

## DID THE PERSONAL PENSION INCREASE SAVINGS IN KOREA?

YOUNG JUN CHUN\*

*This paper examines the effect of the introduction of the Personal Pension on the savings rate in Korea. For this purpose, a formal model of utility maximization which shows the approximation of closed form equations for the Personal Pension and other forms of private savings is constructed, and the substitution elasticity between these two kinds of savings is estimated. The results of the estimation and a simple simulation show that the introduction of the Personal Pension in 1994 raised the savings rate. However, this increase in the savings rate came from the provision of a new financial asset rather than from tax incentives. It is also shown that reducing tax incentives has only a trivial effect on the savings rate.*

JEL Classification: H24, D12

Keywords: Personal Pension, Tax Incentives, Portfolio Choice, Savings Rate

### I. INTRODUCTION

The Personal Pension, which is the Korean version of the Individual Retirement Account (IRA) of the U.S., was introduced in June, 1994 as a form of retirement income arrangement. Even though there are differences between the IRA and the Personal Pension, the latter has very similar features to the former. The most important common feature of these two financial assets is that very generous tax incentives are provided in order to induce people to accumulate an adequate amount of wealth in preparation for postretirement consumption. These incentives include a tax deduction of contributions up to an annual limit, tax-free accrual of interest, and a tax exemption for part of the pension benefits.

An important issue is the effectiveness of the tax incentives for the Personal Pension in increasing the national savings rate. Even though the savings rate in

---

*Received for publication: Sep. 13, 1999. Revision accepted: April 8, 2000.*

\* Research Fellow, Korea Institute of Public Finance, 79-6 Karak-Dong, Songpa-Ku, Seoul, 138-774, Korea, e-mail: chun@kipf.re.kr

Korea has been higher than in industrialized Western countries, the rapidly increasing aging population in Korea will substantially lower the national savings rate in the near future. Actually, since the mid-1980s, a downward trend in private savings has been observed, and some empirical studies showed that the rapidly increasing aging population substantially contributed to this decrease in the private savings rate.

The Personal Pension is also important in relation to the issue of the adequacy of retirement income arrangements. Because of budgetary problems in the Public Pension, a substantial decrease in the level of Public Pension benefit payments is inevitable. Therefore, the role of the Personal Pension as a retirement income arrangement will grow.

Since many countries share these concerns, private pension plans such as the Personal Pension and the IRA have attracted the interest of researchers around the world. In particular, the chronically low levels of U.S. private and public savings have generated considerable concern among academics and policymakers. One frequently suggested method for raising national (public plus private) saving was to expand the IRA in the form of expanding eligibility to a wider range of taxpayers and raising contribution limits and tax deduction limits. The Canadian Personal Pension system, known as Registered Retirement Savings Plan (RRSP), has also been a subject of interest, because the national savings rate of Canada was higher than that of the U.S., even though the two economies were very similar. There has been a dispute on the issue of whether the RRSP substantially contributed to the higher savings rate of Canada.

Previous researches on the effect of Personal Pensions on savings have generated mixed results. Engen, Gale and Sholz (1996) investigate the short-run effects of the IRA using time series and microdata, and the long-run effects using a simulation model. They show that the tax incentives allowed for the IRA tend to induce portfolio reshuffling rather than a net increase of private savings. Skinner and Feenberg (1990) show that in the U.S. the relation between aggregate IRA contributions and other savings critically depends on the definition of savings. On the other hand, Hubbard and Skinner (1996) and Feldstein (1995) show that the IRA substantially induced a net increase in national savings. In particular, Feldstein (1995) suggests that the IRA increases public savings as well as private savings, because the increase in capital accumulation induced by the IRA will increase the profit of firms and this will in turn increase corporate tax revenue. Venti and Wise (1986, 1987, 1990, and 1991) estimate that raising the annual contribution limit would raise IRA savings, and that 45 to 66 percent of the increased contributions would come from reductions in consumption. However, these estimates are based on the identifying assumption that in the absence of IRAs, households that contributed the limit amount would have saved the same amount as households that did not contribute to IRAs.

Investigation of the Canadian Personal Pension system has also generated mixed results. Carroll and Summers (1996) and Venti and Wise (1994) show

that the RRSP contributed to an increase in the national savings rate of Canada. On the other hand, Sabelhaus (1997) shows that the difference in the savings rates between the U.S. and Canada is more plausibly characterized as a simple life-cycle response to differences in the overall inter-temporal income realization built into the tax and public pension systems, rather than as a response to RRSP availability.

There is no previous research on the effect of the Personal Pension on national savings in Korea, because of the relatively short history of the system and a problem of data availability. Recently however, the Korean Household Panel Survey (Daewoo Panel) performed a survey of the proportion of savings in various forms of financial assets, including the Personal Pension, and this makes possible an empirical investigation of the effects of the Personal Pension on individuals' decision making on savings.

The purpose of this paper is to evaluate the effect of the introduction of the Personal Pension on national savings in Korea. For this purpose, a formal model of utility maximization which shows the approximation of closed form equations for the Personal Pension and other forms of private savings is constructed and the substitution elasticity between these forms of savings is estimated using the Daewoo Panel. The model employed in this paper is similar to Venti and Wise (1990). Venti and Wise (1990) formulize preferences about the amounts of savings and their proportions, and this feature of the model simplifies the procedure of estimating the substitution elasticity between the Personal Pension and other means of savings. Without incorporating the preferences about the proportion of savings, one has to consider factors which influence the substitutability between the Personal Pension and other means of savings, such as the differences in liquidity and risks, and this will complicate the analysis. In other words, imperfect substitutability induced by the different degrees of liquidity and risks of financial assets is reflected in an individual's preferences about a portfolio.<sup>1</sup> The difference between the model in Venti and Wise (1990) and the one in this paper lies in the specification of the opportunity cost of the Personal Pension (or IRA) contributions instead of savings in other forms. While the only tax incentive for the IRA considered in Venti and Wise (1990) is the income tax deduction for the IRA contribution, this paper explicitly considers tax free accrual of interest and no tax on the Personal Pension benefits as well as the income tax deduction for contributions.

The results of the estimation and a simple simulation show that the introduc-

---

<sup>1</sup> Some previous researches try to estimate the substitution elasticity without incorporating preferences about the portfolio of financial assets into a model. However, many of them, e.g. Gale and Scholz (1994), try to estimate the substitutability by using information from taxpayers who contributed the limit amount of the IRA contributions. For taxpayers who contributed less than the limit, the IRA and other means of savings are assumed to be perfect substitutes. In this paper, however, imperfect substitutability is assumed for the non-limit contributors as well as for the limit contributors.

tion of the Personal Pension in 1994 raised the savings rate. However, this increase in the savings rate came from the provision of a new financial asset rather than from tax incentives. It is also shown that reducing tax incentives has only a trivial effect on the savings rate.

The remainder of this paper is structured as follows. In Section 2, the formal model for the analysis and the estimation strategy are explained. In Section 3, the data used and some construction of variables are presented. After the results of the estimation and simulation for the evaluation of tax incentives are explained in Section 4, the paper is concluded in Section 5.

## II. THE MODEL

The spirit of the statistical analysis in this paper is to consider the relationship between the Personal Pension contribution and other savings, recognizing the effect of tax incentives allowed for the Personal Pension, making allowances for flexible substitution between the Personal Pension and other forms of savings, and using a specification that is commensurate with the nature of the cross-sectional data. The specification for the estimation is similar to that adopted in Venti and Wise (1990). The difference between the model in Venti and Wise (1990) and the one in this paper lies in the specification of the opportunity cost of the Personal Pension contributions instead of savings in other forms. While the only tax incentive for the IRA considered in Venti and Wise (1990) is the income tax deduction for the IRA contribution, this paper explicitly considers three kinds of tax incentives for the Personal Pension: (i) part of the contribution to the Personal Pension is deducted from the income tax base;<sup>2</sup> (ii) no tax is imposed on the accumulation of Personal Pension wealth; and (iii) the tax rate for Personal Pension benefits is lower than that for the usual types of capital income.<sup>3</sup> The specification for the derivation of a testable implication is as follows.<sup>4</sup>

In an imaginary economy, a person lives  $I$  periods. In this economy, there is no mortality risk. At each period, the person is endowed with one unit of time, which can be transformed into labor input. In this model, it is assumed that the labor supply is inelastically determined, i.e. all the available time (of a person aged  $i$  at  $t$ ) is devoted to labor and this person receives a wage of  $W_{it}$ . Each person makes decisions about savings and the allocation of savings between two forms of savings: (i) a Personal Pension contribution ( $S_{1it}$ ); or (ii) other forms

<sup>2</sup> Forty Percent of the contribution to the Personal Pension is deducted from the income tax base and the annual limit of the deduction is 720,000 won (1US\$ 1,100 won as of September, 2000).

<sup>3</sup> Personal Pension benefits are exempted from the income tax.

<sup>4</sup> In this paper, the penalty for early withdrawal is not considered. An example of research on the IRA which explicitly considers the effect of the penalty is Gale and Scholz (1994).

of savings ( $S_{2it}$ ).

Preferences are represented by the lifetime discounted utility of a time separable, twice continuously differentiable, strictly concave utility function of consumption and the proportion of the Personal Pension contribution out of total savings:  $\sum_i \beta^i u(C_{it+i-1}, \alpha_{it+i-1}, i)$ ,

Where  $\beta$  is a discount factor and  $C_{it+i-1}$ , and  $\alpha_{it+i-1}$  are the consumption and proportion of the Personal Pension contribution of an agent aged  $i$  born at period  $t$ , respectively. The form of utility function is as follows.

$$U(C, \alpha, i) = \frac{1}{1-1/\gamma} (C_i^{1-\eta} A_i^\eta)^{1-1/\gamma} \quad (1)$$

$$A_i = (\alpha_{0i}^{1-\sigma} \alpha_i^\sigma + (1-\alpha_{0i})^{1-\sigma} (1-\alpha_i)^\sigma)^{\frac{1}{\sigma}} \quad (1-1)$$

The Equation (1-1) reflects the preferences in the portfolio. If the rate of return from the Personal Pension contribution is the same as that from the other means of savings, the proportion of the Personal Pension contribution is  $\alpha_{0i}$  at the age of  $i$ . However, as the rates of return differ, the proportion diverges from  $\alpha_{0i}$  and the magnitude of the adjustment of the proportion is dependent upon the substitution elasticity  $(\frac{1}{\sigma-1})$ .

The lifetime budget constraint faced by an agent born at  $t$  is as follows:

$$\sum_{i=1}^T \left[ \prod_{s=1}^i \left( \frac{1}{1+r_{t+s-1}(1-\tau_{yt+s-1})} \right) \right] \{ W_{it+i-1}(1-\tau_{yt+i-1}) + M_{it+i-1}(1-\tau_{ppt+i-1}) - S_{lit+i-1}(1-d \cdot \tau_{yt+i-1}) - C_{it+i-1} \} \geq 0 \quad (2)$$

if  $i > R$ ,  $S_{lit+i-1} = 0$

$$M_{it+i-1} = \begin{cases} 0 & \text{if } i \leq R \\ M_t & \text{otherwise} \end{cases}$$

where  $C_{it+i-1}$ ,  $M_{it+i-1}$  and  $W_{it+i-1}$  are consumption, the Personal Pension benefits, and the wage of an agent born at  $t$  at the age of  $i$ , respectively, and  $r_{t+s-1}$ ,  $\tau_{yt+s-1}$  and  $\tau_{ppt+s-1}$  are the interest rate, and the tax rates on income and the Personal Pension benefits, respectively. Also,  $d$  is the fraction of the personal contribution which is deducted from the income tax base.

The levels of Personal Pension contributions and benefits are determined according to the following equations. Because early withdrawal before the age of 55 incurs a penalty under the current law, it is assumed that the Personal Pension benefits are paid from the age of 55 ( $R=55$ ).

$$\sum_{i=1}^{R-1} S_{1it+i-1} \left[ \prod_{s=i}^R (1+r_{t+s-1}) \right] = \sum_{j=R}^I M_{jt+j-1} \left[ (1+r_{t+R-1}) \prod_{s=R}^j \frac{1}{1+r_{t+s-1}} \right] \quad (3)$$

The level of benefits is dependent upon the amount of Personal Pension contributions and the tax incentives allowed for the Personal Pension. Decision making on the portfolio is made according to the following procedure. The present value of the lifetime after-tax Personal Pension benefits ( $WM_t$ ) can be shown as Equation (4), using Equation (3) and assuming that  $M_{it+i-1} = M_t$ . The value of the benefits is discounted by the after-tax rate of return of other means of savings, because by doing so we can compare the value of Personal Pension wealth with that of other means of savings.

$$WM_t = M_t \sum_{j=R}^I \left( \prod_{s=2}^j \frac{1}{1+r_{t+s-1}(1-\tau_{yt+s-1})} \right) (1-\tau_{ppt+j-1}) \quad (4)$$

With Equations (3) and (4), the (gross) rate of return of the Personal Pension contributions made at the age of  $i$  can be derived as follows:

$$\begin{aligned} & \frac{dWM_t}{dS_{1it+i-1}} \prod_{s=2}^{i-1} (1+r_{t+s-1}(1-\tau_{yt+s-1})) \\ &= \frac{dWM_t}{dM_t} \cdot \frac{dM_t}{dS_{1it+i-1}} \prod_{s=2}^{i-1} (1+r_{t+s-1}(1-\tau_{yt+s-1})) \\ &= \left[ \sum_{j=R}^I \left( \prod_{s=i}^j \frac{1}{1+r_{t+s-1}(1-\tau_{yt+s-1})} \right) (1-\tau_{ppt+j-1}) \right] \frac{\prod_{s=i}^R (1+r_{t+s-1})}{\sum_{j=R}^I \left[ (1+r_{t+R-1}) \prod_{s=R}^j \frac{1}{1+r_{t+s-1}} \right]} \end{aligned} \quad (5)$$

Considering that a fraction ( $d$ ) of  $S_{1it+i-1}$  is deducted from the income tax base, the relative ratio of the (gross) rate of return of the Personal Pension contributions made at the age of  $i$  relative to that of other savings  $\left( \frac{1}{rp_{it+i-1}} \right)$  can be defined as Equation (6). In other words, the opportunity cost ( $rp_{it+i-1}$ ) of increasing the Personal Pension contributions instead of the usual savings can be defined as follows:  $j=R$

$$\begin{aligned} \frac{1}{rp_{it+i-1}} &= \frac{dWM_t}{dS_{1it+i-1}} \prod_{s=2}^{i-1} (1+r_{t+s-1}(1-\tau_{yt+s-1})) \frac{1}{1-d \cdot \tau_{yt+i-1}} \\ &= \left[ \sum_{j=R}^I \left( \prod_{s=i}^j \frac{1}{1+r_{t+s-1}(1-\tau_{yt+s-1})} \right) (1-\tau_{ppt+j-1}) \right] \cdot \\ & \quad \frac{\prod_{s=i}^R (1+r_{t+s-1})}{\sum_{j=R}^I \left[ (1+r_{t+R-1}) \prod_{s=R}^j \frac{1}{1+r_{t+s-1}} \right]} \frac{1}{1-d \cdot \tau_{yt+i-1}} \end{aligned} \quad (6)$$

Equation (6) shows the tax incentives allowed for the Personal Pension: (i) the tax rate for Personal Pension benefits is lower than that for the usual types of capital income; (ii) no tax is imposed on the accumulation of Personal Pension wealth; and (iii) part of the contribution is deducted from the income tax base.<sup>5</sup>

Under the preference specified in Equation (1), the marginal rate of substitution between the Personal Pension contribution and usual savings is

$$\left( \frac{\alpha_{it+i-1}}{1-\alpha_{it+i-1}} \right)^{\sigma-1} \left( \frac{\alpha_{0i}}{1-\alpha_{0i}} \right)^{1-\sigma}.$$

Therefore, the proportion of the Personal Pension contribution out of total savings is determined as follows.<sup>6</sup>

$$\alpha_{it+i-1} = \frac{\left( \frac{\alpha_{0i}}{1-\alpha_{0i}} \right) \cdot r p_{it+i-1}^{\frac{1}{\rho-1}}}{1 + \left( \frac{\alpha_{0i}}{1-\alpha_{0i}} \right) \cdot r p_{it+i-1}^{\frac{1}{\rho-1}}} \quad (7)$$

In order to estimate the parameters  $\alpha_0$  and  $\sigma$ , the following specification is assumed.

$$\frac{S_{1k}}{S_k} = \alpha_k = \frac{\left( \frac{\alpha_{0k}}{1-\alpha_{0k}} \right) \cdot r p_k^{\frac{1}{\sigma-1}}}{1 + \left( \frac{\alpha_{0k}}{1-\alpha_{0k}} \right) \cdot r p_k^{\frac{1}{\sigma-1}}} + \varepsilon_k = f(\alpha_{0k}, \sigma; X_k, r p_k) + \varepsilon_k, \quad (8)$$

$$\varepsilon_k \sim N(0, \sigma_\varepsilon)$$

$$\alpha_{0k} = g(b_-; X_k) = X_k b_- \quad (9)$$

where  $S_k$  is total savings and  $X_k$  is a vector of independent variables including income, wealth, sex and level of education.<sup>7</sup> The parameter  $\alpha_{0k}$  is assumed to be linear in variable  $X_k$ .

Since the proportion of the Personal Pension contribution is between 0 and 1, the likelihood function can be expressed as follows:

<sup>5</sup> For a person who contributes more than the limit for which an income tax deduction is allowed, the expense for the contribution of 1 unit is 1 instead of  $1-d \cdot \tau_y$ . Therefore, the opportunity cost of the Personal Pension contributions becomes the right-hand side of Equation (5).

<sup>6</sup> The ratio of the contribution to the Personal Pension does not depend on the parameter  $\eta$ .

<sup>7</sup>  $k$  in Equations (8) and (9) represents the individuals in the microdata sample.

$$L = \prod_{\alpha_k=0} \left[ 1 - \Phi \left( \frac{f(\alpha_{0k}, \sigma; X_k, rp_k)}{\sigma_\varepsilon} \right) \right] \prod_{0 < \alpha_k < 1} \phi \left[ \alpha_k - \frac{f(\alpha_{0k}, \sigma; X_k, rp_k)}{\sigma_\varepsilon} \right] \prod_{\alpha_k=1} \left[ 1 - \Phi \left( \frac{1 - f(\alpha_{0k}, \sigma; X_k, rp_k)}{\sigma_\varepsilon} \right) \right] \quad (10)$$

where  $\Phi(\cdot)$  and  $\phi(\cdot)$  are the cumulative distribution function and the probability density function of the standard normal distribution, respectively.

### III. DATA

The data set used in the estimation in this paper is the Daewoo Panel (Korea Household Panel Study), which is a small version of the Panel Study of Income Dynamics (PSID). In 1995 (the third year of the Panel), one year after the Personal Pension was introduced, the Daewoo Panel surveyed the proportions of savings in various forms of financial assets. In the survey, explicit questions about the amount of Personal Pension contributions were included.<sup>8</sup>

The third year survey of the Daewoo Panel contains 3,045 households and 7,493 individuals. From the sample, only household heads and their spouses aged between 20 and 55 were selected. In addition, people with no income, no savings, excessive savings, or an uncertain magnitude of savings were removed from the sample. In order to lessen measurement error, people who irregularly made Personal Pension contributions were excluded. After these treatments of the sample, 1,029 individuals remained in the sample. Out of 1,029 individuals, 272 people made regular contributions. It is remarkable that no one made contributions up to the limit of 1 million won a month, and this shows that the contribution limit is quite high.

As mentioned in Section 2, the independent variables can be divided into two groups: (i)  $X_k$ : variables which explain  $\alpha_{i0}$ ; and (ii)  $rp_k$ : the opportunity cost of increasing Personal Pension contributions instead of usual savings (see Equations (8) and (9)). In  $X_k$ , disposable income, age, age squared, the number of family members, dummies for college education, high school education, homeownership, Junse,<sup>9</sup> marriage and sex are included. Dummies for education are included, because education is considered a good indicator of the accumulation of human capital, which crucially influences lifetime wealth. The dummies for the forms of

<sup>8</sup> The 1995 survey of the Daewoo Panel is the only data source for the Personal Pension. Surveys of other years contain some information about the Personal Pension, but, what they report is the total amount of insurance premiums including Personal Pension contributions and other forms of insurance premiums rather than the Personal Pension contribution as a separate survey item.

<sup>9</sup> Junse is a unique practice for renting a house in Korea. Under a Junse contract, a lessee deposits a certain amount of funds with the lessor of a house, and at the expiration date of the contract, the lessor repays the deposit to the lessee. The rate of return for the lessor from the lease is the normal rate of return which can be earned in the financial market.



residence are chosen as indicators of non-human capital. In Korea, there was a period of capital gain from real estate, so Koreans were keen to own homes. Age and age squared are chosen in order to capture preferences for the Personal Pension across the ages. Some previous researches like Engen and Gale (1993) divided the incentives for saving into (i) a precautionary savings motive, and (ii) life-cycle motives, and showed that as people age, their IRA contributions rise but the proportion of contributions that represent net additions to savings falls. Thus, the effect of the introduction of the Personal Pension is crucially dependent upon the age profile of the preferences for the Personal Pension. The number of family members and dummies for sex and marriage are included because these values are known to be important factors for savings.

Disposable income is calculated as follows. Before-tax income includes labor income, income from business, income from farming, financial income and income from irregular jobs. Instead of using the amount of income tax reported in the survey, the tax base (or the assessed income) is calculated by assessing the amount of income tax deductions, including the basic deduction, additional deductions and special deductions.<sup>10</sup> The calculation of these deductions is based on information about the number of family members, the number of dependent children and elderly (over 65 years old), sex, expenditures on education, health care, and the contribution amount for health insurance and private insurance like automobile insurance. In order to get the calculated tax amount, the marginal income tax structure in 1995 (shown in [Table 1]) is used. The only tax credit, which is necessary to get the determined tax amount (the actual amount of the income tax burden), considered here is the tax credit for labor income. Because of this tax credit,<sup>11</sup> the marginal tax rates faced by taxpayers who earn only labor income are different from those faced by global income taxpayers.

[Table 1] Marginal Income Tax Rate Schedule in 1995 (Unit: 10,000 won, %)

Assessed Income	Global Income Taxpayer	Labor Income Taxpayer
0~400	5	4
400~800	9	7.2
800~1,600	18	14.4
1,600~1,877	27	21.6
1,877~3,200	27	27
3,200~6,400	36	36
6,400~	45	45

Source: The Ministry of Finance and Economy, The Synopsis of Korean Taxes, 1995.

<sup>10</sup> For details, see the Ministry of Finance and Economy (1996).

<sup>11</sup> For wage and salary workers, 20% of the calculated tax amount up to 500,000 won per year is deducted from the income tax amount.

In order to calculate the opportunity cost ( $rp_k$ ) of increasing the Personal Pension contribution instead of the usual savings, explicit assumptions about the expectations for the future (real) interest rate and income tax rates are necessary (see Equation (6)). For the simplicity of analysis, it is assumed that an agent maintains myopic expectations for the future interest rate and tax rates.<sup>12</sup> In other words, the marginal income tax rate faced by each agent stays the same and the rate of return from financial assets stays at the same level. The level of the before-tax rate of return from financial assets is assumed to be 7% in the base case.<sup>13</sup> This assumption is based on the fact that the real market interest rate was around 7-8% during the 1994-5 period.<sup>14</sup> For the sensitivity analysis, the cases of  $r=10\%$  and  $r=5\%$  are also considered.

[Table 2] Descriptive Statistics

Variable		Contributor	Non-contributor	All
Income (1,000 won)		16,307	13,899	14,536
Age		38.13	39.89	39.43
Marriage (%)		96	95	95
Education (%)	College Education	24	20	21
	High School Education	52	49	50
	Below High School	24	31	29
Wealth (%)	Own A House	59	59	59
	Junse	33	31	32
	Monthly Rent	8	10	9
Number of Family Members		4.08	4.08	4.08
Total Savings (1,000 won)		6,959	5,395	5,808
Sex (male, %)		76	68	70
Marginal Income Tax Rate (%)		18	15	16
Number of Observations		272	757	1,029

<sup>12</sup> This specification may cause a measurement error on the independent variable reflecting the opportunity cost of the Personal Pension contribution. This may, in turn, bias the parameter toward 0. However, the estimation results explained in Section 4 indicate that the effect of the measurement error is not significant.

<sup>13</sup> The assumption made implicitly is that the before-tax rate of return is the same for all financial assets.

<sup>14</sup> For details, see The Bank of Korea, Monthly Bulletin, 1999.

#### IV. THE RESULT

The estimation results are summarized in [Table 3]. Among the independent variables explaining  $\alpha_{i0}$ , the coefficients for income, age, age squared, and dummies for marriage and sex seem to be significant. A person from the high-income class has a small chance of facing a liquidity constraint, so he/she has room to invest in such a non-liquid asset as the Personal Pension. On the other hand, a person from the low-income class prefers more liquid assets, because of a relatively high chance of liquidity constraint, where he/she would have to immaturely withdraw from the Personal Pension fund and pay a penalty.

The age profile for  $\alpha_{i0}$  shows a peak around the age of 36-7. It is shown that the absolute amount of contribution reaches a peak around the age of 40 (even though the results are not reported). This result can be explained by the interaction of two savings motives: (i) the precautionary savings motive, and (ii) the life-cycle motive. At younger ages (20's and early 30's), much of the uncertainty about future income or social status has not been resolved. However as one grows older, uncertainty about the future tends to substantially decrease. The downward trend after the age of 37 could be explained by the National Pension System (NPS). The NPS was introduced in Korea in 1988. The NPS benefit is quite generous, especially for the participants from the early stage of its introduction. According to the projection by the National Pension Corporation, the organization for the administration of the NPS, the present value of the NPS benefit is more than double that of the NPS contribution for the cohorts who were 40-45 years old in 1988. Thus, this government provision for the older generations could be perceived as a means of income maintenance for the period after retirement.<sup>15</sup> Another possible explanation for the downward trend is the bequest motive. Until recently, it was common for parents (at least for the high-income class) to leave large bequests in the form of real estate and other forms of assets.

A strong explanation for the dummy for sex comes from the fact that in the sample, only household heads and their spouses are included, and the majority of household heads are male. The coefficient for marital status shows that a married person prefers more liquid assets because he/she is more likely to experience discrepancies between income flows and consumption.

Even though they are statistically insignificant, the coefficients for human capital show an interesting pattern. An increase in education level increases the proportion of the Personal Pension contribution, but the rate of increase falls.

The estimate of the substitution elasticity is shown to be quite sensitive to the assumption about the level of the interest rate. In the base case ( $r=7\%$ ), the value is 1.30 ( $\sigma=0.23$ ), and in other cases the value is between 1 ( $\sigma=0$ )

---

<sup>15</sup> This factor cannot be controlled, because the payment of the regular (full) old-age pension benefit of the NPS was scheduled from 2008.

**[Table 3] Estimation Results**

Variable		r=7%	r=10%	r=5%
$\alpha_{i0}$	Constant	-2.0561215 (0.4888101) <sup>8)</sup>	-2.1298117 (0.4968055)	-1.9897679 (0.4793341)
	Income	7.6514316 (1.3715194)	7.6934416 (1.4031508)	7.6162838 (1.3429442)
	Age	0.0976913 (0.0244257)	0.1017711 (0.0249434)	0.0939584 (0.0239235)
	Age2	-0.0013991 (0.0003107)	-0.0014686 (0.0003185)	-0.0013351 (0.0003032)
	Fnum <sup>1)</sup>	-0.0052710 (0.0145898)	-0.0044196 (0.0150542)	-0.0060598 (0.0141671)
	Dcol <sup>2)</sup>	-0.0028785 (0.0281610)	-0.0049441 (0.0289763)	-0.0009270 (0.0273710)
	Dhigh <sup>3)</sup>	0.0141848 (0.0343930)	0.0157423 (0.0358115)	0.0130634 (0.0329907)
	dja <sup>4)</sup>	0.0022871 (0.0535661)	0.0061007 (0.0545126)	-0.0009995 (0.0527667)
	djun <sup>5)</sup>	-0.0148334 (0.0553484)	-0.0096112 (0.0560952)	-0.0196857 (0.0547358)
	dmar <sup>6)</sup>	-0.1242598 (0.0723951)	-0.1164052 (0.0740756)	-0.1317355 (0.0708608)
	sex <sup>7)</sup>	0.2105131 (0.0375568)	0.2115866 (0.0382663)	0.2096657 (0.0368713)
$\sigma$		0.2339182 (0.0791957)	0.0045509 (0.1032436)	0.4008237 (0.0616607)
$\sigma_\epsilon$		0.9481766 (0.1015570)	0.9443901 (0.1010844)	0.9519701 (0.1020022)
# of observations		1029	1029	1029
Log likelihood		-722.92530	-721.58687	-724.16915

Note: 1) The number of family members

2) Dummy for college education

3) Dummy for high school education

4) Dummy for a person who owns a house

5) Dummy for a person with Junse (rent a house with a deposit)

6) Dummy for a married person

7) Dummy for a male person

8) Numbers inside parentheses are standard errors.

and 1.67 ( $\sigma=0.40$ ). In other words, agents reacted very sensitively to the tax incentives allowed for the Personal Pension. The substitution elasticity estimated here is a little higher than estimates in the previous researches. Usually, the tax incentives allowed for the Personal Pension induced a partial substitution of the Personal Pension for other forms of savings. However, according to the results

of the estimation performed here, the substitution of the Personal Pension is so large that the effect on the total savings may be trivial. In that case, contrary to the objective of increasing the savings rate, tax incentives for the Personal Pension will not be effective in attaining that objective.

The effects of the alternatives for future tax reform are investigated following the procedure explained below. Using Equation (7), we can get the following Equation (11). Equation (11) shows the level of the Personal Pension contributions and other forms of financial savings in the case where  $0 < s_1 < L$ . However, if the constraint for  $s_1$  is binding, a closed form solution like Equation (11) cannot be derived.

$$S_{1k}^* = \alpha_{1k} \eta_k Y_{Tk} \quad S_{2k}^* = \alpha_{2k} \eta_k Y_{Tk} \quad (11)$$

where  $Y_{Tk}$  represents disposable income and  $\eta_k$  is the average propensity for financial savings of individual  $k$ ,<sup>16</sup> and  $\alpha_{1k}$  and  $\alpha_{2k}$  represent the proportions of the Personal Pension contribution and the usual savings out of total financial savings of individual  $k$ , respectively.

$$S_1 \begin{cases} = 0 \\ = S_1^* \\ = L \end{cases} \quad S_2 \begin{cases} = S_2^*(0) \\ = S_2^* \\ = S_2^*(L) \end{cases} \quad (12)$$

Instead of deriving the approximate probability distribution from the implicit function  $S_2^*(m)$  ( $m=0$  or  $L$ ), an approximation around the income level  $Y_{Tk}^*$  which induces  $S_1=0$  or  $L$  is performed as in Equations (13) and (14) (see [Figure 1]). Using Equation (14), the level of  $S_2^*(m)$  can be calculated.

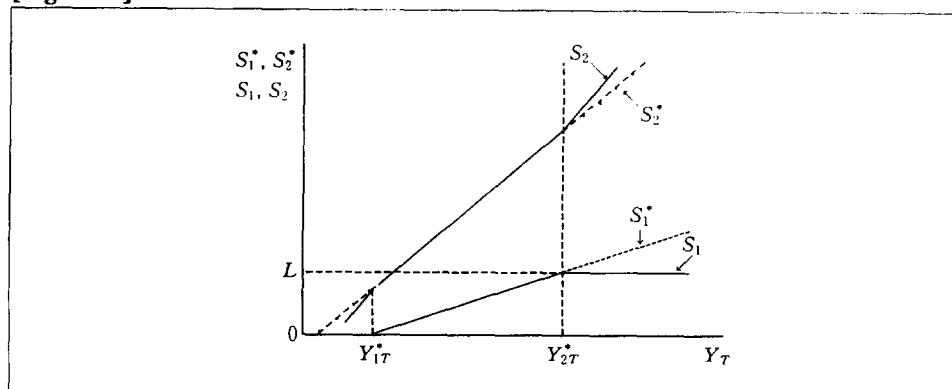
$$m = \alpha_{1k} \eta_k Y_{Tk}^* \quad (13)$$

$$\begin{aligned} S_{2k} &= \alpha_{2k} \eta_k Y_{Tk}^* + \frac{\alpha_{2k} \eta_k}{1 - \alpha_{1k} \eta_k} (Y_{Tk} - Y_{Tk}^*) \\ &= \alpha_{2k} \frac{m}{\alpha_{1k}} + \frac{\alpha_{2k} \eta_k}{1 - \alpha_{1k} \eta_k} Y_{Tk} - \frac{\alpha_{2k} \eta_k}{1 - \alpha_{1k} \eta_k} \cdot \frac{m}{\alpha_{1k} \eta_k} \\ &= \frac{\alpha_{2k} \eta_k}{1 - \alpha_{1k} \eta_k} (Y_{Tk} - m) \end{aligned} \quad (14)$$

The results of a simple simulation using Equation (14) are summarized in [Table 4]. Comparing the level of savings with that in the case of no Personal Pension, the introduction of the Personal Pension is shown to raise the savings

<sup>16</sup>  $\eta_k$  is calculated using Equation (14) and the observed value of  $S_{2k}$  and  $Y_{Tk}$  for a person who did not participate in the Personal Pension, and using Equation (11) for a person who made Personal Pension contributions.

[Figure 1]



rate. The reason for the rise in savings is found, not in tax incentives, but in the provision of a new method of savings. If we considered a situation where the Personal Pension were available and no tax incentives for the Personal Pension were allowed, the savings rate would not change very much. In other words, tax incentives induce substitution between assets rather than increase net savings. The reason why a new method of savings raises private saving can be explained with a special case where  $\sigma=0$ . When  $\sigma=0$ , the utility function of Equation (1) becomes  $C^{1-\eta}(S_1^{\alpha_1} S_2^{1-\alpha_1})^\eta$ . If the Personal Pension were not available (i.e.  $\alpha_1=0$ ), the share of consumption would rise. Therefore, without the Personal Pension, the amount of Personal Pension contributions which would have been made would be allocated among consumption and savings in other forms of assets.

[Table 4] Simulation Results

(Unit: thousand won)

	Personal Pension Contributions	Other savings	Total savings
No Personal Pension	0 (0)	485,907 (1.181) <sup>2)</sup>	485,907 (0.948)
Current System	101,164	411,285	512,449
No Deduction <sup>1)</sup>	62,369 (0.616)	449,607 (1.093)	511,976 (0.999)
Tax on Pension Benefit <sup>1)</sup>	59,411 (0.587)	453,037 (1.101)	512,448 (1.000)

Note: 1) Marginal tax rate used is the same as the marginal income tax rate faced by each person.

2) The numbers in the parentheses are the ratio compared with that under the current system.

Reducing tax incentives, such as removing the deduction for Personal Pension contributions and imposing income tax on the pension benefits, does not change savings very well (see <Table 4>). In these cases, we cannot capture the wealth effect very much. If we consider a situation in which the wealth effect of tax incentives can be fully taken into account, the provision of tax incentives can be shown to decrease the savings rate.<sup>17</sup>

## V. CONCLUSION

This paper investigates the effect of the introduction of the Personal Pension on the savings rate in Korea. For this purpose, a formal model of utility maximization, which shows the approximation of closed form equations for the Personal Pension and other forms of private savings, is constructed, and the substitution elasticity between these two kinds of savings is estimated. The results of the estimation and a simple simulation show that the introduction of the Personal Pension in 1994 raised the savings rate. However this increase in the savings rate came from the provision of a new financial asset rather than from tax incentives. It was also shown that reducing tax incentives does not change the savings rate very much.

These results suggest that the tax incentives allowed for the Personal Pension could be overly generous and tend to induce substitution savings from the usual form of savings to Personal Pension contributions rather than increase net savings. In addition, the tax incentives for the Personal Pension reduce government tax revenue and the government has to raise the tax rates of other tax bases in order to compensate for the loss of tax revenue. This will in turn distort the economic behavior of agents. However, in addition to increasing national savings, the Personal Pension has another (perhaps more important) role: retirement income arrangement. As mentioned above, private pension plans such as the Personal Pension will have to play an important role as retirement income arrangements, since a substantial decrease in the level of Public Pension benefit payments is inevitable due to the budgetary problems of Public Pensions. Therefore, more effort is needed to find an answer to a fundamental question about a socially optimal level of tax expenditure for the Personal Pension, considering the division of the role between Public Pensions and Private Pension schemes and the inter-temporal and inter-sectoral distortion of savings induced by tax incentives.

In order to improve this paper, a more appropriate data set has to be found. For example, panel data spanning a long period and covering a wide range of assets should be used. Specifically, in order to calculate the opportunity cost of Personal Pension contributions more precisely, a data set which enables one to

---

<sup>17</sup> Chun (1999) shows that the introduction of the Personal Pension decreases the level of capital stock in the long run.

track down individuals' portfolio reshuffling in response to changes of tax policies and their own financial situations is needed. In addition, a sensitivity analysis by using other forms of models is needed. In this paper, the imperfect substitutability induced by the different degrees of liquidity and risks of financial assets is reflected in the specification for an individual's preferences about a portfolio. In order to check whether the main results found in this paper are robust to the specification for the decision making process on a portfolio, we need to construct a new model based on other assumptions about the decision making process. For example, we can construct a model where agents decide on the portfolio by considering differences in the characteristics of financial assets such as the differences in liquidity and risks, explicitly.



## REFERENCES

- Carroll, Chris and Lawrence H. Summers (1987), "Why Have Private Saving Rates in the United States and Canada Diverged?" *Journal of Monetary Economics* 20, pp. 249-279.
- Chun, Young Jun (1999), "A Welfare Analysis of Taxation on Pension Income," KIPF Working Paper 99-02, Korea Institute of Public Finance.
- Chun, Young Jun (1997), "Demographic Transition and Social Security: The Case of Korea," KIPF Working Paper 97-05, Korea Institute of Public Finance.
- Daewoo Economic Research Institute (1993-1998), *The Korean Household Panel Study*.
- Engen, E. and W. Gale (1993), "IRAs and Savings in a Stochastic Life-Cycle Model," mimeo.
- Engen, Eric, William Gale and John Sholz (1996), "The Illusory Effects of Savings Incentives on Saving," *Journal of Economic Perspectives*, Vol. 10, No. 4, pp.113-138.
- Feldstein, Martin (1995), "The Effects of Tax-Based Saving Incentives on Government Revenue and National Savings," *Quarterly Journal of Economics* 110, pp. 475-494.
- Gale, William G. and John Karl Scholz (1994), IRAs and Household Saving, *American Economic Review* 84(5), pp. 1233-60 (December).
- Hubbard, R. Glenn and Jonathan S. Skinner (1996), *Assessing the Effectiveness of Saving Incentives*, Washington, D.C.: The AEI Press.
- Sabelhaus, John(1997), "Public Policy and Saving in the United States and Canada," *Canadian Journal of Economics*, Vol. 30, No. 2, pp. 253-275.
- Skinner, J. and Daniel Feenberg (1990), "The Impact of the 1986 Tax Reform on Personal Saving," in J. Slemrod, ed., *Do Tax Matter?: The Impact of the Tax Reform Act of 1986*, MIT Press, pp. 50-79.
- The Bank of Korea (1999), *Monthly Bulletin* (May, 1999).
- The Ministry of Finance and Economy (1995), *The Synopsis of Korean Taxes*.
- The Ministry of Finance and Economy (1996), *Korean Taxation*.
- Venti, Steven and David Wise (1986), "Tax Differed Accounts, Constrained Choice and Estimation of Individual Savings," *Review of Economic Studies* 53, pp. 579-601.
- Venti, Steven and David Wise (1987), "IRAs and Savings," in Martin Feldstein ed., *The Effect of Taxation on Capital Accumulation*, Chicago: University of Chicago Press and NBER, pp. 7-48.
- Venti, Steven and David Wise (1990), "Have IRAs Increased U.S. Savings?: Evidence from Consumer Expenditure Surveys," *Quarterly Journal of Economics* 105, pp. 661-698.
- Venti, Steven and David Wise (1991), "The Saving Effect of Tax-Deferred Retirement Accounts: Evidence from SIPP," in Douglas Bernheim and John B. Shoven, eds., *National Savings and Economic Performance*, Chicago:

University of Chicago Press and NBER, pp.103-128.

Venti, Steven and David Wise (1994), "RRSPs and Saving in Canada," Paper presented at the Conference on Public Policies That Affect Saving, OECD: NBER.