000 SEK yields a 30 % tax deduction per person, above 100 000 SEK the tax deduction is 21 %. 100 % of paid interest rates are eligible for the same tax deduction rule as for losses.

The net growth rate of a one unit of investment with the general savings tax is:

$$(1+r)^n(1-t_g)+t_g\,, \qquad [2]$$

where t_g denotes the general savings tax. Comparing the growth rates, i.e. the first term on the right hand side, for designated pension savings and general savings, it is apparent that the growth rate is slower for designated pension savings due to the yearly taxation, $t_p b$. However, the value of the net return on general savings is reduced by taxation when realized.

The two forces that affect the relationship between the designated pension savings tax and the general savings tax are the investment horizon and the risk premium, or equivalently the presumptive return (i.e. the interest rate on long-term government debt). This follows from the assumption that future and current labor income taxes will be equal. From equation [1] and [2] it is also evident that the longer the horizon the more costly is the designated pension savings tax due to compounding relative to the general savings tax.

The difference between the two tax schemes in expected values are illustrated in *Figure 1*, where a 10 % market return, a risk premium of 4% and a general savings and labor income tax of 30% are used.[8] From the graph it can be seen that the general savings tax is better than the designated pension savings tax for very long investment horizons, while the difference is small for short investment horizons. This follows from the latent tax credit not being realized until the investment is realized. If we also relax the assumption of no rebalancing, the designated pension savings tax is more attractive since at every rebalancing point, the tax is realized with general capital-gains tax.

III b. Including Heterogeneous Risk Preferences and Stochastic Returns

So far we have shown that basing the analysis on a constant return that is often imputed from expected values, the designated pension savings tax is beneficial to investors if the investment horizon is short and/or the presumptive return is low. In this section we will expand the analysis to a more realistic case by including heterogeneous risk preferences and investment risk. This is a more appropriate approach as many investors may be risk averse and investment returns are stochastic.

[8] Based on data from Sveriges Riksbank.
(http://www.riksbank.com/upload/Dokument_riksbank/Monetar_hist/Stocksandbonds1856_2006.xls)

In order to judge which tax system that is preferred with stochastic returns, we have to consider how an investor would rank different scenarios' expected utilities. We assume that investors would rank investing strategies according to the highest expected utility such that:

$$A > B \text{ iff } E[U(A)] > E[U(B)] \quad [3].$$

Calculating the expected utility for investments with stochastic return is complicated for two reasons. First, plausible return distributions are often not possible to integrate. Second, the exact functional form for the utility function is not known.

However, there is a simple method to distinguish strategies that are preferable for all possible concave utility functions. This analysis is based on the method of stochastic dominance (see for example Levy and Sarnat (1984)). They show that in order for investment strategy A to dominate investment strategy B for all risk averse agents, i.e. $E[U_i(A)] > E[U_i(B)] \ \forall i,$ where $U_i(\bullet)$ is concave, the following must hold,

$$\int_{-\infty}^{r} [B(t) - A(t)]dt \geq 0 \quad \forall \ r \quad [4]$$

where $A(t)$ and $B(t)$ are cumulative distributions for investment strategy A and B. This condition which is used to evaluate the efficiency among different outcomes for risk-averse agents is named second order stochastic dominance (SSD).

The easiest way to understand the condition is to study a graph of the cumulative distributions of investment options under different tax schemes. First we compare the cumulative distribution of investments under the designated pension savings tax scheme with the cumulative distribution of untaxed investments. This is shown in *Figure 2* using the average interest rate for government debt between 1993 and 2005 of 6.2%[9]. Clearly, the untaxed return dominates the outcomes with the designated pension savings tax over one period. The cumulative distribution of outcomes without tax lies to the right of the cumulative distribution of outcomes with the designated pension savings tax for all possible probabilities. That is, for all chosen probabilities the designated pension tax lowers the returns. In terms of the condition, the area between the cumulative distribution given a pension savings incentive-tax and the cumulative distribution for the untaxed returns is positive throughout the support of their

[9] Numbers given by the Swedish Tax Authority's ("Skatteverket") home-page are: 8.58, 9.52, 10.16, 7.9, 6.47, 4.98, 4.88, 5.35, 4.97, 4.85, 4.71, 3.95, 3.26 for the years 1993-2005, which yields an average of 6.2%.

functions. For investments in endowment insurance the net returns are shifted even more to the left as the tax is 27%.

Since the designated pension savings tax is path dependent even with a buy-and-hold strategy we cannot evaluate the designated pension savings tax to the general savings tax for many periods. However, as the untaxed returns were shown to dominate the designated pension savings tax in any given period its cumulative return will also dominate. Therefore, we can evaluate capital gains tax against untaxed returns as they serve as an upper bound for the designated pension savings tax.

We also incorporate another feature of the tax system which allows loss deduction against other taxable income. Already in 1944, Domar and Musgrave investigated the effect on investments from this risk-sharing between investors and government. Later both Mossin (1968) and Stiglitz (1969) have taken their analyses into the expected utility frame work. As noted above, seventy percent of the losses on stocks are deductible, while hundred percent of the losses on interest-bearing instruments are deductible against other labor-income tax in Sweden.

The effect of losses being tax deductible makes the general savings tax act almost like a mean preserving spread, as defined by Rothschild and Stiglitz (1970). Probability mass from the tails of the return distribution will be shifted towards the middle of the distribution, although not in a symmetric way for two reasons. First, investment opportunities will in general have positive expected returns, but since taxes are only paid for gains, the shift of the distribution weights will be towards a point to the left of the middle of the distribution. Second, losses are not deductible to a hundred percent, which shift the distribution asymmetrically. Because of this, the general savings tax does not lead to a mean-preserving shrinkage of the probability distribution in general. Therefore we cannot use Rothschild and Stiglitz (1970) to conclude that general savings taxes are preferred to having no taxes due to their risk reducing property.

Using second order stochastic dominance principle to analyze the general savings tax relative the un-taxed returns, we find that untaxed returns are actually not preferable to all risk-averse agents, see *Figure 3*. The reason for this is that for negative returns the condition in equation [4] is not fulfilled as the area between the returns with a 70 percent deductibility of losses and the no-tax return is negative. Note that the area of the overall difference is positive due to the asymmetric shift of probability mass, which implies that the mean is also higher for

the no-tax returns. This is therefore an important problem for policy makers as the effect of the tax system will clearly depend on the shape of the individual utility functions.[10]

In order to obtain more information about the value of the risk reduction due to deductible losses we also calculate the expected utility. The problem is that we do not know what would be a plausible utility function, but based on the literature it might be interesting to look at two cases. Log-utility represents investors with low risk aversion while power utility, with a coefficient of relative risk aversion, γ, larger than one represents investors with high level of risk aversion:

$$E_t\left[U\left(x_{t+1}\right)\right]=\int_{-\infty}^{\infty}\frac{1}{\sqrt{s\pi\sigma^2}}\exp\left\{-\frac{\left(x_{t+1}-\mu\right)^2}{2\sigma^2}\right\}U\left(x_{t+1}\right)dx_{t+1}$$

$$U\left(x\right)=\begin{cases}\ln(x) & if\ \log-utility\\ \dfrac{(x)^{1-\gamma}}{1-\gamma} & if\ \ power-utility\end{cases} \qquad [5].$$

For the case of several periods, the utility of final wealth for designated pension savings is path dependent:

$$E\ \left[U\left(R_{t,T}^{p}\right)\right]=\int_{-\infty}^{\infty}\cdots\int_{-\infty}^{\infty}f\left(r_{t+1}\right)\cdots f\left(r_{t+T}\right)U\left[\left(e^{r_{t+1}}-b_{t+1}xs\right)\cdots\left(e^{r_{t+T}}-b_{t+T}xs\right)\right]dr_{t+1}\cdots dr_{t+T}. \qquad [6]$$

In Table 2 we then compare the expected utility for the different tax-regimes against the untaxed return. This is done using the log-utility for low risk aversion and the power utility with a coefficient of the relative risk aversion set to 3 for high risk aversion.[11] We then find that when we calculate the normally distributed returns net of the different tax systems (general savings taxes and designated pension savings tax) compared to the untaxed returns for one period, the power-utility falls with 2.2 percent for the endowment insurance tax. For the designated pension savings tax the equivalent fall is 1.2%. If we also consider that losses are not deductible then the utility falls with 5.3% but increases with 3.3% when losses are deductible. Performing the same analysis for log-utility the untaxed return has the largest utility and falls by 5.5 percent for the designated pension savings tax and falls about the double for the endowment insurance tax. If losses are deductible the log-utility falls with 9.2 percent, and finally, with no loss-deduction the

[10] If expected returns on risky assets were zero and losses fully deductible all risk averse investors would in fact prefer to be taxed rather than to capture total return before tax.

[11] Note that this is a relatively low level of relative risk aversion. The famous equity-premium puzzle by Mehra and Prescott suggests a level of risk aversion close to 30 in order to explain the equity premium.

utility falls with 37.7 percent. It is clear that with low risk aversion the designated pension savings tax is preferable to the general savings tax and that the opposite is true for investors with high risk aversion. For the two period case tax deductible losses are relatively less favourable to untaxed returns (falls to 3.2 % higher), whereas the difference for the designated pension savings tax is more than twice as large, (increases to 2.5 % lower than untaxed returns).

As it is complicated to calculate the expected utility for pension savings taxes we turn to a long-term comparison of the long-term utility for untaxed returns and general savings with tax-deductible losses. Since we know that a designated pension savings tax always results in lower utility than non taxed returns we can use the non taxed returns as an upper bound for the expected utility of the pension savings tax. Note that the upper bound is close to designated pension savings tax for very short horizon but is extremely conservative for long horizons. *Figure 4* shows that when the investment horizon is as long as 20 years, the power utility of the untaxed return is almost as high as the utility of the taxed returns when 70 percent of the losses are tax deductible. This means that for investors with high risk aversion the designated pension savings tax is not much of an incentive to invest in a private pension plan.

IV. Data

The data on risk-taking is gathered from portfolio choices in the individual accounts introduced in Sweden following a large pension reform in 2000. In 1998, Sweden passed a pension legislation that specified a gradual transition from a public defined-benefit plan to a defined-contribution plan, which will be fully phased out in 2018.[12] One part of this reform was to introduce fully-funded individual accounts for approximately 14 percent of public pension contributions, the "premium pension".[13] From the year 2000, all eligible[14] investors were allowed

[12] Selén and Ståhlberg (2007) explain the transition from an unfunded pension system to a defined contribution pension system in Sweden with the age structure of the population and the age of the median voter.

[13] Since 2000 there are four sources of retirement income in Sweden. First, there is the income pension and the guaranteed pension, which is a pension based on former labor income and for which there is a guaranteed minimum level of SEK 6000 (approximately $600) per month at retirement. The second source is the premium pension, the source of retirement income under study. The third source is a union/collective pension/occupational pension. The fourth source is private pension savings. The first two sources are included in the "national pension system" and from 18.5% of a person's pension eligible income, 16 percentage points (or 86 %) is paid into your income pension and 2.5 percentage points (14 %) goes to the premium pension.

[14] To be eligible for fund selection, labor income must exceed a minimum level in the three preceding years, approximately equivalent to two average monthly salaries per year (SEK 36 000 in 1995, SEK 36 800 in 1996, SEK 37 000 in 1997 and SEK 37 100 in 1998).

to self-direct these contributions by selecting a maximum of 5 funds out of a total of 450 to 600 mutual funds. Following these choices we derive a measure of individual risk-taking.

Prior to self-directing each individual received a fairly comprehensive catalogue (all information was also available on the PPM's web page, www.ppm.nu) containing many facts about types of funds, fund managers, trading procedures and some advice on fund selection with respect to age and risk. A risk measure was also calculated such that each fund was indexed according to risk. This is also the risk measure that we use to derive individual risk-taking. For each fund, the risk measure was defined as the average standard deviation for the three preceding years.[15] PPM then categorized the risk measure into five levels of risk: 0-2 very low risk, 3-7 low risk, 8-17 medium risk, 18-24 high risk and 25- very high risk.

In order to obtain a measure of risk-taking, we calculate for each individual the share of funds chosen that had a risk measure above 25, i.e. the share of high-risk funds. Note that out of the selectable funds approximately 20 percent were high-risk funds. The cut-off level is deliberately set to this high level to ensure that we look at preferences for funds most likely to be judged as risky.

The data on individual designated pension savings, along with other income and background characteristics, is gathered from the Swedish Household Survey on Income (HINK) in 1999, created by Statistics Sweden, which includes 38 237 individuals. Out of these 18 124 were eligible to make a fund selection.[16] The HINK data has access to yearly deposits made into designated pension savings following information from filed tax returns to the Swedish Tax Agency. Thus the designated pension savings deposit filed is only the annual contribution and not the actual size of pension savings. This deposit is also the amount which can be deducted from the labor income. Note that all tax returns are filed individually in Sweden, and for couples each household member is assigned for tax-purposes a percentage of its value.

Of the eligible participants, 11 102 individuals made a selection and 7 122 choose not to select a fund and obtained the default fund. Since the risk-profile of the default fund was

[15] Not all funds had a risk measure given by PPM as they did not exist prior to 2000. Therefore, in order to include such funds, risk levels have been imputed for each fund by assigning the average value of the risk in the guide for similar types of fund.

[16] As the quality of the data is uncertain when it comes to assets and inventories associated with unincorporated businesses, farms and commercial real estate, the conventional practice when using HINK data is to exclude households owning declared wealth in these asset categories. The number of people excluded from the analysis is 1728 individuals with declared wealth in unincorporated businesses, 751 who farm and 72 who receive income from commercial real estate. All results remain robust to the inclusion of these individuals.

determined after the fund choices had been made non-selectors could not have been certain of the level of risk in the default fund, the latter group is excluded from the analysis.

Table III presents summary statistics. About 46 percent of the sample has deducted some amount for designated pension savings. The average amount deducted is approximately SEK 3 000 (app. US $ 445). Women are more likely to have made deductible designated pension savings whereas men have deducted higher levels of designated pension savings. Furthermore, various age groups have used the option of deductible pension savings differently.

Before we proceed with the empirical model, we want to compare the distribution of high-risk shares between those with deductible pension savings to those without, see *Figure 5*. The figure illustrates our findings as the cumulative distribution is thicker in the lower end of the risk distribution for those without designated pension savings. In addition, a non-parametric Kolmogorov-Smirnov test for the equality of the two distributions is rejected at a p-value of 0.01.

V. Empirical Model

The intention is to explore the joint relationship between the use of designated pension savings and risk-taking. So the basic relationship we want to estimate is:

$$DPS = f(INCOME, WEALTH, EDU, AGE, RISK-TAKING) + \varepsilon_i \quad [7]$$

where DPS is either the binomial choice of yes/no or the deducted level of designated pension savings (or equivalently the deposited level). The designated pension savings decision is modeled as a function of different types of assets, each indicating to what extent an investor can afford to privately save for a pension income. $INCOME$ include labor earnings and social transfers and net wealth, $WEALTH$, which is collected by the Swedish Tax Agency is defined as: financial assets (savings deposits, premium bonds, market value of bond funds, mixed funds, stock funds, stocks (A-listed, OTC-listed and other listings), real estate and debt. Education and age is assumed to indicate familiarity with pension planning. The latter also captures the necessity of private pension planning.

Finally, the designated pension savings decision is a function of risk-tolerance, $RISK-TAKING$. However, risk taking is not exogenous to wealth, and is a decision dependent on similar characteristics as is the choice for designated pension savings. Therefore we cannot use the high-risk share chosen for the premium pension, but instead run a two-step estimation

where equation [7] is our second pass regression. Our method is to first model the risk-taking decision for the premium pension by assuming that:

$$HIGHRISK_{\alpha} = g(FIN.SOPH., NETWEALTH, FEMALE, MARRIED, OTHERRISK, AGE) + \gamma_i \quad [8].$$

$HIGHRISK_{\alpha}$ is the share of high risk assets chosen for the premium pension. The high-risk share is made a function of a vector of attributes capturing familiarity with financial markets or financial sophistication, $FIN.SOPH$, which include earnings (empirical support for low-wage workers tending to be more conservative investors is Agnew et al, 2000; Bajtelsmit and VanDerhei, 1997; Hinz et al, 1997) and education. Other characteristics determining the choice of risk tolerance are gender and marital status, shown by e.g.. Sundén and Surette (1998). The risk-taking decision is also dependent on risk exposure in other assets, $OTHERRISK$. We therefore include the share of financial assets invested in risky assets or mixed assets.[17] Additionally, we include the risk or variability associated with alternative pension incomes from the occupational pension. We then acknowledge that some individuals have contribution-based occupational pension flows, which is a more risky alternative to having a defined benefit plan. Finally, we include the age to capture the time horizon influence on risk-taking decision. γ_i is an *iid* distributed error term capturing other factors influencing the risk-taking decision.

From estimates of an OLS regression on equation [8], we predict a level of risk-taking for each individual, which is explained by the above attributes, $PRED.RISK$. From this, we find the difference between the actual high-risk share taken and the predicted high-risk share to get a measure of risk which is not explained by the above economic/socio-economic attributes. Hence, we have that

$$UNEXPL.RISK = HIGHRISK_{\alpha} - PRED.RISK \quad [9],$$

where $UNEXPLRISK$ is then included in the pension savings decision as a proxy for risk-tolerance.

Yet another factor may confound the level of high-risk assets chosen for the premium pension. The choice of being an active investor versus choosing the default fund may not be

[17] The division is: (i) Safe Assets: savings deposits, interest rates on savings accounts, premium bonds and the market value of savings in bond funds, interest rate on securities.(ii) Mixed Assets: the market value of savings in mixed funds, asset values stated in the income-tax return form as "other valuables" (which are personal inventories such as cars, foreign securities etc). (iii) Risky Assets**:** the market value of stocks (A-listed, OTC-listed and other listings), the market value of savings in stock funds, dividend payments, other securities.

random. Therefore, we estimate a Heckman selection model which accounts for the selection into being an active investor to find *PRED.RISK*. The decision to be an active investor is modeled on the basis of previous findings on active investors (see Madrian and Shea 2001; Engström and Westerberg, 2003). Included regressors are familiarity with financial markets (age, education, income, financial assets, lacking financial assets) and some reform-specific attributes (region, year). Identification variables for the choice to be active are wealth risk exposure, occupational pension risk, the level of financial wealth out of net wealth and some reform-specific attributes.

VI. Empirical Results

In Table IV, we present the regression results for the choice of high-risk assets. We find first that familiarity with financial markets is associated with higher risk-taking. A larger risk exposure in financial assets is also positively related to risk-taking. Moreover, having a larger uncertainty in alternative pension-flows decreases risk-taking. Females also have lower shares of high-risk assets as compared to men. Marital status has a negative impact on the share of high-risk assets, contrary to an expected effect of the spouse's income acting as a substitute for a low-risk asset.

The results of a Heckman-selection model are given in column 2 and 3 and yield essentially the same results. There is some non-randomness of the sample indicating that there has been a selection of less risk-tolerant individuals among active investors. Active investors are also more likely to be familiar with financial markets, to have higher labor income, and larger financial wealth. An interesting finding is that females are less likely to have chosen the default alternative. From the model displayed in column 3, we then obtain the predicted risks and deduct the actual risk to get a measure of the share of high-risk assets not explained by socio-economic factors. This measure is then used in equation [7].

The results find the anticipated relationship between risk tolerance and the use of designated pension savings. The results presented in Table V suggest that individuals who are more risk-tolerant are more likely to save in designated pensions, although not at the highest levels of risk-taking.[18] Note that this is the risk taking which cannot be explained by basic socio-economic characters. The probability to choose designated pension savings is also clearly related to affordability and familiarity with pension planning. Both labor income and wealth increases

[18] We have done the estimations using the average level of risk-taking in the PPM portfolio as well and obtain the same results.

the probability to privately save for a pension, but less so for very high levels of labor income and wealth. This is a plausible pattern given the fixed deductibility-structure for higher incomes. We are also able to confirm our model result of a short investment horizon influencing the willingness to use deductible pension savings positively. The willingness to use the deductible pensions increases with age but at a decreasing rate.

The second and third columns in Table V show two regression models on the amount deducted. We divide the sample into the two groups that have different threshold values for the maximum allowed deduction. Risk tolerance is again positively related to the level of deductible pension savings, although decreasingly so for incomes below the first threshold. [19]

An interesting relation is that there is a U-shaped relationship between labor income and the amount deducted for individuals only being able to deduct the maximum amount of SEK 18 200. Could this reflect the fact that a deductible amount of SEK 18 200 is a relatively higher amount to deduct from labor income taxation for individuals with lower incomes than for richer, and thus the increased possibility for individuals with higher earnings to actually save money to invest in pension wealth? For individuals with incomes above the threshold, the relationship between labor income and deducted amount is hump-shaped. For net wealth the relationship is hump-shaped for both labor income groups. For the amount deducted age is not hump-shaped but instead somewhat increasing for older individuals. Yet, if we exclude the squared term the age coefficients are positive and significant. [20]

Figure 6 illustrates the cumulative distributions of the unexplained risk levels for individuals with or without designated pension saving. Again, we find a difference in the two distributions where individuals having designated pension savings are more risk tolerant. A non-parametric Kolmogorov-Smirnov test also rejects the equality of the two distributions at a p-value of 0.000. Finally in *Figure 7* we show the cumulative distributions of the unexplained risk levels corrected for selection. Again a non-parametric Kolmogorov-Smirnov test rejects the equality of the two distributions at a p-value of 0.000. Note that in comparison to *Figure 5* in which the actual share of high-risk funds is used, we find a larger difference between the two groups with the risk-taking not explained by socio-economic variables.

[19] One concern may be a high correlation between the unexplained risk and the residuals in model 7. This appears to be no problem since the correlation is between 0.001and 0.003.

[20] In an alternative model, we measure risk-taking with the share of risky assets out of financial wealth, see Appendix Table I. We again confirm the results of risk-taking and private pension savings. Individuals who are more prone to take risks (not explained by socio-economic factors) are more likely to choose deductible private pensions, although not for the highest levels.

VII. Conclusions

Many countries need to reform their pensions systems in order to meet the demands of an ageing society. Since Sweden has been one of the front runners in reforming its pension system much can be learnt from the Swedish experience, see e.g. Diamond (2009). The application of individual public pension accounts in such a large scale is unique and the combined effect of having presumptive taxation and self-directed pension accounts has increased the role of investor's interest and ability to make active investment decision, as well as heterogeneous risk preferences. We have shown that neglecting risk preferences when designing tax policies intended to promote designated pension savings may have unintended consequences for individuals with a low risk tolerance. Combining this with a higher reliance on self-directed pensions, the importance of a public awareness about the impact of asset allocation on portfolio accumulations has increased.

Many individuals also earn pension rights from occupational pensions. Individual accounts are becoming a more popular solution also in the design of these schemes. Therefore, a large share of pension incomes will not only be determined by incentives to work, but on the individual's capacity to invest. Additionally the capacity to invest will affect the incentive to voluntarily save for their retirement or not. The intention behind introducing the individual accounts as a part of the public pension system was for the pension system to be risk-balancing, see SOU 2004:13. The investment allocation was thought to balance pension income risk induced by demographic changes, economic growth and specific shocks within the industry in which the individual works. However, we show that the problem is that the same individuals who are expected to get a low return in their individual accounts also refrain from using the tax-incentives created to promote pension savings. Moreover, as successful financial investments will become more important income source given a larger degree of self-directing in many pension schemes, a taxation system that further increase the risk in the investment may make more groups refrain from investing in risky assets.

Acknowledgements

We are grateful for valuable comments from Ann-Charlotte Ståhlberg, Mats Persson, Panu Poutvaara, Jesper Roine, Chris Shioya and conference participators at the EEA Conference in Barcelona 2009, seminar participants at SOFI, Stockholm University and Högskolan Dalarna. The usual disclaimer applies.

References

Agnew, J., Balduzzi, P., Sundén, A.E. (2003) "Portfolio Choice, Trading and Returns in a Large 401(k) Plan", *American Economic Review*, Vol. 93, 193-215.

Anderson, A., (2007), "All Guts, No Glory: Trading and Diversification among Online Investors", *European Financial Management Journal,* vol. 13.

Atkinson, A. B., Sandmo, A., (1980), "Welfare Implications of the Taxation of Savings", *The Economic Journal,* Vol., 90, no.359, 529-49.

Bajtelsmit, V. L., Van Derhei, J. L. (1997) "Risk aversion and Pension Investment Choices", in *Positioning Pensions for the Twenty-First Century,* Gordon, M. S., Mitchell, O. S., Twinney, M. M., eds. Philadelphia: University of Pennsylvania Press, 45-66.

Cnossen, S., and L. Bovenberg, (2003) "The Dutch Presumptive Capital Income Tax: Find or Failure?" in Public Finance and Public Policy in the New Century, edited by S. Cnossen and H-W Sinn, MIT Press, Cambridge, 241-261.

Cronqvist, H., Thaler, R.H., (2004), "Designing Choices in Privatized Social-Security Systems: Learning from the Swedish Experience", *American Economic Review*, Vol. 94, 424-428

Diamond, P.A. (2009), "Economic Globalization and Swedish pensions", Expert Report no 28, Sweden's Globalisation Council, 2009.

Domar, E.D., and R.A Musgrave, (1944), "Proportional Income Taxation and Risk-taking," *Quarterly Journal of Economics,* 58, 388-422.

Engström, S., Westerberg, A. (2003) "Which Individuals Make Active Investment Decisions in the New Swedish Pension System?", *Journal of Pension Economics and Finance*, Vol. 2, 225-245.

Hinz, R. P., McCarthy, D. D., Turner, J. A. (1997) "Are Women Conservative Investors?: Gender Differences in Participant-Directed Pension Investments", in *Positioning Pensions for the Twenty-First Century,* Gordon, M. S., Mitchell, O. S., Twinney, M. M., eds. Philadelphia: University of Pennsylvania Press, 91-103.

Hedesström, T, H Svedsäter och T Gärling (2004) "Identifying Heuristic Choice Rules in the Swedish Premium Pension", *Journal of Behavioral Finance*, Vol. (5), 32-42.

Huberman, G. (2001) "Familiarity Breeds Investment", *Review of Financial Studies*, Vol. 14, 659–680.

Jianakoplos, N. A., Bernasek, A. (1998) "Are Women More Risk Averse", *Economic Inquiry, Vol. 36, 620-630.*

Kritzman, M., (2000), *"Puzzles of Finance",* John Wiley and Sons, Inc., New York.

Levy. H., Sarnat, M., (1984), *"Portfolio and Investment Selection: Theory and Practice",* Prentice-Hall International.

Lodin, S-O (2009), "Kapital och fastighetsbeskattningen – idag och i morgon", underlag till Globaliseringsrådets skattegrupp, Department of Education.

Madrian, B., C., Shea, D., F. (2001) "The Power of Suggestion: Inertia in 401(k) Participation and Savings Behavior", *Quarterly Journal of Economics*, Vol. 116, 1149–1187.

Mehra, R., Prescott, E. C., (1985), "The Equity Premium: A Puzzle", *Journal of Monetary Economics,* Vol. 15, 145-61.

Merton, R., C. (1987) "A Simple Model of Capital Market Equilibrium with Incomplete Information", *Journal of Finance*, Vol. 42, 483–510.

Mossin, J., (1968), "Taxation and Risk-Taking: An Expected Utility Approach", *Economica*, vol. 35, no. 137, 74-82.

Palmer, E. (2002) "Swedish Pension Reform. How Did it Evolve and What Does It Mean for the Future?" In Feldstein, Martin and Siebert, Horst (eds), *Social Security Pension Reform in Europe*. Chicago, University of Chicago Press.

Poterba, J. M., Wise, D. A. (1998) "Individual Financial Decisions in Retirement Saving Plans and the Provision of Resources for Retirement", in *Privatizing Social Security*, Feldstein, M., ed., Chicago: University of Chicago Press, 85-105.

Poterba, J. M., (2004) "Portfolio Risk and Self-Directed Retirement Saving Programs", *Economic Journal*, Vol 114, 26-51.

Roine, J., Waldenström, D., (2008), "The evolution of top incomes in an egalitarian society: Sweden, 1903-2004", *Journal of Public Economics,* 92:1-2, 366-87

Rothschild, M., Stiglitz, J., (1970), "Increasing Risk I: a Definition," *Journal of Economic Theory,* 2:3, 225-43.

Samuleson, P. (1958) "An exact Consumption-loan Model of interest with or without the Social Contrivance of Money", *Journal of Political Economy*, Vol. 66, 467-482.

Sandmo, A., (1977), "Portfolio Theory, Asset Demand and Taxation: Comparative Statics with Many Assets", *The Review of Economic Studies,* Vol. 44, no. 2, 369-79.

Sandmo, A., (1985) "The Effects of Taxation on Saving and Risk-taking", in *Handbook of Public Economics,* Vol. 1*,* Auerbach, A. J., Feldstein, M.S., eds. North-Holland Publishing Co., Amsterdam, 265-311.

Selén, J., Ståhlberg, A-C (2007) "Why Sweden's pension reform was able to be successfully implemented", *European Journal of Political Economy*, Vol. 23, 1175-1184.

SOU (1994) "Reformerat pensionssystem. Betänkande av Pensionsarbetsgruppen", *SOU 1994:21*, Stockholm.

SOU (2005) "Difficult Waters? Premium Pension Savings on course", *SOU 2005:87*, Stockholm.

Stiglitz, J. E., (1969), "The Effects of Income, Wealth, and Capital Gains Taxation on Risk-Taking", *The Quarterly Journal of Economics,* Vol. 83, no. 2, 263-83.

Sundén, A. E., Surette, B. J. (1998) "Gender Differences in the Allocation of Assets in Retirement Savings Plans", *American Economic Review*, Vol. 88, 207-211.

Säve-Söderbergh, J. (2007) "Pension Wealth: Gender, Risk and Portfolio Choices", Dissertation Series, No. 59, The Swedish Institute for Social Research, Stockholm University.

Figures

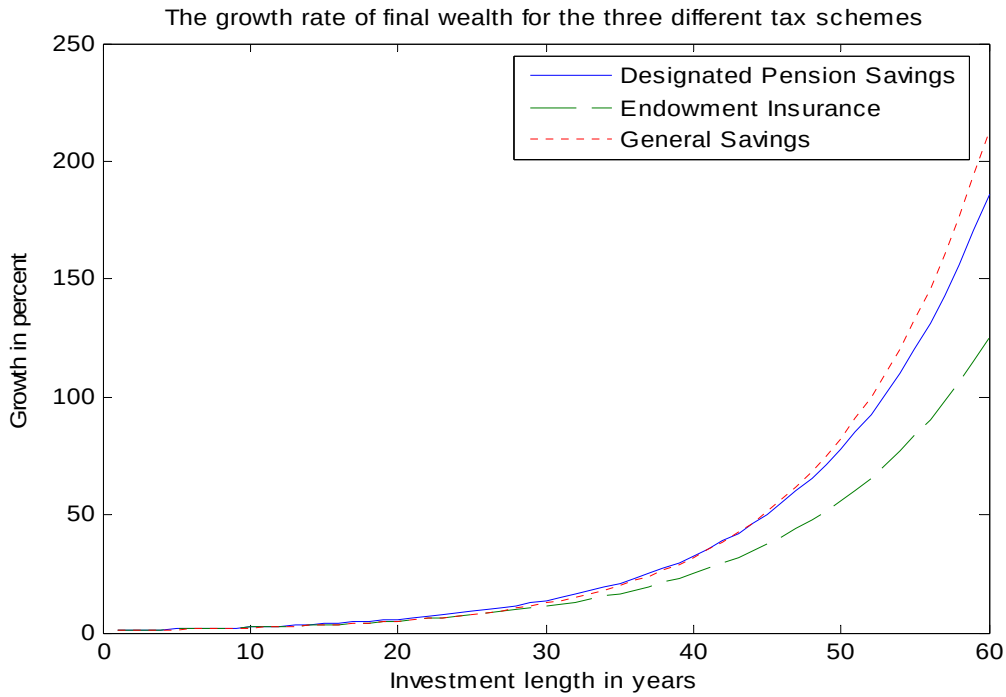


Figure 1. The graph shows how general savings is better than designated pension savings with long investment horizons due to the latent tax credit that is not realized until the investment is realized

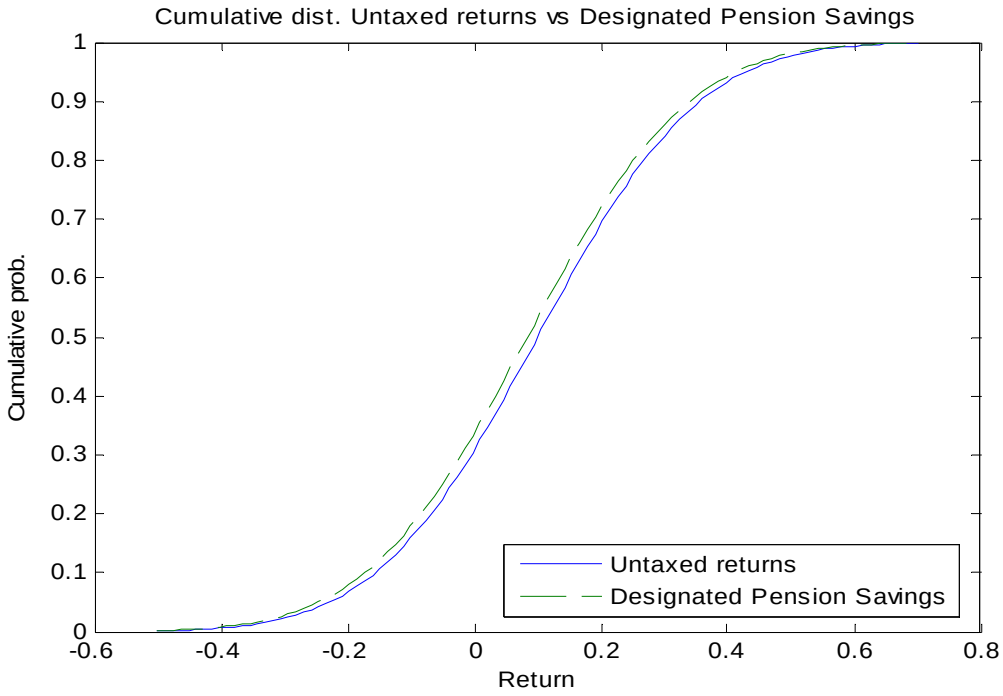


Figure 2 Graph of the cumulative distributions for the returns of an investment (normally distributed with expected return of 10% and standard deviation of 20%) which is either taxed with the designated pension savings tax or is not taxed at all.

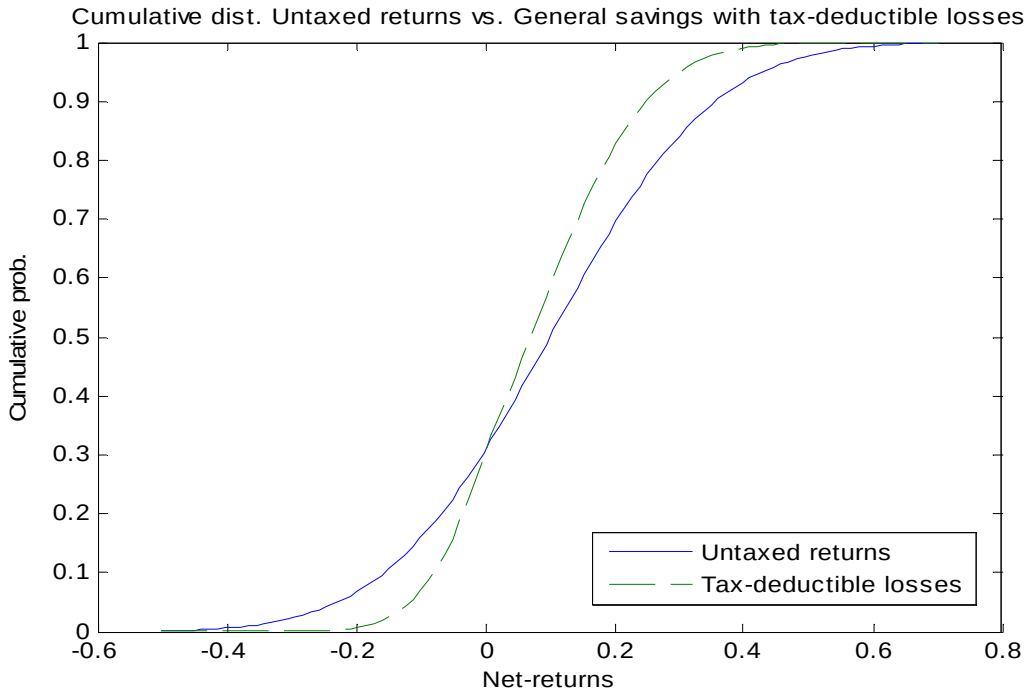
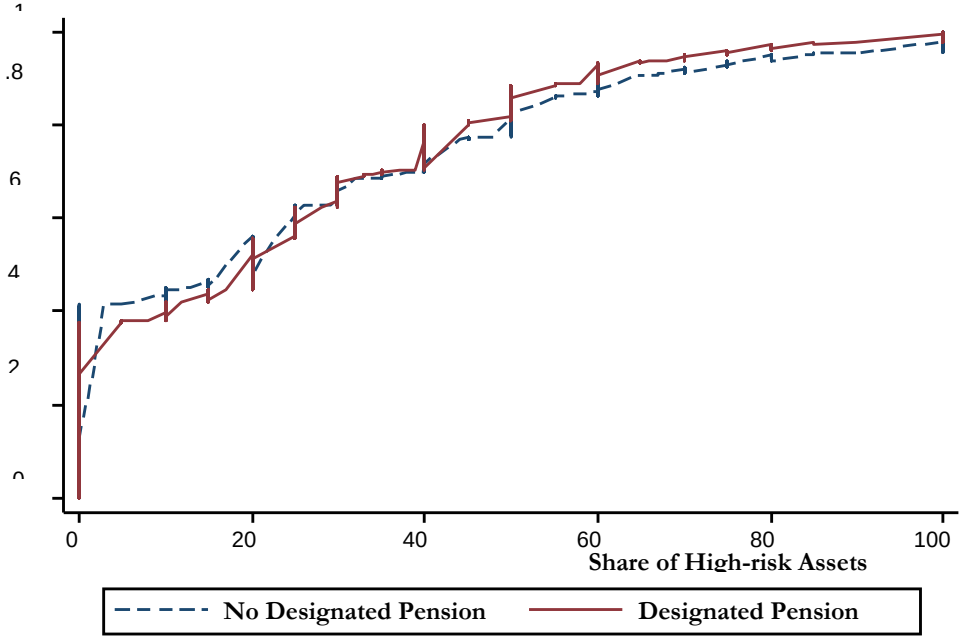


Figure 3 The cumulative distribution for investment returns with no taxes plotted against investment returns net of taxes when losses are deductible to 70%. The distribution is normal with a mean of 10 % and a standard deviation of 20 %.

Figure 4 The graph shows the utility for the final value without taxes against the final value net of taxes when 70% of the losses are deductible against labor income. The untaxed final value serves as an upper bound for the utility of the designated pension savings tax as we have shown that it always has a lower utility than the untaxed return. We have also marked the expected utility for the designated pension savings tax for the first three years with *. For longer horizons we have extrapolated the expected utility for the designated pension savings tax using the correlation with the expected utility for general savings tax, marked with o.

Figure 5 The cumulative distributions of the share of high-risk for individuals with designated pension savings and for those without



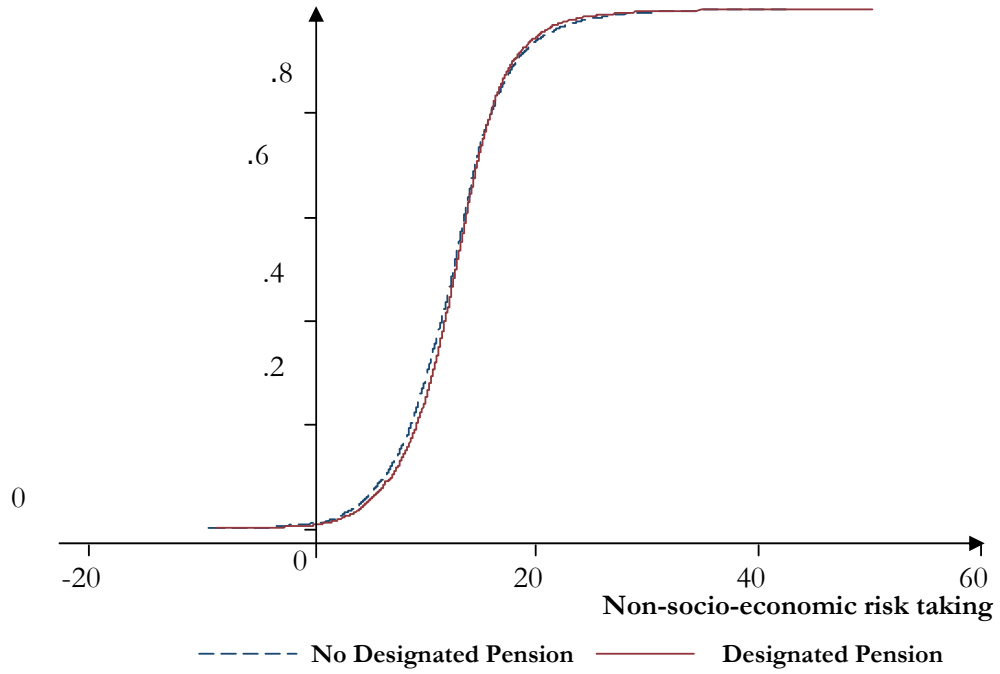


Figure 6 The cumulative distributions of risk taking not explained by socio-economic background (or the share of high-risk funds chosen that is not explained by typical socio-economic background factors), for individuals with designated pension savings and for those without.

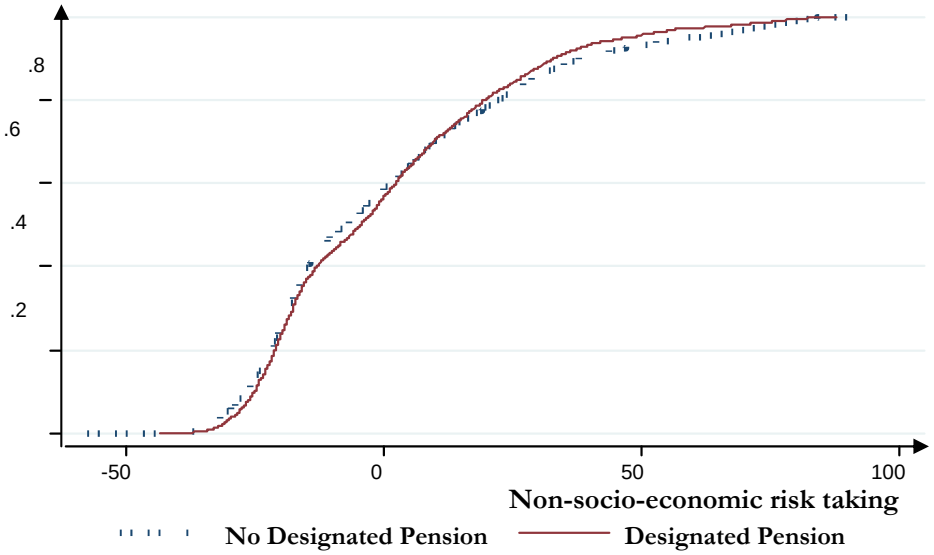


Figure 7 The cumulative distributions of risk taking not explained by socio-economic background (or the share of high-risk funds chosen that is not explained by typical socio-economic background factors), for individuals with designated pension savings and for those without, controlling for selection effects into being active investors.

Tables

Table I. Tax Design

	Tax rate	*Deductible losses*	*Deductible deposits*	*Return*
1. General Savings Tax	30 %	Yes	No	actual
2. Designated Pension Savings Tax	15 %	No	Yes (limited)	presumptive
3. Endowment-Insurance Tax	27 %	No	No	presumptive

Table II. The change in expected utility given different tax-regimes

	Power Utility	**Log Utility**
	(High Risk Aversion)	*(Low Risk Aversion)*
The Change in Expected Utility from having no tax to having:		
One Period:		
1. Endowment Insurance Tax	-2.2 %	-10 %
2. Designated Pension Savings	-1.2 %	-5.5 %
3. With deductible losses	3.3 %	-9.2 %
4. Without deductible Losses	-5.3 %	-37.7 %
Two-Period:		
1. Endowment Insurance Tax	-4.5 %	-10.1 %
2. Designated Pension Savings	-2.5 %	-5.6 %
3. With deductible losses	3.2 %	-16.2 %
4. Without deductible Losses	-7.76 %	-30.7 %

Note: The columns display the change in expected utility from having untaxed returns to having returns taxed by the different tax-regimes. The power utility represents individuals with a high level of risk aversion, with the coefficient of relative risk aversion set to three. The log-utility represents individuals with a low level of risk-aversion.

Table III. Summary statistics on the usage of deductible designated pension savings

	Choosing deductible designated pension savings = Yes			The level of designated pension deposits deducted		
	All	Men	Women	All	Men	Women
ALL	46 %	41 %	50 %	2954.2	2978.0	2931.8
				(53.5)	(86.0)	(65.0)
AGE:						
<25	14 %	13 %	15 %	322	244	402
25-35	43 %	41 %	44 %	1437	1514	1361
36-45	51 %	56 %	45 %	2639	2615	2660
46-55	54 %	48 %	60 %	4443	4566	4328
56-65	49 %	42 %	55 %	5435	5416	5454
LABOR INCOME (TH. SEK)						
0-150	30 %	15 %	35 %	1406	653	1716
151- 250	46 %	36 %	55 %	223	1558	2753
251-350	58 %	54 %	65 %	4345	3778	5525
351-450	63 %	60 %	74 %	6620	6193	8195
451-550	63 %	62 %	71 %	8514	8226	10234
>550	61 %	59 %	70 %	11089	11290	9839
SHARE OF HIGH-RISK FUNDS (24+)	43 %	40 %	47 %	3236	3461	2971**
SHARE OF STOCKS OF FINANCIAL ASSETS IS 20 %	39 %	34 %	43 %	2063	2001	2120
SHARE OF STOCKS OF FINANCIAL ASSETS IS 21-79 %	59 %	54 %	65 %	5117	5221	5012
SHARE OF STOCKS OF FINANCIAL ASSETS IS 80 %	51 %	46 %	56 %	3197	3240	3157
NUMBER OF OBS.	11102	5381	5721	11102	5381	5721

Note: Standard deviations are given in parentheses. ***/**/* denote statistical significance at the 1/5/10 percent levels respectively. The percentages refer to the percentage within each age/income/risk-taking/financial risk exposure- group having used the option of deductible designated pension savings.

Table IV. Regression results on designated pension savings behavior and risk

	OLS	Heckman	Heckman
	High-risk Share	Pr (Active=1)	High-risk Share
EDUCATION < 9 YEARS	-1.313*	-0.143***	-0.881
	(0.695)	(0.026)	(0.731)
EDUCATION > 12 YEARS	2.108***	-0.023	2.159***
	(0.602)	(0.024)	(0.604)
LABOR INCOME(10^{-4})	0.097***	0.012***	0.079***
	(0.023)	(0.001)	(0.024)
NET WEALTH (10^{-5})	0.021***		0.020***
	(0.004)		(0.004)
NET WEALTH SQ (10^{-9})	-0.048**		-0.004*
	(0.024)		(0.002)
AGE	-0.909***	-0.004***	-1.004***
	(0.171)	(0.001)	(0.177)
AGE SQ	0.006***		0.007**
	(0.002)		(0.002)
FEMALE=1	-3.413***	0.103***	-3.572***
	(0.552)	(0.021)	(0.559)
MARR/COHAB=1	-0.574		-0.616
	(0.620)		(0.620)
RISKY SHARE	5.551***		5.176***
	(0.634)		(0.662)
MIXED SHARE	2.365**		1.977**
	(0.963)		(0.983)
OCC. PENSION RISK 1	-2.904***		-2.903***
	(0.667)		(0.667)
OCC. PENSION RISK 2	-1.775**		-1.697**
	(0.724)		(0.724)
UNDEFINED OCC.P	-0.639		-0.278
	(0.940)		(0.957)
FINANCIAL WEALTH		0.052*	
		(0.029)	
FINANCIAL WEALTH SQ		-0.004*	
		(0.002)	
NO FIN WEALTH		-0.319***	
		(0.022)	
LAMDA			-3.373*
			(0.050)
REFORM-SPEC. CONTROLS		Yes	
CONSTANT	49.726***	0.717***	54.027***
	(3.220)	(0.061)	(3.894)
WALD CHI2		822.07	822.07
PROB>CHI2		0.000	0.000
F-STATISTIC	46.67		
PROB>F	0.000		
R-SQ.	0.0557		
ADJ. R-SQ.	0.0545		
NUMB. OF OBS.	11102	17987	17987

Note: Standard deviations are given in parentheses. ***/**/* denote statistical significance at the 1/5/10 percent levels respectively.

Table V. Regression results on designated pension savings behavior controlling for unexplained high risk-taking using risk-taking for the premium pension

		INC<364	364<INC<728		INC<364	364<INC<728
	DPS Dummy	Deducted DPS Deposit	Deducted DPS Deposit	DPS Dummy	Deducted DPS Deposit	Deducted DPS Deposit
NON-SOCIO-ECON RISK	-0.0005	3.51**	17.18	0.0019***	7.18***	23.17*
	(0.0005)	(1.63)	(11.60)	(0.0006)	(2.03)	(13.951)
NON-SOCIO-ECON RISK SQ				-0.0001***	-0.154***	-0.268
				0.00002	(0.051)	(0.349)
EDUCATION < 9 YEARS	-0.236***	-534.49***	-1247.65	-0.237***	-532.54***	-1264.11
	(0.035)	(114.57)	(1564.49)	(0.035)	(114.57)	(1564.98)
EDUCATION >12 YEARS	0.083***	477.149***	1715.97**	0.085***	476.46***	1741.02**
	(0.029)	(101.91)	(722.36)	(0.029)	(101.86)	(723.26)
LABOR INCOME(10^{-4})	0.029***	-80.82***	89.62***	0.029***	-85.63***	89.55***
	(0.002)	(22.06)	(30.47)	(0.002)	(22.11)	(30.48)
LABOR INCOME SQ (10^{-9})	-0.000***	0.042***	-0.002**	-0.000***	0.042***	-0.002**
	(0.000)	(0.01)	(0.00)	(0.000)	(0.006)	(0.000)
NET WEALTH (10^{-5})	0.002***	29.314***	14.51***	0.002***	29.44***	14.72***
	(0.000)	(1.097)	(3.09)	(0.000)	(1.10)	(3.10)
NET WEALTH SQ (10^{-9})	-0.002***	-0.0002***	-0.003**	-0.002***	-0.0002***	-0.004**
	(0.000)	(0.000)	(0.001)	(0.000)	(0.00)	(0.001)
AGE	0.131***	-2.581	-56.55	0.125***	-11.21	-72.60
	(0.009)	(28.85)	(382.05)	(0.009)	(28.98)	(382.70)
AGE SQ	-0.001***	1.077***	3.77	-0.001***	1.18***	3.99
	(0.000)	(0.35)	(4.24)	(0.000)	(0.356)	(4.25)
CONSTANT	-3.411***	-293.43	-3489.81	-3.229***	26.14	-3064.18
	(0.172)	(518.93)	(8299.82)	(0.174)	(529.26)	(8320.08)
LR-CHI2(5)	1082.30			1127.76		
PROB>CHI2	0.000			0.000		
PSEUDO R2	0.071			0.074		
F-STATISTIC		265.21	15.55		239.82	14.04
PROB>F		0.000	0.000		0.000	0.000
R-SQ.		0.190	0.134		0.191	0.134
ADJ. R-SQ.		0.189	0.125		0.190	0.125
NUMB. OF OBS.	11102	10186	916	11102	10186	916

Note: Standard deviations are given in parentheses. ***/**/* denote statistical significance at the 1/5/10 percent levels respectively.

Appendix Table VI. Regression results on pension savings behavior using the share of risky assets of Financial Assets as a measure of risk-taking

		INC<364	364<INC<728		INC<364	364<INC<728
	DPS Dummy	Deducted Amount	Deducted Amount	DPS Dummy	Deducted Amount	Deducted Amount
RISK	0.140***	234.242*	610.14	1.406***	5145.579***	14894.103***
	(0.036)	(124.946)	(907.32)	(0.159)	(546.395)	(3602.156)
RISK SQ				-1.288***	-4991.483***	-1.48e+04***
				(0.157)	(540.722)	(3606.044)
LABOR INCOME(10^{-4})	0.029***	-93.635***	91.46***	0.028***	-91.907***	92.882***
	(0.003)	(22.075)	(31.15)	(0.003)	(21.983)	(30.868)
LABOR INCOME SQ (10^{-9})	-0.000***	0.005***	-0.00***	-0.000***	0.004***	-0.000***
	(0.000)	(0.001)	(0.00)	(0.000)	(0.001)	(0.000)
NET WEALTH (10^{-5})	0.002***	29.859***	13.21***	0.001***	27.635***	11.363***
	(0.000)	(1.151)	(3.26)	(0.000)	(1.171)	(3.261)
NET WEALTH SQ (10^{-9})	-0.000***	-0.000***	-0.000**	-0.000***	-0.000***	-0.000
	(0.000)	(0.000)	(0.00)	(0.000)	(0.000)	(0.000)
AGE	0.151***	44.185	117.56	0.154***	55.356*	129.077
	(0.009)	(28.910)	(392.28)	(0.009)	(28.814)	(388.765)
AGE SQ	-0.002***	0.433	1.65	-0.002***	0.287	1.382
	(0.000)	(0.353)	(4.358)	(0.000)	(0.352)	(4.319)
NO FINANCIAL ASSETS	-0.373***	-747.592***	-3975.48***	-0.295***	-454.529***	-2790.171**
	(0.034)	(112.848)	(1242.11)	(0.035)	(116.772)	(1264.526)
CONSTANT	-3.663***	-775.802	-5560.08	-3.786***	-1236.113**	-6685.388
	(0.174)	(520.632)	(8513.508)	(0.175)	(520.837)	(8441.512)
LR-CHI2(5)	1291.42			1358.56		
PROB>CHI2	0.000			0.000		
PSEUDO R2	0.0863			0.0908		
B		315.16	16.94		291.98	17.20
PROB>F		0.000	0.000		0.000	0.000
R-SQ.		0.2021	0.1353		0.2088	0.1518
ADJ. R-SQ.		0.2014	0.1273		0.2081	0.1429
NUMB. OF OBS.	10840	9965	875		9965	875

Note: Standard deviations are given in parentheses. ***/**/* denote statistical significance at the 1/5/10 percent levels respectively.