Fiscal Impacts of Taxation on Pension in Aging Korea: A Generational Accounting Approach

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Abstract

This paper investigates the fiscal impacts of taxation on pension in aging Korea. We approach this issue considering the special feature of Korean pension taxation structure, the EE-half T system with: (i) the provision of too generous tax incentive to pension that allows the deduction for the pension benefits as well as for the pension contributions; and (ii) tax exemption for the revenue from pension funds. We found that the tax exemption for the pension fund revenue will substantially deteriorate the long-term fiscal balance, through the crowding-out of taxable nonpension wealth by the tax exempt pension wealth and its resulting annuitization of wealth, while the provision of the deductions for the pension benefits as well as contributions has only small impacts, because of low effective marginal tax rates for the wage income and the large magnitude of public pension benefits promised compared with the pension contributions.

1. Introduction

While the current proportion of old-age population of Korea is lower than other OECD countries, the speed of population aging is very high. Even though the proportion of the population aged 65 and older was 7.2 percent as of 2000, much lower than the developed countries, the proportion is projected to increase to 23.1 percent in 2030, almost the same as their projected average. This rapid increase in the old-age population proportion implies substantial increase in the number of pension recipients and the pension benefit income in the near future. In addition to the population aging, the provision of public pensions, whose benefit level promised is much higher than that of pension contribution, will also contribute to the increase in the pension benefit payments in the future years. Moreover, the structural problem of the current public pension system, too generous pension benefit promised compared with pension contribution, implies the accumulation of substantial magnitude of the net pension wealth, which is defined as the present value of the pension benefit income minus the pension contributions for the remaining lifetime, and the accumulation will induce rapid increase in the proportion of the pension wealth in the household portfolio.

The increase in the proportion of the pension wealth is highly likely to decrease the tax revenue of the capital-related taxes, such as capital income tax, taxes on asset-holdings, and taxes on asset transactions, in the future, due to the EET Korean pension taxation system, which allows the deduction for pension contributions, exempts the income tax for the revenue of the pension fund, and imposes income tax on pension benefits. The tax exemption for the pension fund revenue will reduce income tax revenue, because a substantial part of the taxable nonpension wealth will be replaced with the tax-exempt pension wealth: the previous researches, such as Diamond and Hausman (1984), Hubbard (1986), Samwick (1995), Munnel (1976), Mireaux and King (1984), Avery et al. (1986), and Gale (1998) studied the issue of the crowding-out of the nonpension wealth by the pension wealth and produced a wide range of the estimates for the degree of the crowding-out[1]. The annuitization of the household portfolio may further decrease the capital-related tax revenue, since the previous researches such as

[1] Diamond and Hausman (1984), Hubbard (1986), Samwick (1995) suggested that the nonpension wealth is crowded out by the amount of 20 percent or less of the pension wealth. Munnell (1976), Mireaux and King (1984), Avery et al. (1986), and Gale (1998) showed that the degree of the crowding-out is much higher, 62 percent offset, 27-50 percent offset, and offset up to 82 percent, respectively. Other pervious researches such as Cagan (1965), Katona (1965), Munnell (1974), Kotlikoff (1979), Blinder et al. (1980), Venti and Wise (1996) showed the possibility of no offset or positive effects on the nonpension wealth. The wide range of the estimates suggests the necessity of estimation of the degree of the offset in Korean situation.

Auerbach and Kotlikoff (1992) and Kotlikoff et al. (1996), suggested the possibility of rise in the propensity to consume resulting from the annuitization of wealth, which will increase (decrease) the consumption (capital-related) tax base. In addition, Korean pension tax system is effectively the EE-half T system, because of the provision of generous pension benefit deduction. This implies the decrease in tax base for the income tax on pension benefit.

The purpose of this paper is to investigate the fiscal impacts of taxation on pension in aging Korea. We approach this issue in 2 aspects: (i) provision of too generous tax incentive to pension that allows the deduction for the pension benefits as well as for the pension contributions; and (ii) tax exemption for the revenue from pension funds. Related with the first aspect, we evaluate the fiscal impacts of 2000 income tax revision which transformed pension taxation structure from the TEE[2] to the EET and provided the generous deduction for the pension benefits. Related with the second aspect, we assess the fiscal impacts of the crowding-out of the nonpension wealth, which implies the substitution of the household wealth from the taxable nonpension wealth to the tax-exempt pension wealth, and the annuitization of wealth, which decreases tax base of capital-related taxes through increase in consumption.

We use the generational accounts (GA) to evaluate the fiscal impacts of the taxation on pension in Korea because the crowding-out of nonpension wealth and the annuitization of wealth, due to the pension taxation, will affect the fiscal balance through the changes in the tax revenue of the future periods. The forward-looking property of the GA enables reliable evaluation of Korean fiscal situation and the fiscal impacts of the crowding-out of nonpension wealth and the annuitization of wealth

Our findings are summarized as follows. First, the transformation of tax structure from the TEE to the EET and the provision of pension benefits deduction have only small effects on fiscal sustainability because of the following 2 reasons: (i) the amount of tax revenue decrease due to deduction for pension contribution is small because of the low effective wage income tax rate; and (ii) the value of the public pension benefit of the future will be so large that it will produce tax revenue large enough to cover the reduction of tax revenue resulting from the provision of pension benefit deduction. Second, we found that the degree of the nonpension wealth offset by the net pension wealth is about 20 percent. The substitution of household wealth from the taxable nonpension wealth to the tax exempt pension wealth will substantially deteriorate the long-term budgetary imbalance. Finally, we showed that the annuitization of wealth will

[2] The TEE system does not allow deduction for pension contributions, and exempts income tax for pension fund revenue and pension benefits.

substantially decrease the tax bases of capital-related taxes, which further deteriorate the public finance in Korea.

The overall results indicate that the deterioration of the long-term budgetary imbalance is primarily due to the tax exemption for the pension fund revenue. However, this does not imply that the effects of the income tax deduction for the pension benefits will be trivial, since the public pension reforms to restore the long-term fiscal balance by increasing the pension contributions and decreasing the pension benefits will amplify the fiscal impacts of the pension benefit deduction provision.

The remainder of the paper is organized as follows. Section 2 and section 3 briefly explain the demographic situation and pension taxation in Korea. Section 4 summarizes the fiscal situation in Korea based on the generational accounts. Section 5 analyses the fiscal impacts of the pension taxation. This section consists of the analyses on the following 3 aspects related with pension taxation in Korea: (i) the transformation of taxation structure from the TEE to the EET and the provision of pension contribution deduction; (ii) the crowding-out of the nonpension wealth by the pension wealth; and (iii) the annuitizaton of wealth. Finally, section 6 summarizes and concludes the paper.

2. Demographic Transition in Korea

Figures 1-3 summarize the population projection based on the 2005 population projection model of National Statistics Office (NSO) of Korea. The 2005 NSO projection covers the period 2004-2050. We extend the population projection up to 2110 using the NSO's assumptions about fertility rates[3], mortality rates[4], and international mobility rates[5]. Baseline calculations are conducted under the assumption that the total fertility rate and age-sex mortality rates will remain constant at their 2050 levels until 2110.

The figures indicate that Korea will experience drastic change in demographic structure as well as total population. The total population is projected to reach maximum level around 2020 and decrease rapidly afterwards. The proportion of the aged 65 and older will increase from 9 percent (as of 2005) up to 39 percent and that of the

[3] We made 3 alternative fertility rate assumptions, high, medium, and low fertility rate assumption. Our base case result is based on the medium fertility assumption (see Table 3).

[4] The average life expectancy is projected to rise from currently 77.9 years (as of 2005) to 83.3 years in 2050.

[5] International movement of population is limited in Korea. For example, net immigration in 2000 was 19 thousand. We assume that the international movement rates remain constant at their 2050 levels until 2110.

economically active population, aged 15-64, will decrease from 71 percent to 52 percent, which implies that while the current proportion of old-age population is smaller than other OECD countries (see Table 2), the speed of population aging is very high, because of a low fertility rate and prolonged life expectancy. In particular, the fertility rate of Korea is much lower than many other OECD countries[6]. Moreover, The NSO projects that the total fertility rate will remain lower than that of many other OECD countries: the fertility rate sharply dropped from 1.47 (2000) to 1.19 (2005) and is projected to rise gradually to 1.30 (2035).

United Nations (1998) projection also shows that the proportion of the population aged 65 and older will increase from 7.2 percent (as of 2000), much lower than the average of developed countries (14.4 percent), to 23.1 percent (2030), almost the same as their projected average (22.6 percent). The time required for the old-age population proportion to increase from 7 percent (14 percent) to 14 percent (20 percent) is 19 years (7 years), which is much shorter than in other developed countries (France (115 years (41 years)), U.S. (71 years (15 years)), Japan (24 years (12 years))). Thus, Korea will age much faster than any other OECD countries.

3. Taxation on Pension in Korea

Taxation on pension consists of three parts: (i) deduction for pension contributions; (ii) taxation on revenue from pension fund; and (iii) taxation on pension benefits. The income taxation of the OECD countries usually adopts one of the two kinds of structure (EET, TEE). The EET system allows the deduction for pension contributions, does not impose the income tax on the revenue from the pension fund, and imposes income tax on pension benefits. On the other hand, the TEE system includes the pension contributions in the income tax base, and does not impose income tax on the revenue from the pension fund or pension benefits. Both the EET and the TEE avoid the double taxation, i.e. the income tax is imposed only once, either when pension contribution is made (TEE) or when the pension benefits are paid (EET).

Korean income tax system adopts the EET. The system was transformed from the TEE to the EET by 2000 income tax revision. The coverage of the pension benefits subject to income tax includes the public pensions, which are composed of the national pension (NPS) and the occupation pensions (OCP)[7], and the private pensions such as

[6] The fertility rate of Korea as of 2004 was 1.19. The rates for other OECD countries are 1.36 (Germany), 1.88 (France), 1.41 (Japan), 2.06 (U.S.), 1.64 (U.K.).

[7] The occupational pensions consist of the pension for government employees (PCS), the pension for private school employees (PPS) and pension for military personnel (PMP).

the retirement pensions and personal pensions, which are the Korean type of the corporate pensions and Individual Retirement Accounts (IRA) respectively.

Korean income tax provides an additional tax incentive to the pension system in the form of the deduction for pension benefits, in addition to the deduction for pension contributions. The magnitude of the deduction for pension benefits is not trivial: it is about half the magnitude of the deduction for wage income, which exempts the income tax for approximately 50 percent of wage income earners in Korea (see Table 4). Therefore, the structure of Korean pension tax system is effectively E-E-half T system, which will deteriorate the government fiscal balance.

4. Current Fiscal Situation: benchmark economy

We use the generational accounts (GA) to evaluate the current fiscal situation and the fiscal impacts of the taxation on pension in Korea due to the following 2 reasons. First, the consolidated budget balance and the national debt, which are widely used as indices for the fiscal sustainability, may cause fiscal illusion in Korean situation. The current consolidated budget surplus is due to the small magnitude of public pension benefit expenditure, resulting from the fact that the history of the NPS, which covers the largest proportion of Korean population, is very short, thus, most of the NPS participants have not acquired the entitlement to the pension benefits. However, maturation of the NPS will increase the benefit expenditure and deteriorate the government budgetary balance in the future, because the NPS promises very generous benefits compared with the contributions. Even though the current level of national debt of Korea is relatively low, it is rising very rapidly. Another reason for the use of the GA is that the crowding-out of nonpension wealth and the annuitization of wealth, due to the pension taxation, will affect the fiscal balance through the changes in the tax revenue of the future periods. The forward-looking property of the GA enables reliable evaluation of Korean fiscal situation and the fiscal impacts of the crowding-out of nonpension wealth and the annuitization of wealth

The generational accounts are defined as the present value of the net tax payments, tax payment to the government minus transfer income from the government, of current and future generations for their remaining lifetime, under the condition that the intertemporal government budget constraints hold: i.e. the future net tax payments of current and future generations have to be sufficient, in present value, to cover the present value of future government consumption as well as service the government's

initial net debt[8]. The traditional GA for the current generations, who are alive in the benchmark year, is computed under the current fiscal rules, whereas the fiscal imbalance due to the current fiscal policies is absorbed entirely by the future generations. Therefore, we use the generational imbalance, the difference between the lifetime net tax payments of future generations and those of current newborn (the aged 0 cohort at the benchmark year), as an index of the long-run budgetary imbalance, since the generational accounts of both newborns and future generations take into account the net tax payments over these generations' entire lifetimes. If future generations bear a heavier tax burden than the newly born do, current fiscal rules will have to be adjusted in the future to meet the budget constraint. We also use the magnitude of the required tax (and transfer) adjustment to attain the long-term government fiscal balance as an index for the fiscal imbalance.

Table 5 reports the traditional GA for Korea, under the assumption that the productivity growth rate is 1.5 percent and the real discount rate is 3.5 percent[9]. The table shows positive values of net payments for most cohorts alive in our benchmark year 2004 for GA calculation, except for cohorts aged 85 or older, indicating that most generations will, on balance, pay more in present value than they receive. This is primarily due to the fact that social welfare benefits such as public pension benefits, Medical Insurance (MI) benefits, Minimum Living Standards Security (MLSS) benefits and other social welfare services (OSTP) were quite small in the aggregate as of 2004. Aggregate public pension and MI benefits were 1.1 percent and 2.1 percent of GDP respectively as of 2004 and those for the MLSS and the OSTP were 0.5 percent and 0.6 percent of GDP respectively. However, maturation of the NPS and the projected increase in social welfare expenditures will increase transfer payments to old-age groups. The row labeled "Future Gen." indicates the present value of amounts that those born in 2005 will, on average, pay, assuming that subsequent generations pay this same amount except for the adjustment for growth. The account for future generations is about 157 percent larger than those for those aged 0, which implies that the current fiscal policies are not sustainable and that a substantial fiscal burden is shifted to future generations.

Table 5 also reports the present value, rest-of-life transfer benefits and tax burdens by

[8] The concept of the generational accounts is explained in the Appendix.

[9] The calculation procedure for the GA for Korea is explained in Auerbach and Chun (2006) and Auerbach et al (2005). The paper updates the accounts under the new population projection and new projections for aggregates and the age-sex distributions of the components of taxes, transfer payments, and government consumption. The accounts are expressed in thousands of won, the domestic currency of Korea. As of April 2006, 954 won were worth about US$1.

category. The substantial negative entries for public pensions and Medical Insurance play a key role in the large overall generational imbalance. On the tax side, three important characteristics of the Korean tax system are: (i) the large share of consumption taxes; (ii) the relative unimportance of labor income taxes; and (iii) the large proportion accounted for by taxes on capital-related taxes, such as capital income tax, tax on asset-holdings and tax on asset transactions. The large share of consumption taxes and capital-related taxes implies that the crowding-out of the nonpension wealth and the annuitization of wealth will change the magnitude of tax bases of consumption taxes and capital-related taxes.

Table 6 reports the generational imbalance and the required tax (and transfer payment) to attain the long-term fiscal balance for Korea. The generational imbalance under the current tax policies (case [1]) amounts to 157 percent. The required tax adjustment is 25.4 percent, if the adjustment is made to all cohorts alive in 2010 and later. Delay in the tax adjustment raises its magnitude. For example, if we delay the required tax adjustment until 2030, it reaches 45.5 percent. If the increase in tax burden is accompanied by the same percentage decrease in transfer payments to attain long-run government budget balance, the magnitude of the required adjustment decreases to 17.1 percent (if the adjustment is made to all the cohorts alive in 2010 and later) and 27.7 percent (if we delay the adjustment until 2030).

5. Assessment of Fiscal Impacts of Taxation on Pension

We evaluate the fiscal impacts of the following 3 aspects related with pension taxation in Korea: (i) the transformation of taxation structure from the TEE to the EET combined with the provision of pension benefit deduction (the EE-half T system); (ii) the crowding-out of the nonpension wealth by the pension wealth; and (iii) the annuitizaton of wealth. The first part of the assessments compares the fiscal imbalance under the alternative two systems, and evaluates the fiscal impacts of 2000 income tax revision, which transformed the pension taxation structure from the TEE to the current EE-half T system. The second part involves the comparison of the decrease in the capital-related tax revenue and the increase in consumption tax revenue, due to the crowding-out of the taxable nonpension wealth, which reduces the capital-related tax base and increases the consumption. The last part evaluates the effects of the increase in consumption and the reduction of wealth accumulation due to the annuitization of wealth.

5. 1. Assessment of Tax System: TEE vs. EE-half T

Table 6 reports the degree of generational imbalance and the required tax (and transfer) adjustment to attain the long-term fiscal balance under the alternative two tax systems: the EE-half T ([1]); and the TEE ([2]). Comparison of economy [1] and economy [2] shows that the transformation from the TEE to the EE-half T has only small effects on fiscal sustainability, even though the current EE-half T system allows generous tax deduction for pension income. The degree of generational imbalance rises from 153 percent to 157 percent. The required tax adjustment rises from 25.0 (44.9) percent to 25.4 (45.5) percent if we raise the tax burden in 2010 (2030). The required tax and transfer adjustment rises from 16.8 (27.3) percent to 17.1 (27.7) percent if the adjustment is made in 2010 (2030).

The reasons for the small fiscal impact are: (i) the amount of tax revenue decrease due to the deduction for pension contributions newly provided under the current system is small, because about 50 percent of wage income earners are income tax-exempt and the effective marginal tax for wage income is also low because of generous wage income deduction; and (ii) the aggregate value of pension benefits payment will be much larger than that of pension contribution burden in the future. The ratio of the aggregate pension benefit expenditure to GDP is projected to increase from currently 1.1 percent to 14.5 percent around 2070, whereas the ratio for the contribution revenue will remain around 3 percent in the future: i.e. the value of the public pension benefit of the future will be so large that it will produce tax revenue large enough to cover the reduction of tax revenue resulting from the provision of pension benefit deduction. However, this does not imply that the effect of pension benefit deduction provision on public finance is trivial. Public pension reforms to restore the long-term fiscal balance by increasing the pension contributions and decreasing the pension benefits will amplify the fiscal impacts of the pension benefit deduction provision.

5. 2. Impacts of the Crowding-out of Nonpension Wealth

The investigation of fiscal impacts of crowding-out of nonpension wealth by pension wealth takes 3 steps: (i) estimation of the degree of crowding-out of nonpension wealth due to the increase in pension wealth; (ii) projection of the revenue changes of capital-related taxes and consumption tax; and (iii) assessment of the effects on the long-term budgetary balance based on the GA.

Estimating Nonpension Wealth Function

We use the 1999-2002 surveys from Korea Labor and Income Panel Study (KLIPS),

which consists of household survey, individual survey and individual's job experience survey, to estimate the nonpension wealth function. The household survey provides data on household's assets, debts, demographics, and consumption. The individual survey and individual's job experience survey contains information needed to compute individuals' net public pension wealth, such as non-capital income and job experience. We merge these 3 surveys to construct a sample, which includes households in which the average of the head's and his/her spouse's age is between 35 and 50. We exclude the household where the head is not employed: i.e. the sample includes the household where the head is wage income earner or the self-employed. We also exclude households without pension wealth.

The dependent variable is the value of the nonpension wealth, which is summation of the value of housing, other real estate, down payment for rented house and net financial asset. Independent variables are the number of household members, the average of the head's age and his/her spouse's, the age squared, the sum of the head's and his/her spouse's non-capital income, the average of the head's and spouse's years of education, the dummy for marital status, the dummy for the head's being a wage income earner, and household sum of net pension wealth.

The net pension wealth is the present value of the public pension benefits minus pension contribution for the remaining lifetime. The pension benefits consist of two parts: (i) the value of benefits based on the pension right which is already acquired by the pension contributions made in the past; and (ii) the value based on the pension benefits which will be acquired by the contributions made in the remaining working periods. We compute the first part of the pension benefits taking into account the work experience of the past. The second part of the pension benefits and the pension contributions for the remaining working periods are computed taking into account the expected income profile and employment status. We assume that each individual's expected income profile is the same as the profile of the average income by age, with the absolute level being the only difference. The expectation on the employment status is that the probability of being employed at each age for the remaining working periods is the same as the employment rate by age and sex.

We adjust the net pension wealth, taking into account the econometric bias shown in Gale (1998). Gale (1998) presented a simple life-cycle model, written as equation (1) to show the possibility of underestimation of the degree of the crowding-out of the nonpension wealth by pension wealth.

A household (or worker) at age or time period 0 chooses current and future consumption to maximize lifetime utility, subject to a lifetime budget constraint and

exogenous cash earnings, pension benefits, and interest rates. If the within-period utility function is isoelastic (constraint relative risk aversion [CRRA]), the household solves the following problem:

$$\max \quad \int_0^T \frac{C_t^{1-\rho}}{1-\rho} e^{-\delta t} dt \quad \text{subject to} \quad \int_0^T C_t e^{-rt} dt \le \int_0^T E_t e^{-rt} + \int_R^T B_t e^{-rt} dt \tag{1}$$

where t indexes age or time, C is consumption, ρ is the coefficient of relative risk aversion, δ is the time preference rate, E is real cash earnings, r is the real interest rate, B is real pension benefits, R is the age of retirement and the age at which pension benefits begin, and T is life span. Maximization of (1) implies the following consumption flow:

$$C_t = C_0 e^{[(r-\delta)/\rho]t} \tag{2}$$

and

$$C_0 = \frac{x}{e^{xT} - 1}\left(\int_0^T E_t e^{-rt} dt + \int_R^T B_t e^{-rt} dt\right), \qquad x = \frac{r-\delta}{\rho} - r \tag{3}$$

Equation (3) determines initial consumption; (2) determines consumption growth. These equations show that the model embodies complete offset between pensions and nonpension wealth: consumption in each period depends on the present value of total resource available, but not on the allocation between wages and pensions. In the preretirement period, nonpension wealth at age A (W_A) equals the accumulated value of all prior earnings less consumption:

$$W_A = \int_0^A (E_t - C_t) e^{r(A-t)} dt \tag{4}$$

Substitution (3) into (2) and the result into (5) yields

$$\begin{aligned} W_A &= \int_0^A (E_t - C_t) e^{r(A-t)} dt \\ &= \int_0^T E_t e^{r(A-t)} dt - Q\int_0^R E_t e^{r(A-t)} dt - Q\int_0^R B_t e^{r(A-t)} dt \end{aligned} \tag{5}$$

where

$$Q = \begin{cases} \dfrac{e^{xS} - 1}{e^{xT} - 1} & if\ x \neq 0 \\ \dfrac{S}{T} & if\ x = 0 \end{cases} \tag{6}$$

and S representing years of service in the pension and, in this example equals age.

Equation (5) relates nonpension wealth to the present value of wages earned to date, the present value of lifetime cash earnings multiplied by an adjustment factor Q, and the present value of future pension benefits multiplied by Q. A regression of nonpension wealth on the right side of (5) would yield a pension wealth coefficient of $-Q$.; Q will fall between one and zero because $S<T$. Thus using the unadjusted pension wealth as an independent variable would underestimate the substitutability of pension wealth for nonpension wealth.

We use the product of the net pension wealth and the adjustment factor Q as an independent variable. The value of Q is computed under the assumption that $r=\delta$, and r=3.5%[10].

Table 7 reports the estimation results of nonpension wealth function. Table 7 shows that using unadjusted net pension wealth underestimates the substitutability between nonpension wealth and pension wealth, which is consistent to Gale (1998)'s theoretical implication presented above. The median regressions tend to yield higher pension wealth coefficients than the ordinary least square regressions, however the difference is not large. The overall estimation results indicate that the degree of nonpension wealth offset by pension wealth is about 20 percent.

Table 8 shows that using the net financial wealth, which is a narrow measure of nonpension wealth, as dependent variable underestimates the degree of the nonpension wealth offset by pension wealth, which is a similar result to that presented by Avery et al. (1986), Engen and Gale (1997), and Gale (1998). The degree of the offset is shown larger for younger age groups. This is primarily due to the fact that the pension wealth of older age groups takes smaller proportion of total wealth than that of younger age groups because of short history of the NPS[11]. For example, the cohort aged 60 (50) as of 2004 was first covered by the NPS at the age of 44 (34). The degree of the nonpension wealth offset for household with higher non-capital income or human wealth, the present value of non-capital income for the remaining lifetime, is shown larger than that for household with lower non-capital income or human wealth.

[10] This value is also used in the computation of the generational accounts.

[11] The NPS was introduced in 1988 and extended its coverage to the whole Korean population in 1999.

Projection of Tax Revenue Change

Based on the results of nonpension wealth function estimation, we assume that 20 percent of nonpension wealth is offset by the pension wealth. As mentioned at the beginning of section 5, we need to compare the effects of nonpension wealth offset on capital-related tax revenue with those on consumption tax revenue.

In order to project the capital-related tax revenue change, we compute the nonpension wealth and pension wealth by age and sex of the future years. The calculation of nonpension wealth starts with the determination of aggregate value of nonpension wealth. We define the aggregate value as aggregate capital income divided by real interest rate (3.5%). Then, we allocate the aggregate nonpension wealth among age and sex groups, based on the distribution of wealth by age and sex, estimated by using the 1999- 2002 KLIPS. For the years following the benchmark year, we assume that the nonpension wealth by age and sex will grow at the productivity growth rate (1.5 percent per annum). Pension wealth by age and sex is computed using a projection model of the NPS, the PCS and the PPS[12]. Then, we compute the magnitude of nonpension wealth reduction by age and sex by multiplying the degree of nonpension offset (20 percent) with the net pension wealth of the corresponding age-sex group. We assume that the tax burden of the capital-related taxes, including capital income tax, taxes on asset-holdings, and taxes on asset transactions, by age and sex of the future year will decrease proportionally to the magnitude of nonpension wealth decrease of the corresponding group due to the pension wealth. The resulting change in the aggregate tax revenue of capital-related taxes is reported in Figure 5. The capital-related tax revenue is projected to decrease by up to 12 percent of that in the economy without pension wealth.

In order to project the consumption tax revenue, we compute the magnitude of the consumption increase which results in the same magnitude of decrease in nonpension wealth using equation (7): i.e. we choose m^* to equate the present value of increased lifetime consumption and the magnitude of the nonpension wealth offset (β^*=0.2) by one unit increase in the pension wealth at the age 0[13].

$$\int_0^T m^* e^{[(r-\delta)/\rho]t} e^{rt} dt = \beta^*, \quad m^* = \frac{\beta^*}{e^{xT} - 1} \tag{7}$$

We adjust the consumption by age and sex for the future years using m^*. We assume

[12] For the details of the projection model, see Auerbach and Chun (2006).

[13] $e^{[(r-\delta)/\rho]t}$ in equation 7 represents age-consumption profile. Therefore, we use the consumption profile estimated using KLIPS to solve for m^*.

that the consumption tax burden of all the age-sex groups increases by the product of m^* and their consumption tax burden in economy without pension wealth (economy [1]). Figure 5 shows that the resulting aggregate consumption increase is up to 3 percent of that in economy [1]. This implies that the crowding-out of the nonpension wealth by pension wealth will decrease the tax revenue in the future periods[14].

Assessment of the Fiscal Impacts

We consider three economies with different degree of the nonpension wealth offset by pension wealth. Economies [3], [4], [5] are the cases of 20 percent, 30 percent, and 50 percent offset of nonpension wealth respectively. Comparison of economy [1] and these economies shows that the crowding-out of nonpension wealth by pension wealth substantially deteriorate the long-term budgetary imbalance. The generational imbalance increases from 157 percent to 173 percent if we assume 20 percent offset. The increase in the generational imbalance is amplified if we assume higher degree of the offset: the 30 (50) percent offset increases the generational imbalance to 181 (198) percent. The 20 percent offset raises the required tax adjustment from 25.4 percent to 28.0 percent, if we adjust 2010. The 30 (50) percent offset raises the required tax adjustment to 29.3 (32.0) percent, if we adjust 2010.

5. 3. Impacts of Annuitization of Wealth

In section 5.2, we show that 1 unit of net pension wealth crowds out 0.2 unit of nonpension wealth, which implies that a substantial part of wealth will be annuitized. The investigation of the effects of the annuitization of wealth on the long-term budgetary balance in Korean context is very suggestive, since the previous researches, such as Auerbach and Kotlikoff (1992) and Kotlikoff et al. (1996), suggested the possibility of rise in the propensity to consume resulting from the annuitization of wealth, which will increase (decrease) the consumption (capital-related) tax base.

The investigation of fiscal impacts of annuitization wealth takes 3 steps: (i) estimation of consumption function with respect to various kinds of wealth including nonpension wealth and pension wealth; (ii) projection of the revenue changes of capital-related taxes and consumption tax; and (iii) assessment of the effects on the long-term budgetary balance based on the GA. The step (i) is needed, because we need to compare

[14] The consumption tax revenue as of 2004 is 46.8 trillion won and the capital-related tax revenue is 44.5 trillion won, which is almost the same as the consumption tax revenue. Therefore, the large difference in the proportional change in the tax revenue between the capital-related taxes and the consumption tax, due to the crowding-out nonpension wealth and resulting consumption increase, implies that the total tax revenue will substantially decrease in future years.

the marginal propensity to consume with respect to nonpension wealth with that with respect to pension wealth to investigate the effects of annuitization of wealth on consumption. The step (ii) and step (iii) are similar to those we take in the assessment of the crowding-out of nonpension wealth.

Estimating consumption Function

We use 1999-2000 KLIPS sample to estimate the consumption functions at the household level, which include the number of household members, primary income earner's age, the age squared, and each household's total values of current asset holdings, human wealth[15], and net pension wealth, as explanatory variables. We include the households, whose head belongs to the age group 15-64, and have positive non-capital income. We exclude the households without pension wealth.

Table 9 shows that the coefficient of the net pension wealth, the marginal propensity to consume with respect to the net pension wealth, is larger than that of the current asset holdings (nonpension wealth), which implies that the annuitization of wealth, the substitution of the pension wealth for nonpention wealth, will increase consumption. The difference in the marginal propensity to consume between the two assets ranges from 0.1 percent to 3.0 percent.

It is remarkable that maturing of the NPS is likely to further increase consumption level. Table 9 shows the coefficient for the product of dummy variables, for the NPS participation as opposed to the OCP, and the value of net pension wealth, is negative and significantly different from 0 in both the pooled sample II and the fixed effect II estimation, which implies that the propensity to consume with respect to net pension wealth is smaller for the NPS participants than that for the OCP participants. It is probably due to the fact that the history of the NPS is very short and most of the NPS participants have not acquired the entitlement to pension benefits. Therefore, it is highly likely that the maturing of the NPS will raise the propensity to consume with respect to the net NPS wealth at least to the level with respect to the net OCP wealth in the future, which will further increase consumption and reduce nonpension wealth accumulation.

Projection of Tax Revenue Change

[15] The human wealth is the present value of non-capital income for the remaining lifetime. We compute the human wealth taking into account the expected income profile and employment status of the remaining working periods. We assume that each individual's expected income profile is the same as the profile of the average income by age, with the absolute level being the only difference between individuals. The expectation on the employment status is that the probability of being employed for the remaining working periods is the same as the employment rate by age and sex.

We compute the change in consumption and wealth accumulation due to the annuitization of wealth, to project the tax revenue change of consumption tax and capital-related taxes. The magnitude of the consumption increase due to the annuitization is the product of the magnitude of the annuitized wealth and the difference between the marginal propensity to consume with respect to pension wealth and that with respect to nonpension wealth. The magnitude of the annuitized wealth is that of the offset nonpension wealth by pension wealth, which is about 20 percent of the pension wealth. We assume that the consumption tax revenue will increase proportionally to the magnitude of consumption increase. We also assume that the capital-related tax revenue will decrease proportionally to the magnitude of nonpension wealth accumulation decrease, which is the magnitude that would be accumulated if there were no annuitization of wealth.

We compute the magnitude of tax revenue change in the following 3 cases where the difference in the marginal propensity to consume is 0.5 percent, 1.5 percent, and 3.0 percent. Figure 6 reports the case where the difference in the marginal propensity to consume is 1.5 percent. In this case, the consumption tax revenue increases by up to 2.7 percent and the capital-related tax revenue deceases by up to 10.7 percent.

Assessment of the Fiscal Impacts

We consider three economies with a different gap between the marginal propensity to consume with respect to the pension wealth and the nonpension wealth: 0.5 percent; 1.5 percent; and 3.0 percent (economy [6], [7], [8] respectively). Comparison of the economy [3] and economies [6], [7], [8] shows that the annuitization of wealth deteriorate the long-term budgetary balance. However, the degree of the deterioration is lower than that by the direct effects of the crowding-out of the nonpension wealth. The generational imbalance increases from 173 percent ([3]) to 178 percent ([7]), if we assume 1.5 percent difference in the marginal propensity to consume. The generational imbalance increases to 183 percent if we assume 3 percent difference in the marginal propensity to consume. The required tax adjustment in the case of the 1.5 percent difference in the marginal propensity to consume, if we adjust in 2010, rises from 28 percent to 28.7 percent and the magnitude will increase to 38.0 (51.8) percent, if the adjustment is delayed until 2020 (2030).

5. Conclusion

We have investigated the fiscal impacts of taxation on pension in aging Korea. We

approached this issue considering the special feature of Korean pension tax structure, the EE-half T system with: (i) the provision of too generous tax incentive to pension that allows the deduction for the pension benefits as well as for the pension contributions; and (ii) tax exemption for the revenue from pension funds. Related with the provision of tax deductions, we investigated the fiscal impacts of 2000 income tax revision which transformed pension taxation structure from the TEE to the EET and provided the generous deduction for the pension benefits. Related with the tax exemption for the pension fund revenue, we investigated the fiscal impacts of the crowding-out of the nonpension wealth, which implies the substitution of the household wealth from the taxable nonpension wealth to the tax-exempt pension wealth, and the annuitization of wealth, which decreases tax base of capital-related taxes through increase in consumption.

Our findings are summarized as follows. First, the transformation of tax structure from the TEE to the EET and the provision of pension benefits deduction have only small effects on fiscal sustainability because of the following 2 reasons: (i) the amount of tax revenue decrease due to deduction for pension contribution is small due to the low effective wage income tax rate; and (ii) the value of the public pension benefit will be so large that it will produce tax revenue large enough to cover the reduction of tax revenue resulting from the provision of pension benefit deduction. Second, we found that the degree of the nonpension wealth offset by the net pension wealth is about 20 percent. The substitution of household wealth from the taxable nonpension wealth to the tax exempt pension wealth will substantially deteriorate the long-term budgetary imbalance. Finally, we showed that the annuitization of wealth will substantially decrease the tax bases of capital-related taxes, which further deteriorate the public finance in Korea.

The overall results indicate that the deterioration of the long-term budgetary imbalance is primarily due to the tax exemption for the pension fund revenue. However, this does not imply that the effects of the income tax deduction for the pension benefits will be trivial, since the public pension reforms to restore the long-term fiscal balance by increasing the pension contributions and decreasing the pension benefits will amplify the fiscal impacts of the pension benefit deduction provision.

This paper focused on the effects of the public pension wealth. The investigation of the fiscal impacts of the ‘Retirement Pension’, which is the Korean type of the employer-sponsored pension and was introduced in 2005, and ‘Personal Pension’, which is the Korean type of Individual Retirement Account, will be an important agenda for the future research, since those private pension plans may further offset nonpension

wealth and annuitize wealth.

This paper needs a methodological revision, because our approach is basically a partial equilibrium approach, which may exaggerate the effects of the pension wealth increase. A general equilibrium approach needs to be considered, because the general equilibrium change in factor prices (i.e. rise in rate of return to capital) resulting from decrease in nonpension wealth may mitigate the crowding-out and annuitization effects.

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Appendix. Generational Accounts

The concept of the generational accounts is based on the government's intertemporal budget constraint. This constraint, written as equation (A-1), requires that the future net tax payments of current and future generations be sufficient, in present value, to cover the present value of future government consumption as well as service the government's initial net debt.

$$\sum_{s=0}^{D} N_{t,t-s} + \sum_{s=t}^{\infty} N_{t,t+s} = \sum_{s=t}^{\infty} G_s (1+r)^{-(s-t)} - W_t^g \qquad \text{(A-1)}$$

The first summation on the left-hand side of (A-1) adds together the generational accounts of existing generations. The term $N_{t,t-s}$ stands for the account of the generation born in year t-s. The index s in this summation runs from age 0 to age D, the maximum length of life. The second summation on the left-hand side of (10) adds together the present value of remaining net payments of future generations, with s representing the number of years after year t that each future generation is born. The first term on the right-hand side of (10) is the present value of government consumption. In this summation the values of government consumption, G_s in year s, are discounted by the pre-tax real interest rate, r. The remaining term on the right-hand side, W_t^g, denotes the government's net wealth in year t – its assets minus its explicit debt.

Equation (A-1) indicates the zero sum nature of intergenerational fiscal policy. Holding the present value of government consumption fixed, a reduction in the present value of net taxes extracted from current generations (a decline in the first summation on the left side of (A-1)) necessitates an increase in the present value of net tax payment of future generations.

The term $N_{t,k}$ in (A-1) is defined by:

$$N_{t,k} = \sum_{s=\max(t,k)}^{k+D} T_{s,k} P_{s,k} (1+r)^{-(s-t)} \qquad \text{(A-2)}$$

In expression (A-1), $T_{s,k}$ stands for the projected average net tax payments to the government made in year s by the generation born in year k. The term $P_{s,k}$ stands for the number of surviving members of the cohort in year s who were born in year k. For the generations who are born in year k, where $k>t$, the summation begins in year k. Regardless of the generation's year of birth, the discounting is always back to year t. A set of generational accounts is simply a set of values of $N_{t,k}$, one for each existing and future generation, with the property that the combined present value adds up to the right-hand side of equation (A-1).

The generational accounts are calculated in two steps. The first step involves calculation of the net tax payments of current generations (the first term on the left-hand-side of equation (A-1)). This is done on the basis of current fiscal rules without being constrained by the intertemporal budget constraint of the government. In the second step, given the right-hand-side of equation (A-1) and the first term on the left-hand-side of equation (A-1), we determine, as a residual, the value of the second term on the left-hand side of equation (A-1), which is the collective payment, measured as a time-t present value, required of future generations. Accordingly, whereas the fiscal burdens for current generations are based entirely on current fiscal rules, the government budget constraint fully determines the fiscal burdens for future generations.

Based on the collective amount required of future generations, we determine the average present value of lifetime net tax payments for each member of each future generation under the assumption that the average lifetime tax payments of successive generations rise at the economy's rate of productivity growth. Leaving out this growth adjustment, the lifetime net tax payments of future generations are directly comparable with those of current newborns, since the generational accounts of both newborns and future generations take into account net tax payments over these generations' entire lifetimes. Measuring the generational imbalance as the difference between two lifetime

tax burdens provides a measure for the sustainability of the public finances. If future generations bear a heavier tax burden than the newly born do, current fiscal rules will have to be adjusted in the future to meet the budget constraint.

In addition to the generational imbalance, we express the fiscal gap, between the current and future generations, using other measures such as the required changes in taxes (and transfer payments) for current and future generations together. We compute the required adjustment in two steps. First, we compute the net payments of both the current and future generations under the current fiscal policies, without being constrained by the intertemporal budget constraint of the government. Then we adjust the tax burden (and the transfer payment) of the generations alive in a specific year and thereafter proportionally to attain the long-term government fiscal balance, which is defined as the situation where the equation (A-1) holds: i.e. the future net tax payments of current and future generations be sufficient, in present value, to cover the present value of future government consumption as well as service the government's initial net debt.

Table 5 reports the generational accounts of Korea under the assumption that the productivity growth rate and the discount rate are 1.5 percent and 3.5 percent per annum respectively. Table 5 also reports the present value, rest-of-life transfer benefits and tax burdens by category. Table 6 reports the indices for the fiscal sustainability, the generational imbalance and the required tax (and transfer) adjustment to attain the long-term government budgetary balance.

Table 1. Demographic Structure and Dependency Ratios of Selected Countries (%)

Country	Demographic Structure						Total Dependency Ratio	
	2000			2030			2000	2030
	0-14	15-64	65+	0-14	15-64	65+		
World	29.7	63.4	6.9	22.4	65.8	11.8	57.7	52.0
Developed Countries	18.2	67.4	14.4	15.4	62.0	22.6	48.4	61.3
Developing Countries	32.5	62.4	5.1	23.6	66.5	9.9	60.3	50.4
Japan	14.7	68.1	17.2	12.7	59.3	28.0	46.8	68.6
U.S.A	21.5	66.0	12.5	17.8	61.6	20.6	51.5	62.3
Italy	14.3	67.5	18.2	11.6	59.3	29.1	48.1	68.6
France	18.7	65.4	15.9	16.9	59.9	23.2	52.9	66.9
China	24.9	68.3	6.8	17.3	67.0	15.7	46.4	49.3
India	33.3	61.7	5.0	22.3	68.0	9.7	62.1	47.1
Korea	**21.1**	**71.7**	**7.2**	**12.4**	**64.6**	**23.1**	**39.5**	**54.9**

Source: United Nations, *World Population Projections*, 1998

Table 2. Speed of Population Aging of Selected Countries

	Year Attained			Number of Years Required for Transition	
Proportion of Old Population[1)]	7%	14%	20%	7%→14%	14%→20%
Japan	1970	1994	2006	24	12
France	1864	1979	2020	115	41
Germany	1932	1972	2012	40	40
U.K.	1929	1976	2021	47	45
Italy	1927	1988	2007	61	19
U.S.A	1942	2013	2028	71	15
Korea	**2000**	**2019**	**2026**	**19**	**7**

Source: United Nations, *The Sex and Age distribution of World Population*, each year
Note: 1) Proportion of the population aged 65 and older.

Table 3. Fertility Assumptions (unit: persons / 1,000 women)

Year	Low Fertility	Medium Fertility (base case)	High Fertility
2000	1.47	1.47	1.47
2005	1.17	1.19	1.21
2010	1.14	1.21	1.27
2015	1.11	1.22	1.33
2020	1.08	1.24	1.39
2030	1.03	1.28	1.53
2035	1.00	1.30	1.60
2050-	1.00	1.30	1.60

Table 4. Wage Income Deduction and Pension Income Deduction

Deduction for Wage Income	
Wage income less than or equal to 5 million won	Total amount
more than 5 million won less than or equal to 15 million won	5 million won + 0.5 × (wage – 5 million)
more than 15 million won less than or equal to 30 million won	10 million won + 0.15 × (wage – 15 million)
more than 30 million won less than or equal to 45 million won	12.25 million won + 0.10 × (wage – 30 million)
more than 45 million won	13.75 million won + 0.05 × (wage – 45 million)
Deduction for Pension Income	
Pension income less than or equal to 2.5 million won	Total amount
more than 2.5 million won less than or equal to 5 million won	2.5 million won + 0.5 × (wage – 2.5 million)
more than 5 million won less than or equal to 9 million won	3.5 million won + 0.2 × (wage – 5 million)
more than 9 million won	4.3 million won + 0.1 × (wage – 9 million)

Table 5. Generational Accounts of Korea (Unit: 1,000 won)

Age	GA Total	Public Pensions	Medical Ins.	Emp. Ins.	WC	MLSS	OSTP	Labor Income Tax	Capital Income Tax	Tax on Asset holdings	Cons. Tax	Tax on Asset Trans.	Other Taxes	Seign-iorage
0	94,271	-11,621	-4,065	177	-12	-3,890	-4,539	11,848	19,073	58,381	5,479	14,572	8,204	164
5	103,036	-12,537	-2,033	183	10	-3,813	-4,533	13,281	21,975	59,392	6,120	15,801	8,674	184
10	113,094	-11,890	-1,004	189	32	-3,722	-4,384	14,802	25,291	60,348	6,827	17,091	9,164	206
15	120,444	-14,847	-485	194	38	-3,651	-4,321	16,441	29,164	61,799	7,650	18,550	9,743	234
20	125,632	-19,655	-529	223	4	-3,549	-4,317	17,844	33,093	62,989	8,504	19,972	10,281	265
25	123,799	-18,527	-2,203	286	-71	-3,393	-4,282	17,755	33,583	61,223	8,802	19,298	10,322	253
30	108,905	-22,824	-4,074	290	-126	-3,321	-4,190	16,572	32,463	56,806	8,875	17,534	9,734	246
35	80,075	-36,793	-6,052	265	-178	-3,263	-4,036	15,481	30,249	51,506	8,554	14,808	8,622	228
40	60,584	-40,878	-8,223	169	-293	-3,246	-3,891	12,878	28,905	45,936	8,186	12,582	7,653	225
45	54,431	-32,085	-10,241	108	-299	-3,220	-3,752	10,058	26,899	40,598	7,839	10,648	6,724	202
50	38,041	-31,555	-11,905	15	-228	-3,094	-3,583	6,587	23,245	35,466	6,987	9,306	5,766	189
55	17,103	-34,041	-12,968	-99	46	-3,042	-3,434	3,156	19,725	29,841	5,699	6,469	4,549	167
60	9,815	-23,684	-12,709	-134	-31	-2,951	-3,301	955	14,860	24,503	4,534	3,348	3,454	155
65	7,974	-12,501	-11,538	-144	12	-2,730	-3,181	88	11,274	19,637	3,219	614	2,504	124
70	5,357	-8,765	-9,313	-176	-100	-2,301	-2,606	0	8,369	15,240	2,395	20	1,749	104
75	4,595	-5,022	-7,286	-134	-81	-1,540	-2,104	0	4,954	12,411	1,391	0	1,240	71
80	2,013	-2,674	-5,727	-101	-62	-1,042	-1,613	0	2,565	8,453	879	0	836	60
85	-193	-1,335	-4,233	-74	-47	-520	-1,209	0	1,082	4,963	380	0	463	41
90	-4,643	-744	-2,944	-51	-34	-392	-874	0	139	70	50	0	59	32
95	-3,646	-797	-2,275	-38	-27	0	-701	0	49	56	6	0	40	23
99	-1,272	-445	-663	-11	-8	0	-208	0	12	17	1	0	12	6
Future gen.	242,007	69,414	4,214	-667	204	-	-	-	-	-	-	-	-	-

Table 6. Policy Simulation Results (%)

	[1][1)]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Generational[2)] Imbalance	157	153	173	181	198	174	178	183
	Required Tax Adjustment							
current	29.2	28.7	32.2	33.7	36.8	32.4	32.9	33.7
future	86.6	85.1	95.2	99.7	108.7	96.2	97.9	100.6
2010	25.4	25.0	28.0	29.3	32.0	28.2	28.7	29.4
2020	33.6	33.0	37.0	38.8	42.4	37.4	38.0	39.1
2030	45.5	44.9	50.2	52.7	57.7	50.7	51.8	53.3
	Required Tax and Transfer Adjustment							
current	20.0	19.7	21.9	22.8	24.8	22.0	22.4	22.8
future	62.1	61.1	67.9	70.9	77.0	68.5	69.7	71.4
2010	17.1	16.8	18.7	19.5	21.2	18.9	19.1	19.6
2020	21.4	21.1	23.5	24.5	26.6	23.7	24.1	24.6
2030	27.7	27.3	30.3	31.7	34.4	30.6	31.1	31.9

Note: 1) [1]: benchmark case (current tax system: EET)
[2]: TEE system
[3]: 20% crowding-out of Nonpension wealth
[4]: 30% crowding-out
[5]: 50% crowding-out
[6]: [3] + Annuitization (MPC increase: 0.005)
[7]: [3] + Annuitization (MPC increase: 0.015)
[8]: [3] + Annuitization (MPC increase: 0.03)
2) Generational imbalance: (net payment of future generations ÷ net payment of age 0 current generation - 1) × 100

Table 7. Nonpension Wealth Functions

	OLS		Median Regression	
	Unadjusted Net pension wealth	Adjusted Net Pension Wealth	Unadjusted Net pension wealth	Adjusted Net Pension Wealth
constant	660.9 (14614)[1)]	388.3 (14620)	-735.6 (8723)	303.8 (9070)
# of household members	674.0*[2)] (177.2)	667.3* (177.3)	563.3* (105.8)	561.3* (110.0)
Age[3)]	-507.3 (700.0)	-503.8 (700.2)	-247.4 (417.8)	-312.6 (434.4)
age^2	10.50 (8.37)	10.61 (8.37)	5.13 (4.99)	6.15 (5.19)
Non-capital Income[4)]	2.18* (0.11)	2.16* (0.11)	2.06* (0.06)	2.04* (0.07)
Years of Education[5)]	739.3* (60.5)	721.0* (60.3)	430.6* (36.1)	415.6* (37.4)
Marital Status	-4188.2* (530.4)	-4091.8* (530.0)	-2104.6* (316.6)	-2025.9* (328.7)
Dum_Wage[6)]	-544.03* (275.33)	-567.89* (274.99)	-0.134 (164.3)	-17.427 (170.6)
Net Pension Wealth	-0.133* (0.046)	-0.184* (0.073)	-0.147* (0.027)	-0.220* (0.045)

Note: 1) represents standard error.
2) significant with confidence level of 95%
3) average of household head's age and his/her spouse's
4) household head's non-capital income + his/her spouse's
5) average of household head's years of education and his/her spouse's
6) Dummy for household head's being wage income earner

Table 8. Effects of Pension Wealth on Nonpension Wealth

		OLS		Median Regression	
		Unadjusted Net pension wealth	Adjusted Net Pension Wealth	Unadjusted Net pension wealth	Adjusted Net Pension Wealth
Benchmark Case (4798) [4]		-0.133*[2] (0.046)[1]	-0.184* (0.073)	-0.147* (0.027)	-0.220* (0.045)
(1)	Dependent Var. : Net financial asset	-0.024 (0.022)	-0.025 (0.035)	-0.030* (0.015)	-0.044* (0.023)
(2)	age≥60 (584)	-0.091* (0.034)	-0.096* (0.049)	-0.050* (0.019)	-0.036** (0.028)
	50≤ age < 60 (1763)	-0.042 (0.076)	-0.060 (0.096)	0.122* (0.045)	0.158* (0.058)
	40≤ age < 50 (3170)	-0.094 (0.058)	-0.152**[3] (0.087)	-0.131* (0.023)	-0.206* (0.038)
	30≤ age < 40 (3004)	-0.270* (0.057)	-0.537* (0.123)	-0.164* (0.037)	-0.345* (.077)
(3)	Non-capital income ≥20million won (2334)	-0.241* (0.065)	-0.354* (0.105)	-0.252* (0.057)	-0.406* (0.086)
	Non-capital income <20million won (2464)	0.060 (0.073)	0.087 (0.109)	0.016 (0.036)	0.003 (0.056)
(4)	Household human capital ≥400million won (2158)	-0.242* (0.067)	-0.357* (0.110)	-0.239* (0.044)	-0.428* (0.072)
	Household human capital <400million won (2640)	0.005 (0.072)	-0.015 (0.109)	-0.023 (0.039)	-0.090 (0.063)

Note: 1) represents standard error.
2) significant with confidence level of 95%
3) significant with confidence level of 90%
4) number of observations

Table 9. Household Consumption Functions

	Dependent variable: consumption							
	1999 sample	2000 sample	2001 sample	2002 sample	pooled sample I	pooled sample II	fixed effect I	fixed effect II
constant	-1057.7* (197.3)[1)]	-1287.0* (219.1)	-1482.5* (219.3)	-1985.8* (235.3)	-1538.0* (111.0)	-1591.4* (119.7)	-3353.1* (383.8)	-3235.9* (431.7)
# of household members	81.32*[2)] (12.57)	116.4* (15.31)	118.2* (14.61)	135.1* (17.08)	86.78* (7.47)	87.52* (7.47)	-19.56 (14.35)	-18.91 (14.35)
age	77.88* (9.02)	84.87* (9.87)	97.24* (9.68)	118.1* (10.49)	97.45* (4.98)	99.72* (5.01)	163.88* (16.56)	163.94* (16.56)
age^2	-0.85* (0.09)	-0.93* (0.10)	-1.09* (0.09)	-1.26* (0.10)	-1.05* (0.05)	-1.07* (0.05)	-1.32* (0.17)	-1.31* (0.17)
Asset holdings(X_1)	0.0232* (0.0012)	0.0218* (0.0014)	0.0260* (0.0012)	0.0230* (0.0013)	0.0238* (0.0006)*	0.0237* (0.0006)	0.0090* (0.0011)	0.0090* (0.0011)
human wealth (X_2)	0.0040* (0.0003)	0.0058* (0.0004)	0.0062* (0.0004)	0.0068* (0.0004)	0.0063* (0.0002)*	0.0064* (0.0002)	0.0042* (0.0003)	0.0043* (0.0003)
net pen. wealth (X_3)	0.0242* (0.0040)	0.0304* (0.0037)	0.0265* (0.0032)	0.0377* (0.0034)	0.0367* (0.0017)*	0.0404* (0.0031)	0.0320* (0.0034)	0.0394* (0.0054)
Dum_NPS[3)]	-	-	-	-	-	18.27 (18.79)	-	-145.88 (230.54)
Dum_NPS×X_3	-	-	-	-	-	-0.010* (0.004)	-	-0.011* (0.005)

Note: 1) represents standard error.
2) significant with confidence level of 95%
3) Dummy variable for National Pension Participant's household

Figure 1. Total Population (1 million persons)

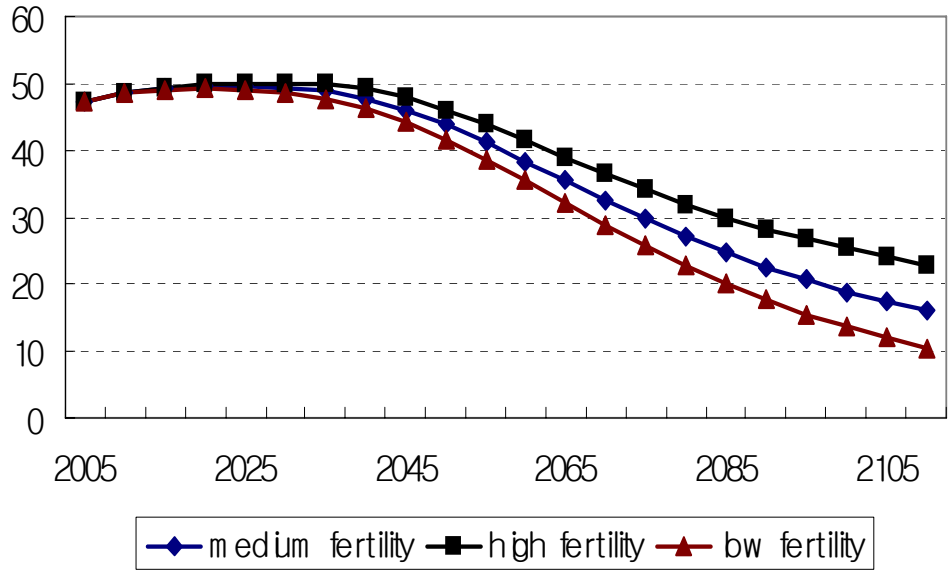

Figure 2. Proportion by age group

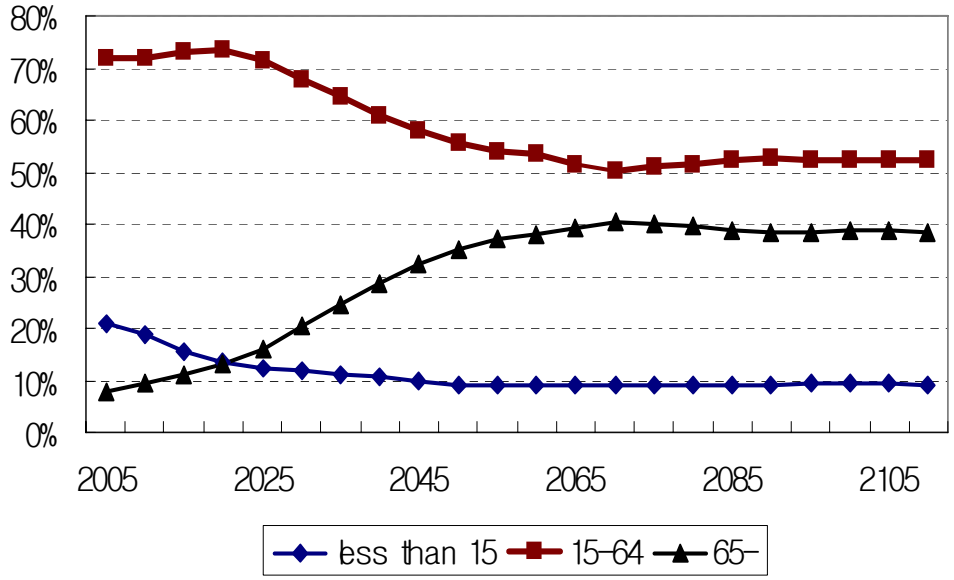

Figure3. Proportion of the aged 65 and older under alternative fertility assumptions

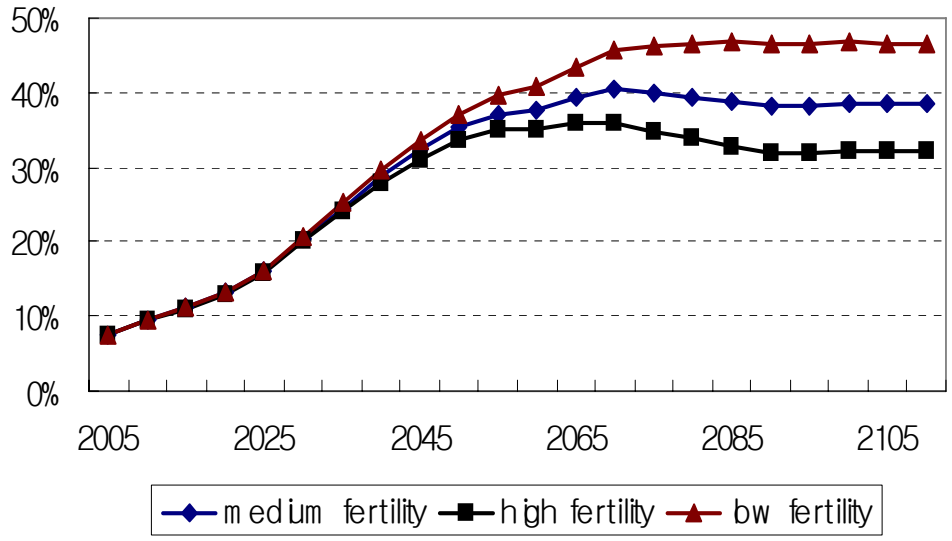

Figure 4. Aggregate Public Pension Benefit and Contribution

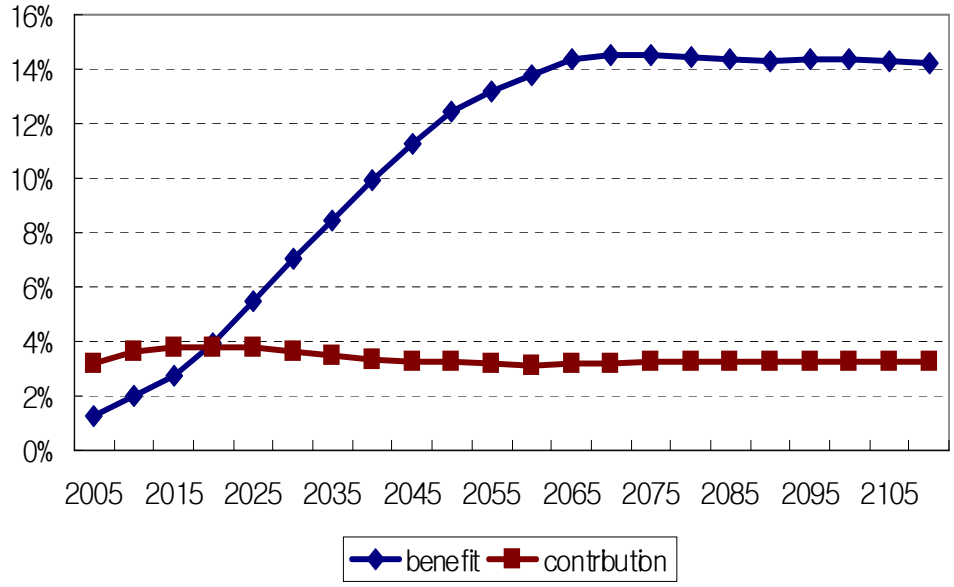

Figure 5. Tax Revenue Effect of Pension Wealth Accumulation
(20% crowd-out of nonpension wealth)

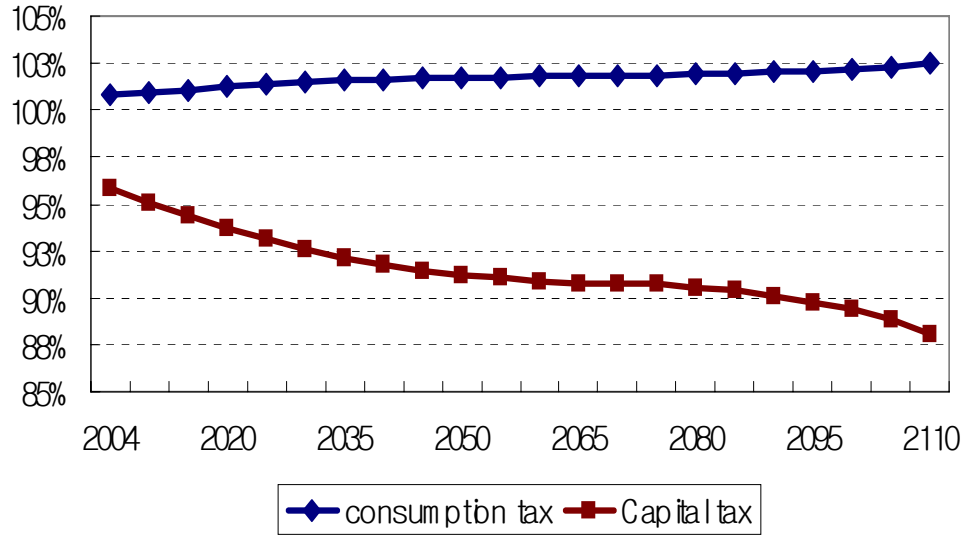

Figure 6. Tax Revenue Effect of Annutization
(1.5% MPC increase)