

An Empirical Study of the Crowding-out Effect of the Public Pension on Private Savings by Household Characteristics

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This study provides good empirical evidence of the effect of the public pension system on private savings using a saving function. Various types of household status are analyzed-the whole sample, households with a consistent balance sheet surplus, those with a consistent balance sheet deficit, those with a surplus or deficit on their balance sheets mixed for five straight years, and government employee or non-government employee households-to obtain further significant empirical evidence for the crowding-out effect. The following findings emerge from the estimation results. First, the crowding-out effect in constant surplus households is larger than in constant deficit households. Also households with a surplus or deficit mixed show a lot bigger crowding-out effect than do either of the former two cases. This means that those whose income earnings are unstable decrease their current savings and then expend them, implying that the magnitude of the crowding-out effect depends on the stability of income. Second, the crowding-out effect in households of government employees is smaller than in those of the non-government employees. In other words, income stability and early retirement incentives decrease the crowding-out effect itself. Our study implies that the effect of the public pension system on private savings may be affected by job or income security.

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I. Introduction

Most countries in the world have a public pension system to provide income security for old people. Although securing income in old age is held by some to be primarily the responsibility of the individuals, governments have generally introduced and operated a mandatory public pension scheme for the following reasons: First, there may be a market failure resulting from high transaction costs or moral hazard in a private pension market. Second, the potentially unequal income distribution among the old might worsen despite the government efforts to improve it, because the private pension market has been controlled by the 'private insurance principle.' Third, rapid changes of demographic factors, such as the low fertility rate, the ageing population, and long lifespan, bring about serious problems in supporting the aged and thus individuals will not readily prepare for old-age adequately by themselves.

On the other hand, it is said that a mandatory public pension makes a decrease in disposable income inevitable, which has an influence on the present savings or consumption of an individual. Although the public pension system, such as a national pension or 'specific occupational pension,' naturally increases compulsory saving, there is a room for various opinions as to whether it has an effect on private savings. Thus it has given rise to a long-running debate about the effect of the public pension scheme on private savings.

Actually, both the academic and the policy arenas have been interested in a dilemma between a public pension and private savings. Much of the literature shows inconsistencies in the empirical evidence. Some demonstrate that the public pension system has a negative influence on private savings, others claim that it has no effect or a positive effect on private savings (U.S. CBO Memorandum, 1998). This might be due to the method and the data used in empirical estimation. Nevertheless, most studies conclude that a public pension crowds out private savings. Almost all papers on Korean case also show that it crowds out private savings.

Our paper, like previous works, sets out to examine what impact the public pension has on private savings through empirical analysis. However, we take a rather different approach from the other studies as follows: First, we use observable savings and public pension contributions in the specific periods without estimating future social security wealth as in the previous studies. Second, the regression equation is derived from a residual, that is, saving is defined as the remainder after the subtraction of consumption from income. Third, previous studies were based on the relationship between pension wealth

and consumption or savings, whereas we use the ratios of the contributions to the income and the savings rate to find if the public pension crowds out private savings.¹⁾ Fourth, most studies try to grasp if the effect the public pension has on private savings from the whole sample; however, we divide the whole sample into several groups by the characteristics of surplus/deficit in household balance sheet and the job of the household head.

The previous studies have used either time-series or cross-sectional data for empirical analysis, but more recently there have a number of attempts to provide a systematic analysis using panel data. Following this trend, we panelized the "Survey of Urban Family Data for 1998-2002" released by the Korea National Statistics Office(hereinafter, KNSO).

The article proceeds as follows. Section 2 briefly reviews the related literatures and discusses descriptive statistics. In Section 3, we derive the empirical equation from a savings function and then estimate it by household characteristics, i.e., the whole sample, balance-sheet surplus households, balance-sheet deficit households, and households showing a surplus or a deficit on their balance-sheets consistently for five straight years, and households whose head was or was not a government employee. Finally, Section 4 summarizes the important and significant results and presents the policy implications.

II. Literature Survey and Descriptive Statistics

1. Previous Studies

Herein, we briefly discuss the previous literatures. Feldstein (1974) was the first to investigate the empirical relationship between public pension wealth and household savings, sparking fierce debate in the academic arena. He applied a consumption function to his model, based on Ando-Modigliani's life-cycle income hypothesis and the time-series data of the U.S.A. for 1929~1971. He showed a large negative effect of social security wealth on private saving. Leimer and Lesnoy (1982) claimed there had been an error in calculating social

1) Hurst and Ziliak (2004), Hubbard (1986), King and Dicks-Mireaux (1982), and Munnell (1974, 1976) used saving itself as an independent variable. Attanasio and Rohwedder (2001) employed the saving rate and the ratio of the public pension contributions to income in the same way as our study, and showed the crowding-out effect of the public pension scheme on private savings.

security wealth in Feldstein (1974), which related to the change in benefits for surviving spouses that was instituted in 1957 in the U.S.A. So they corrected his alleged errors to recalculate the figures again, and argued that a public pension system did not crowd out private savings but rather induced a mild increase in them, contrary to Feldstein's findings (1974). Feldstein (1995b) again extended the sample period to 1992 addressing many of the points criticized in the other studies. He confirmed the empirical evidence of his 1974 study, that private savings were reduced by 60 % due to the public pension. Attanasio and Rohwedder (2001) showed the crowding-out effect of public pension schemes, i.e., the state basic pension and the state earnings related pension scheme (SERPS), respectively, on private savings by age group.

Meanwhile, there have been a number of studies concerning Korea including Yun (1999), Won and Lee (2002), Lim and Moon (2003), and Kim (2003).²⁾ Notably, Yun (1999) estimated Feldstein's model using the semi-parametric method in the same period and data as Feldstein (1995b) but obtained different results. Kim (2003) also estimated the German GSOEP panel data during 1986~1990. He used the concept of expected lifetime income and pension wealth with the fixed effect model, and thus it can be said that the public pension crowds out the private saving under the pay-as-you-go system in the German.

Now we summarize the following findings from the previous literature: First, empirical results differ across models, estimation methods, and sample periods. Second, the older the pension system and the greater the public confidence in government, the larger the crowding-out effect of the public pension system on private savings. Third, most studies investigated the relationship between the public pension and the private savings under the pay-as-you-go system, which has been the most common financing method in developed countries. Fourth, the function in the model is a consumption function rather than a saving function.

2. Dataset to be used.

Let us now discuss the "Urban Household Survey" that we employ. The survey is conducted monthly by KNSO, but for tabulation of the results and their release are quarterly and also annually. This survey covers households residing in sixty-nine cities in Korea but farmers' households, fishermen's households, and one-person households are excluded. In addition, income items were not

2) Korea introduced a mandatory national pension system in 1988, which applied to certain company workers. In 1999, insurance coverage was extended to all citizens. So there have been only a few papers dealing with this topic so far in Korea.

collected from the self-employed including households that run restaurants or inns or boarding houses, households with two or more business employees, and foreigners' households.

Table 1 Survey Items in the "Urban Household Survey"			
Total Revenue	Income	Current income	Labor income Business income/ subsidiary work income Wealth income Transfer income
		Non-current income	Income from celebrations and condolences, articles sold, and other such like income
	Other Revenue	Assets decrease	Withdrawals of savings, non-life insurance receipts, Sale of equities and real estate
		Increase in liabilities	Loans by households, Installment and credit purchase
	Balance carried-over from the previous month		
Total Disbursement	Family Expenditures	Consumption Expenditures	Food and beverages Housing Utilities Furniture and utensils Clothing and footwear Medical care Education Culture and recreation Transportation and telecommunication Others
		Non-consumption Expenditures	Direct taxes, public pension contributions, social insurance premiums, and other non-consumption expenditures
	Other Disbursements	Assets Increase	Savings, non-life insurance, purchases of equities and real estate
		Decrease in liabilities	Repayment of (housing) loans, installment and Repayment of installment, and so on
	Carried-over to the next month		

The survey items include household distinction, the number of household members, the number of earners, the existence of a spouse of the household head, the sex/age/educational attainment/industry/occupation of the household head and the spouse, items concerning other household members, relationship to household head, sex, age, activity status, household type, the source of income where no member of the household has an occupation, the yearly income, items

concerning residence, type of residence, the number of automobiles, types/amount of income items and amount of expenditures, and so on (see details in Table 1).

KNSO surveyed very similar households for five years since 1998 in the Urban Household Survey, so we can panelize it in order to draw significant implications free of bias during this period. The sample sizes are as follows: 5,603 households in 1998, 5,597 in 1999, 6,413 in 2000, 6,349 in 2001, and 6,121 in 2002. We selected households having at least the occurrence of the following three items, viz. non-negative labor income, family expenditure, and public pension contributions. From these, we build a panelized dataset with 902 households per year. Non-responding households were excluded in order not to decrease the accuracy of the estimation and distort the results. Also, the unit of analysis is not individuals but households.

3. The Descriptive Statistics

As already mentioned, the number of the households is 902 (totally 4,510 cases for 5 years). We divide the whole sample into households with a balance sheet surplus or those with a balance sheet deficit, households with straight surpluses or deficits on their balance sheets for five consecutive years, and government employee households or non-government employee households. The division into balance sheet surplus and deficit households is because the question of whether or not disposable income is available is considered to act differently on decisions about saving. Also, the reason why we divide the whole sample into government employee household and non-government employee households is as follows. First, a government employee pension system (hereafter, GEPS) was introduced in 1960, since when some 45 years have passed so that now the ratio of beneficiaries stands at over 18%. In fact, GEPS in Korea has as long a history as public pension systems in developed countries, having relatively significant and important implications for savings decisions. Second, income in government employee household may be relatively more stable than that of non-government employee households. Third, most people generally expect at present that the government will secure the payment of benefits from GEPS rather than those from the national public pension. So we anticipate the crowding-out effect of GEPS to differ from that of the national public pension scheme.

Next, we analyze the descriptive statistics of the variables to be used in the regression estimation and the other variables by household characteristics.³⁾ For

simplicity, we show descriptive statistics for every two years and discuss their means for the analyzed periods, because there is little change in statistics from year to year over five years(see Tables 2 and 3).

We begin by discussing estimates of the demographic variables including

Table 2 Descriptive Statistics in the Whole Sample

Classification		1998		2000		2002		Means for 5 years	
		Mean	S.D	Mean	S.D	Mean	S.D	Mean	S.D
Number of Family		3.8	1.0	3.8	1.0	3.7	1.0	3.8	1.0
Head Age		41.7	9.2	43.0	9.1	44.7	9.2	43.2	9.3
Dummy (%)	Head Sex	89.7	30.4	89.3	30.9	87.8	32.7	88.9	31.4
	Education 1	77.2	41.9	76.4	42.5	76.6	42.4	76.8	42.2
	Education 2	35.1	47.8	34.4	47.5	35.5	47.9	35.1	47.7
	House	77.5	41.8	77.3	41.9	78.1	41.4	77.8	41.6
	Student	4.3	20.3	4.5	20.8	5.7	23.2	4.8	21.4

Notes: 1) S.D. means standard deviation.

2) Education 1: the high school and above, Education 2: the college and above.

Table 3 Descriptive Statistics of Numeric Variables in the Whole Sample

(Unit: Thousand Korean won per month)									
Classification		1998		2000		2002		Means for 5 years	
		Mean	S.D	Mean	S.D	Mean	S.D	Mean	S.D
Household Income		1,934	945	2,298 (18,8)	1,125	2,742 (19,3)	1,347	2,323	1,188
Household Expenditure		1,630	792	2,110 (29,3)	1,051	2,405 (14,0)	1,237	2,062	1,073
Household Savings		305	648	189 (-62,0)	742	337 (78,3)	999	261	811
Public Pension Contributions		47	48	75 (59,6)	65	91 (21,3)	71	72	64

Note: S.D. means standard deviation.

dummies in the whole sample. 78 percent of households own a house, 89 percent of household heads are male, and 77 percent and 35 percent of household heads respectively graduated from the high school and above, or the college and above. Five percents of them have students non full-time education. Besides this, the average age of household heads is 43.2, while the average number of members

3) The numeric and the ratio variables are defined in Section III.

of households is about 3.8 persons.

Now, we discuss the descriptive statistics of level variables. Labor income, in absolute terms, increased continually for five years. It grew 18.8 percent between 1998 and 2000 and 19.31 percent between 2000 and 2002. Both expenditures and public pension contributions show similar results to labor income in absolute terms. In contrast, the growth rate has declined for five years for household expenditures. Savings decreased until 2000, in both absolute and ratio terms. This was because the growth rate of expenditures (29.3%) increased faster than that of income (18.8%). But the growth rate of incomes has been increasing faster than that of family expenditures since 2001 and, as a result, the nominal amount of savings in 2002 is larger than that in 1998.

Now compare the descriptive statistics of the surplus households with those of deficit households. A household balance sheet surplus (or deficit) means that the disposable income exceeds (or is less than) the household expenditure. Table 4 shows that statistical measures represent average values for five years. Even though the income level in surplus households is 1.72 times as much as that of deficit household, the level of consumption is lower by 19 percent, i.e., it is 81 percent of that of the deficit households. It seems that surplus households have a lower propensity to consume. Also, the contributions in surplus households are bigger than those in deficit households. The ratio of contributions and premiums to income was found to be 3.47 percent in surplus households and 2.98 percent in deficit households for the ratio of the contributions to the income. The age of

Table 4 Descriptive Statistics by Household Characteristics

(Unit: Thousand Korean won per month, age, persons)

Classification	Surplus households		Deficit households		Mixed households		Government employee household		Non-government employee household	
	Mean	S.D	Mean	S.D	Mean	S.D	Mean	S.D	Mean	S.D
Income	2,769	1,239	1,612	1,381	2,186	1,106	3,254	1,464	2,198	1,102
Expenditure	1,988	927	2,454	1,804	2,092	1,085	2,817	1,429	1,953	981
Savings	781	597	-842	827	94	709	437	1,015	246	764
Public Pension Contributions	96	66	48	53	67	68	145	93	64	55
Age of Head	41.1	7.4	48.8	10.6	43.5	9.5	44.0	7.5	42.8	9.4
Number in household	3.8	0.9	3.6	1.1	3.8	1.1	4.0	1.1	3.8	1.0
Sample size	1,580		295		2,635		671		3,839	

Notes: 1) S.D. means standard deviation, 2) All estimates are mean values for five years.

the head of the household in deficit households was 48.8 years on average, which was older than 41.1 years in the case of surplus households, implying that the deficit may be due to higher educational expenditures than those of surplus households.

Furthermore, we estimate the descriptive statistics of households with either a surplus or a deficit on their balance sheet for five straight years to see how sustained income stability influences the behavior of a household. Generally, it is said that a household with an unstable income does not have a stable propensity to consume and thus feels inclined to adjust to savings or to be unable to continue saving for a certain period. This is because spending is downwardly sticky relative to savings. In this context, higher public pension contributions may result in less saving. Our particular interest here is to confirm whether these expectations are backed up by the empirical evidence.⁴⁾

Finally, we compare government employee households with non-government employee households. Both labor income and consumption in the former are about 1.5 times higher than those in the latter because the ratio of the labor income to the family expenditure in government employee households, i.e., 86.6 percent, is higher than the 88.9 percent in non-government employee households. Also, income in government employee households is higher than that in non-government employee households. This may be ascribable to 70.2 percent of the heads of government employee household having graduated from the college and above, as against only 27.8 percent of heads of non-government employee households (Chung et al., 2004).⁵⁾ On the other hand, the ratios of public pension contributions to labor income were 4.5 percent, and 3.0 percent, respectively, in government employee households and non-government employee households, reflecting the fact that the contribution of government employees to GEPS is higher than that of those insured in workplaces to the national pension scheme.⁶⁾

4) The crowding-out effect of the public pension on private savings in the surplus household sample is likely to be less than in the whole sample because there must be many households with a monthly income higher than the upper bound of the income range (3.6 million Korean won) in the surplus sample relative to other groups. So it is expected that the crowding-out effect will appear to be increasing at a particular level but decreasing after that.

5) Chung et al., (2004) claimed that the wage gap by the education level among regular workers might have been decreasing until the mid-1990s but subsequently increasing, for those whose aged between 25 and 54 in workplaces with more than 10 persons.

6) The contribution rate estimates differ from the contribution rate specified in the law. This is because the income of employees working at workplaces subject to the national pension scheme is based on the "Standard Monthly Income" with 45 grades, whereas the GEPS is calculated by multiplying the basic income by the contribution rate.

III. Empirical Results

1. Regression Equation

There are several types of income, including labor income, business income, wealth income, and transfer income in the "Urban Household Survey" data (see Table 1). Following previous studies, for example, Park and Kim(2000), and considering the particular characteristics of the panelized data from the "Urban Household Survey" dataset, we employ the labor income of a household as the income variable in the regression equation. The reasons are as follows: Firstly, the dataset is collected from workers in cities, and so labor income is evaluated as the most credible survey item. Secondly, business income and ancillary income are said to be under-reported. Thirdly, wealth income is a variable affecting only a special group having financial assets. Fourthly, saving from transfer income may be viewed as difficult except for a few households.⁷⁾ Note that the labor income of a household is made up of that of its head, spouse and other family members.

Consumption(C) is the sum of the consumption expenditures(C^C) and non-consumption expenditures(C^{NC}) in the Urban Household Survey, as may be seen from Table 1. Consumption expenditures are composed of food and beverages, housing, utilities, furniture and utensils, clothing and footwear, medical care, education, culture and recreation, transportation and telecommunications, and so on. Non-consumption expenditures consist of taxes, social contributions, interest payments, etc. For reference, the contributions are the sum of those of the head, spouse and other household members. Among non-consumption items taxes(t) and health insurance premiums(S_i) are non-refundable in cash, whereas public pension contributions are refundable after retirement as a pension asset having the character of savings. We use this logic to derive a saving function, defining saving as the remainder after subtracting family expenditure from labor income, i.e., the balances(Park and Kim, 2000; Won and Lee, 2002) and may be expressed as in the following equation.

$$\begin{aligned} S &= Y - C \\ &= Y - (C^C + C^{NC}) \\ &= Y - C^C - S^p - t - S_i \end{aligned}$$

7) Besides this, the ratios of all non-labor incomes to current income vary between 8.9% and 9.4%, so that even if they were to be included, the results would show little difference from those for labor income alone.

$$\begin{aligned}
&= Y - S^p - (C^c + t + S_i) \\
&= Y - S^p - C'.
\end{aligned}$$

As public pension contributions and consumption are considered a function of income, the above equation can be rewritten

$$S + S^p = Y - C'(Y) = S(Y).$$

Now dividing both sides by income(Y) to change into ratio terms, we get

$$\begin{aligned}
\frac{S}{Y} + \frac{S^p}{Y} &= \frac{S(Y)}{Y}, \\
s + s^p &= s(Y), \\
s &= s(Y) - s^p,
\end{aligned}$$

However, as private savings can be also influenced by factors other than income and the public pension; for example, the number of family members, the age of the householder, job, and the education level of the householder, and the other demographic variables, we introduce these variables into our saving function as follows.

$$s = Y - s^p + Z + \varepsilon$$

We apply the above equation to our panelized data as follows.

$$s_{it}^h = \alpha \ln Y - \beta s_{it}^p + \gamma Z_i + \varepsilon_{it}, \quad (1)$$

where s_{it}^h is the private savings rate, Y is the household labor income, s_{it}^p is the public pension contributions rate, and Z_i is the time-invariant and individual-variant variables.

The public pension contributions rate (s_{it}^p) is calculated by dividing contributions by the labor income. For reference, the national public pension scheme has 45 standard monthly income tiers on which premiums are levied and the premium rate is 9 percent (employee 4.5 percent, employer 4.5 percent). However, the actual contribution rate is below 4.5 percent of actual income. As we mentioned above, this implies that contributions are dependent not on the actual income but on the standard monthly income specified with labor income in excess of this attracting no additional premium and also the contribution rate

applies to individuals and not households.

In the panel estimation, we employ independent variables as labor income, the rate of the contributions to labor income, the other demographic variables, such as the number of the family members, the age and education level of the householder, and the other dummy variables.⁸⁾ Labor income is changed into a logarithm-type variable so as to control heteroscedasticity, an approach which has been used in other studies(see Lim and Moon, 2003).⁹⁾

Meanwhile, there have been two types of studies reported in previous papers: One is based on the life-cycle income hypothesis and estimates the model using both life-time pension wealth and life-time contributions(Feldstein, 1995b; Kim, 2003), while the other is taken by papers that estimate the relationship between the public pension and private savings with income, public pension contributions, and saving-related variables during a specified period (Bailliu and Reisen, 1997; Won and Lee, 2002). Our work follows the second approach for the following reasons: First, the Korean national public pension scheme is still at the initial stage and there is a strong possibility that the scheme will be changed in the near future. This is now actually under discussion in Korea. In this context, it is meaningless to measure lifetime pension wealth and even the lifetime contributions paid. Second, the household is naturally interested in social security wealth itself but has a reluctance to calculate it thoroughly for the future, for that kind of task is usually considered a nuisance. Households are assumed to engage in unboundedly rational behavior in their decision-making, being concerned over the obscurity of the annual stability of the national pension and the uncertainty and lack of information about it.

2. Panel Regression Results

Now let us discuss the empirical results from the estimation model. We estimate the results by the Pooled Regression Model, the Fixed Effect Model(hereafter, the FEM), and the Random Effect Model(hereafter, the REM), respectively.

We employ the Lagrange Multiplier Test(hereafter, the LM) and the Hausman Test to select a model having a better fit. The LM is used to find whether the pooled regression model or other models represent a better method. Also we use the Hausman Test to find the better method as between the FEM and the

8) Other than the dummy for the high school and above, the dummy for the college and above is added for reflecting the increase in the education level.

9) The natural logarithm of saving is lower than the saving rate in the goodness-of-fit-test for estimating the regression model.

REM(see Maddala, 1987).

Generally speaking, the larger estimates of the LM Test, the FEM and the REM are better than the pooled regression model, and for the higher(less) values of the Hausman Test, the FEM (the REM) is better than the REM(the FEM). The LM Test indicates that the FEM or the REM is better than the pooled regression in all cases, whereas the Hausman Test indicates that the FEM is the better model in all cases except for that of government employees(see Table 5). But here we analyze regression results in all cases with the FEM for their consistency of coefficients, and the results are shown in Table 6 and 9.

Table 5 Results of the Lagrange Multiplier Test and the Hausman Test

Classification	Lagrange Multiplier Test	Hausman Test
Whole sample	1995,34 (1 df, prob value=0,000000)	75,92 (10 df, prob value=0,000000)
Government employee	366,38 (1 df, prob value=0,000000)	9,50 (10 df, prob value=0,484973)
Non-government	963,03 (1 df, prob value=0,000000)	57,31 (10 df, prob value=0,000000)
Continued surplus	480,35 (1 df, prob value=0,000000)	37,76 (10 df, prob value=0,000042)
Continued deficit	28,67 (1df, prob value=0,000000)	24,73 (10 df, prob value=0,005882)
Mixed	142,12 (1 df, prob value=0,000000)	186,48 (10 df, prob value=0,000000)

For the whole sample, we found as did other studies that the public pension crowds out private savings.¹⁰⁾ According to the results in Table 6, the most important variable is the public pension contribution rate (=public contributions/labor income) and this makes the private savings rate decrease. The coefficient of the public pension contribution rate indicates that the wealth substitution effect, which makes the private savings rate decrease, surpasses the retirement effect, which increase the savings rate.

The empirical results are as follows: the greater the income, the higher the private savings rate. The fact that the householder is a male has a positive influence on private savings. But the more family members or the higher the education level, the less the private saving rate. Also the fact that a household

10) The magnitude of the crowding-out effect is not provided, because we are interested in the existence of the crowding-out effect and its sign.

has a house or a student member causes the private saving rate to decrease. Unfortunately, the dummy for the sex of the householder and house ownership are statistically insignificant. Specifically, estimating the education level of a householder with high school and above, or college and above, the signs of the coefficients for the two dummies are negative, meaning that a higher education level lessens the private savings rate of a household. Interestingly, the coefficient of the dummy variable for high school and above is lower than that of the dummy variable for college and above. Second, a greater number of family members decreases the savings rate, indicating that having more members induces the household to spend more. Third, a higher age of the head of the householder decreases the private savings rate. This indicates a household with an older head or a student tends to spend proportionally more than other households and thus the saving rate may decrease.

Table 6 Panel Regression Results by Job

Variable	Whole Sample		Government Employee		Non-government Employee		
	Coefficients	t-value	Coefficients	t-value	Coefficients	t-value	
Log (Labor Income)	0.584	30.833***	0.267 (0.050)	5.329***	0.578 (0.020)	28.984***	
Public Contributions/ Labor Income	-3.354	-9.179***	-1.945 (0.653)	-2.981***	-3.702 (0.411)	-9.001***	
(Head Age) ²	0.000	3.740***	-0.000 (0.000)	-0.732	0.000 (0.000)	3.349***	
Head Age	-0.045	-4.331***	0.015 (0.033)	0.465	-0.044 (0.011)	-3.961***	
The Number of Household Members	-0.039	-3.474***	-0.016 (0.021)	-0.766	-0.052 (0.012)	-4.412***	
Dummy	House	-0.038	-1.308	0.024 (0.069)	0.340	-0.018 (0.032)	-0.575
	Student	-0.127	-3.907***	-0.035 (0.039)	-0.882	-0.144 (0.037)	-3.934***
	Head Sex	0.042	1.418	0.414 (0.118)	3.511***	0.011 (0.032)	0.325
	Education 1	-0.084	-2.292**	0.086 (0.105)	0.826	-0.066 (0.040)	-1.665*
	Education 2	-0.101	-2.605**	-0.012 (0.059)	-0.199	-0.113 (0.044)	-2.557**
R-square	0.663		0.589		0.659		
Adjust R-square	0.578		0.477		0.573		

Notes: 1) *, **, *** are significant at the 10%, 5%, and 1% levels, respectively.
2) The values in parenthesis are standard deviations.

Now let us compare the results of the whole sample with those of previous studies. First, Won and Lee(2002) found similar results to our paper's using the public pension as a dummy variable. Their results showed that the dummies for the education level, owning a house, and age have a negative effect, but income has a positive effect on private saving, so the signs of coefficients are the same as ours. Second, Lim and Moon(2003) use both micro- and macro-data. Although, unlike us with respect to micro-data, they made use of the natural logarithm of the ratio of financial wealth to income, the public pension crowds out private savings as in our results. Also, for the macro data analysis, they claimed that the introduction of the national pension scheme in 1988 caused private savings to decrease, as the national saving rate began to decrease immediately after 1988. They estimated the regression equation and found that the public pension crowds out private savings to a statistically significant degree. In connection with the result, we explain this effect more specifically with Tables 7 and 8. Table 7 shows that the total saving rate has been decreasing since peaking at its highest rate of 40.5% in 1988. The Bank of Korea argues that this was not a transitory phenomenon but a trend resulting from a structural change of the factors underlying savings decisions.(see press release of the Bank of Korea of May 4, 2005). The Bank of Korea quotes the reasons for the decrease of private saving as being: the weakening of households economic conditions resulting from the increase of household liabilities and the higher unemployment among young people, the higher asset prices, the alleviation of liquidity

Table 7 Trends of the Saving Rate by Type

(Unit: %)				
year	Total saving rate	Private saving rate	Net private saving rate	Government saving rate
1981	24.3	18.9	9.0	5.4
1985	31.1	25.0	14.3	6.1
1988	40.5	32.8	24.2	7.7
1990	37.5	29.2	21.4	8.3
1995	36.3	27.2	16.4	9.1
1999	35.3	26.1	16.3	9.2
2000	33.7	21.9	9.9	11.8
2001	31.7	20.7	5.9	11.0
2002	31.3	19.6	2.0	11.7
2003	32.6	20.4	—	12.2

Notes : Values after 1995 are based on the year 2000.
Source: 「National Accounts」, the Bank of Korea.

constraints and changes in consumption patterns, the extension of the social security net, the progressive ageing of the population, and so on. Focusing on the social security scheme first of all, the commencement of the national pension scheme caused a decrease in the total saving rate but the ratio of the National Pension Fund to current GDP has been increasing continuously since then(see Table 8). Accordingly, pundits maintain that, from the household's point of view, disposable income is decreased by the payment of national pension contributions and household saving declines, the consequence of which is to bring about a contraction of overall savings.

Table 8 Trends of GDP and the Ratio of the National Pension Fund to Current GDP

(Unit: Billion Korean Won, %)									
Year	1985	1988	1990	1995	2000	2001	2002	2003	2004
GDP	84,061	137,112	196,691	398,838	578,665	622,123	684,264	724,675	778,445
Ratio of National Pension Fund to Current GDP	—	0.4	1.1	4.6	10.5	12.2	13.6	15.5	17.1

Source: www.nso.go.kr, www.npc.or.kr

Now, we discuss the estimation results by job characteristics in Table 6. As mentioned above, we divide the whole sample into government employee households and non-government employee households by job. The reasons are as follows: first, GEPS was introduced in 1960, and 45 years have passed since then. Second, the government's underlying GEPS induces government households to decide private savings differently from household with other kinds of job. In fact, GEPS in Korea has as long a history as the public pension system in the developed countries, which offer more relatively significant and important implications for a savings decision (see details in Appendix).

The coefficient of the national public pension contribution rate in the government employee household is -1.945, which is a lot lower than the -3.354 for the whole sample and the -3.702 for the non-government sample. This implies that the net wealth substitution effect is not large due to the job and pension fund security. Also, GEPS has an earlier retirement age, 50, than that of the national pension scheme, 60. Therefore, a government employee reduces present consumption and then increases private savings in preparation for extending the period after an earlier retirement, which is a retirement effect. In the end, the private savings increase from the retirement effect offsets the private

saving decrease from the asset substitution effect, and thus the crowding-out effect in GEPS is estimated to be lower than that in the non-government sample.

The rapid increase in the number of retired government employees after the financial crisis in late 1997 supports this empirical evidence indirectly. The number of retired government employees increased for three straight years, i.e. 34,000 persons (3.5%) in 1997, 55,000 persons (5.8%) in 1998, and 95,000 persons (10.3%) in 1999 (Data of the Ministry of Government Administration and Home Affairs in Korea, 2001). This development induced a willingness among government employees to increase private savings to prepare for the possibility of early retirement.

Recently in the process of reforming of GEPS, the government extended the minimum age of retirement step by step from 50 to 60; however, it will still be less than the minimum age, i.e., 65 after 2013, under the national public pension scheme. In this context, the incentive for government employees to retire earlier is still higher than under the national pension scheme.

Table 9 Panel Regression Results by Household Economic Characteristic

Variable	The surplus household		The deficit household		The mixed household		
	Coefficients	t-value	Coefficients	t-value	Coefficients	t-value	
Log (Labor Income)	0.155 (0.014)	11.471***	1.182 (0.153)	7.715***	0.674 (0.024)	28.644***	
Public Contributions/ Labor Income	-1.828 (0.301)	-6.076***	-1.616 (1.624)	-0.995	-4.246 (0.510)	-8.326***	
(Head Age) ²	0.000 (0.000)	1.636	0.003 (0.001)	2.212**	0.000 (0.000)	2.123**	
Head Age	-0.015 (0.007)	-2.093**	-0.280 (0.108)	-2.584**	-0.033 (0.013)	-2.583**	
The Number of Household Members	-0.028 (0.008)	-3.524***	-0.171 (0.082)	-2.075**	-0.033 (0.014)	-2.363**	
Dummy	House	-0.002 (0.019)	-0.091	-0.057 (0.374)	-0.153	-0.063 (0.035)	-1.802*
	Student	-0.028 (0.023)	-1.230	-0.232 (0.200)	-1.159	-0.150 (0.042)	-3.585***
	Head Sex	0.020 (0.021)	0.984	-0.650 (0.710)	-0.916	0.026 (0.036)	0.744
	Education 1	-0.028 (0.026)	-1.068	-0.283 (0.411)	-0.687	-0.080 (0.044)	-1.816*
	Education 2	-0.008 (0.021)	-0.386	0.731 (0.606)	1.205	-0.150 (0.054)	-2.779***
R-square	0.560		0.633		0.486		
Adjust R-square	0.446		0.522		0.355		

Notes: 1) *, **, *** are significant at the 10%, 5%, and 1% levels, respectively.
2) The values in parenthesis are standard deviations.

Next, let us discuss the empirical results by economic characteristics, that is, households with a balance sheet surplus or deficit for five years (See Table 9). According to the estimation results, the crowding-out effect in deficit households is a little bit less than in surplus households. This shows that deficit households do not actually have sufficient income to spend, and thus the net effect resulting from the asset substitution effect and the retirement effect is less than in the case of surplus households. In other words, deficit households think that the public pension itself will fall short of their needs in preparation for old-age and they do not reduce their private savings. On the other hand, surplus households have sufficient money to save and thus decrease their savings more than deficit households. Second, among other variables, apart from the contribution rate, income in deficit households increases the private saving rate more than it does in surplus households. However, the variables such as the age of the householder, the number of family members, the dummy for the student, head sex, and high school and above(=education 1) in deficit households have a larger negative effect on private saving rate than in surplus households. Notably, the dummy for the household head's sex has a positive impact on the private saving rate. Nonetheless, most dummy variables are not statistically significant. Third, the dummy for college and above(=education 2) decreases the private saving rate in deficit households, but increases it in surplus households. However, this variable is not statistically significant, either.

Now consider a household with a mixture of surpluses or deficits on its balance sheet over the analyzed five-year period. Such households do not have stable incomes and are not expected to be in a position to make consistent decisions. So we separated out households with a mixture of balance sheet surpluses or deficits over the analyzed period from the whole sample to see if they differ from the households with consecutive balance sheet surpluses or deficits in the estimation results. The sign of the coefficient is nearly the same as for households with consistent surpluses and deficits, but we do find meaningful results(see Table 9). The coefficient of the public contributions rate is much higher than in the other two cases. This indicates that households whose income is not stable decrease their private saving rate sharply because of the payment of contributions to the public pension. In other words, they rely heavily on the public pension system to provide for their retirement. Based on the fact that consumption itself has generally stable trends with downward rigidity, an unstable income series decreases private savings rather than changing the consumption pattern. In this context, it can be said that, in case of unstable income earners, it is not easy for them to convert their propensity to consume in

times of surplus to one appropriate in a period where their balance sheet is in deficit (the ratchet effect of consumption), and, in the short run, the private savings rate may be reduced relative to households consistently in deficit. The latter have a low propensity to save but get accustomed to a low level of expenditure. This makes the crowding-out effect relatively small due to their reluctance to change their propensity to save. We can confirm this as follows: the coefficient standing for the crowding-out effect is -1.828 in households consistently in surplus on their balance sheet as against -1.161 for those consistently in deficit.

IV. Conclusions

We estimated the crowding-out effect of the public pension scheme on private savings by household characteristics, using a panel regression with a saving function. The estimation results show as did previous studies that the public pension crowds out private saving in all cases.

All in all, several meaningful facts emerge from the empirical evidence. First, the crowding-out effect turned out to be larger in households with a balance sheet surplus than those with a deficit, because the net wealth substitution effect is higher for the former than in the latter. Second, households whose balance sheets show a mixture of surpluses and deficits over a five-year period decreased the private saving rate more than did either those continuously in surplus or continuously in deficit. That means that households with unstable incomes prepare for their old-age by way of the public pension system as they have less incentive to save at the current stage. These results imply that income stability can be an important component in the crowding-out effect. Third, there is less crowding-out of saving rate in government employee household than in non-government households, implying that income stability and the option of early retirement induce a reduction of the crowding-out effect. From the second and third empirical findings, we can infer a household's job security is closely connected with income stability.

Note that this should not be taken to imply that the crowding-out effect simply reduces total or lifetime savings. In other words, the public pension decreases private savings at the present stage, but total saving may be increased if the lifetime public pension received is bigger than the present value of the lifetime contributions after retirement.

Our study has a few limitations in its explanation of the empirical results, in that many samples were dropped while panelizing the dataset and a number of households were found to be an receipt of both employment income and pension income. We anticipate the emergence of genuinely meaningful panel datasets that will be able to overcome these limitations and allow all kinds of income to be used in the same regression estimation and not just labor income.

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Appendix

1. A Comparison of Insured Persons and Beneficiaries in the National Pension Scheme and GEPS in Korea

As may be seen from Table 1, the National Pension Scheme is seventeen times as large as the GEPS in terms of the number of participants covered (Those who have joined GEPS are not required to join the National Pension Scheme). However, the pension support ratio of beneficiaries to insured persons in the National Pension Scheme is 6.4%, whereas that in GEPS is 18.3%, which is three times as much. Also the annual pension paid per beneficiary in the GEPS was over eight times as high as that paid for each beneficiary of the National Pension Scheme in 2002, largely because the GEPS was introduced in 1960, almost two generations before the national pension scheme. The average annual amount of pension paid was about 15 million Korean won in GEPS as against just 1.8 million Korean won under the National Pension Scheme.

Table 1 Contributor/Beneficiary Ratios of the National Pension Scheme and GEPS

Classification	National Pension	GEPS
Number Insured (A)	16,499 thousand persons	931 thousand persons
Number of Beneficiaries (B)	1,059 thousand persons	170 thousand persons
B/A	6.4%	18.3%
Average Pension (1 year)	1,808 thousand won	14,919 thousand won

Source: Korea National Statistical Office.

2. A Comparison of GEPS with the National Pension Scheme in Korea

Let us compare the contribution rates toward the national pension scheme with those toward GEPS. Workplace participants in the National Pension Scheme share the total 9% contribution with their employers, both paying 4.5 percent. From July 2004, the total contribution payable by regional participants has been reduced to 8 percent. On the other hand, government employees share the total 17 percent contribution with government, each side contributing 8.5 percent.

Classification		National Pension Scheme	GEPS
Beginning year		1988	1960
Range of the Insured		Residents of Korea aged 18 to 60 except for government employees and a private school teachers	Government employees, public school teachers, judicial officers, police, etc.
Benefit Types		<ul style="list-style-type: none"> - Old-age, disability, nonwidowed, widow/widows' partner, survivor pension - Lump-sum Refund, Lump-sum Death Payment 	<ul style="list-style-type: none"> - Retirement benefit, survivor benefit, disability benefit, retirement allowance - Medical benefits, assistance benefit
Benefit Structure of Old-age Pension	Rate	9% of standard monthly income (employee 4.5%, employer 4.5%)	17% of standard monthly income (employee 8.5%, government 8.5%)
	Benefit Formula	$\text{Old-age pension: } 1.8 \times (A+B) \times (1 + 0.05n) / 12 \text{ month}$ where n: years over 20 years, A: the average income of all insured persons during 3 years before commencement of benefit, B: average income of the beneficiary during entire contribution	$\text{Retirement pension: } (0.5 + 0.02n) \times W$ n: years over 20 years (up to 33 years) W: average remuneration of the insured person during the three years before commencement of benefit
	Benefit Adjustment	Percentage increase in the CPI each year	<ul style="list-style-type: none"> - Before 2000: the rate of increase of remuneration - After 2000: rate of increase in the CPI
	Minimum Age of Benefit	From 60 (65 from 2033)	From 50 (Step by step raise to 60)
	Payment Method	Pension	Pension or lump-sum payment
	Benefit Level	Equivalent to 60% of income (average 40 years of contribution)	Equivalent to 76% of income (average for 33 years of contribution)
Institution		National Pension Corporation	Government Employees Pension Corporation

Source: www.npc.or.kr and www.geps.or.kr

The income replacement rate is estimated at 60 percent for 40 year-participants in the national pension system, whereas it is 76 percent for the 33 years-participant in GEPS. Also, the real value of the income is indexed to the ratio of increase in the CPI(Consumer Price Index) in the two systems. In regard to the type of benefit, lump-sum payment is exceptional in the national pension scheme, but GEPS beneficiaries may select either lump-sum payment or a pension.

There is the minimum contribution period for both schemes, ten years for the

national pension scheme, but twenty years for GEPS. The minimum age for receipt of benefit is sixty for the National Pension Scheme but fifty years for GEPS. This will be raised to sixty-five for the national pension, and sixty for the GEPS. All in all, this indicates that a government employee will still be better off than a participant in the National Pension Scheme.