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The Impact of Aging Population in Korea on Household Saving Rate  
Behavior

By

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ABSTRACT

Korea is entering into the class of an aging population nation. The aging of a population raises some important issues. This paper investigates to what extent does the aging population affect the saving rate, using the life-cycle/permanent income hypothesis, and the tests are carried out with Korean household data from 1977 to 2002. The result of the investigation reveals that real saving rates increase when the duration of lifetime and per household real disposable income rise, and they decrease when the growth rate of income and net worth-to-GDP ratio rises. The growth rate of per household real disposable income has negative effects, suggesting that the households calculate their life cycle income in a forward looking manner. The elasticities with respect to a change in the lifetime horizon and the growth rate of per household income are 0.58 and  $-0.03$ , respectively. A one percent rise in the net worth to GDP ratio reduces the saving rate by 0.3 percent. A one percent rise in per household income increases the saving rate by 0.33. Hence, the saving rates are inelastic to a change in the determinants. The younger age and the elder age dependency ratios have insignificant effects on the household saving rate behavior. When the life expectancy rises, while all other things remaining unchanged, the economy's real net saving rate rises to 31 percent by the year 2020 and declines to 29 percent or less in the year 2030. The real net saving rate of Korea will be lower, even though it will remain still high.

JEL Classification: D1, E21, J1

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I. Introduction

As life expectancy increases, the old aged population has been growing rapidly in Korea. As a result, Korea is entering into the class of an “aging population nation”. So far, it appears that the aging of the population has not affected the social, political, and economic conditions of Korea. However, as the aging population increases, it is expected to have an impact on the economy.

The aging of a population raises some important issues and challenges ahead that need to be addressed, i.e health care, housing, and other related services for the purpose of improving the welfare of the elderly. Providing the above-mentioned services raises some macroeconomic issues for any nation, in particular, their implications on government budgets, productivity, economic growth, financial markets, and foreign exchange markets.<sup>1</sup>

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<sup>1</sup> For research on the implications, and other related issues, see the Cutler, Poterba, Sheiner and Summers (1990), De Serres and Pelgrin (2002), Kohl and O’Brien (1998), Turner, Giorno, De Serres, Vourh and Richardson (1998), Masson and Tryon (1990). For descriptive analysis of the possible effects in Korea, see Lee Bang (2003), Korea Development Bank (2003), Lee Hae Hoon (2002), and Lee Eun Mi (2002).

We are interested in investigating the macroeconomic implication of an aging population on economic growth in Korea. To what extent does the aging population affect the saving rate? How would the aging population affect economic growth of the nation? In light of the importance of the saving rate, which determines the growth per head in a growing economy, the primary focus of this paper is on the effect of an aging population on the household savings rate, using the life-cycle/permanent income hypothesis. We attempt to test the life cycle income hypothesis with the Korean household data from 1977 to 2002.

Following this introductory section, section II discusses the trend of the aging population and labor force in Korea. The old aged dependency ratio and the two aging population indices show an upward trend of aging population in Korea. Section III shows that the saving rate determines the output growth per head, using Solow neo-classical and AK growth models. The main channels through which aging population influences economic growth are its effects on the savings rate and productivity of labor. Section IV presents the saving rate choice of individual consumers under the intertemporal utility maximization rule. Section V sets up the econometric specification of the saving rate hypothesis and discusses the empirical results obtained with the annual data of household in Korea from 1977 to 2002. Section VI offers a summary and some concluding remarks.

## II. Age Profile of Population and Labor Force

### II.1 Population

The population of Korea was estimated to be 25 million in 1960 and the Male and female population were 12.5 and 12.4 million, respectively (see Table 1). The population growth rate declined from 2 percent per year in the 1960s to less than one percent per year in the 1990s. The growth rate of Korean population in the year 2002 was about 0.6 percent. The life expectancy in Korea increased greatly, from about 55 years in the 1960s to 75 years in the 1990s. In the recent years, the life expectancy of female population was 8 years longer than the life expectancy of male population. Currently the life expectancy is growing at 0.7 percent per year.<sup>2</sup>

The share of the population under the age 14 years steadily declined from 43 percent in the 1960s to 21 percent in 2002. The share of the population between the ages 15 and 64 years, which is the economically active population, rose from 54 percent in the 1960s to 71 percent in the year 2002 (see Table 2).

The share of the elderly or aged population, i.e., those age 65 years old and older, rapidly increased from 3.4 percent in the 1960s to 8 percent in the year 2002.<sup>3</sup> As a result of longer life expectancy and lower total fertility rate, the share of the elderly population above the age 80 years increased from 0.3 percent in the 1960s to 1.2 percent in 2002.

The elderly dependency ratio is defined as the ratio of the elderly population to the economically active population. The Korean elderly dependency ratio increased from 6.3 percent in the 1960s to 11.1 percent in the year 2002 and has been rising at an increasing rate.(see Table 3). In the recent years, the elderly dependency ratio grew at a

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<sup>2</sup> For descriptions of aging population phenomenon in Korea, see Lee, Eun Mi (2002) and Bang (2003).

<sup>3</sup> The share of the elderly population is lower than the average share of OECD countries of about 13 percent.

higher than 4 percent rate per year. Korea has experienced a rise in the elderly dependency ratio almost equal to that of OECD countries.

In Korea, the elderly population has been rising while the younger population has been decreasing since 1960. The ratio of the elderly population to the population under the age 14 years increased from about 7.9 percent in the 1960s to 38.5 percent in 2002. The ratio has grown at an increasing rate from a negative 0.6 percent rate in 1960 to 5.9 percent rate in 2002. Although the ratio is called in the literature an index of aging population, it could also be called a burden index of aging population. This non-traditional term reflects more appropriately how many elderly persons would be cared by one young person.

We introduce an aging index of the population, defined as an average of each age group's rank weighted by its share in the total population. We assigned the numbers 1, 2, and 3 to the ranks for the younger, active, and elderly population, respectively. This index shows a trend of the mixture in the population i.e. in the 1960s the index was 1.6 and rose to 1.9 in the year 2002, indicating that the population is moving toward a more aged population.

People in more recent years expect to live longer than in earlier years. This is clearly confirmed by the figures given in Table 4. In 1981, the people 1-4 year old are expected to live 67.1 more years, and there are no age groups higher than 80~84 age group. In 1999, the 1-4 old age group is expected to live 75.6 years more. The age group of 85~89 is expected to live 5 more years. Table 5 contains the population projection. While the rate of increase in Korean population is estimated to fall in immediate future, it

will become negative in the remote future. But, the population aging is projected to grow further. It seems clear that Korea is entering into the class of an aging country.

While the aged population is growing, the education of the working population has been greatly enhanced in recent years. As shown in Table 6, about 28 percent and 9 percent of the population in 1970 completed the primary and middle school education, respectively. About 2 percent of the population completed the university and higher education. In 1995, about 17 percent and 16 percent of the population achieved the primary and middle school education, respectively. The population educated in university and graduate schools is 16 percent of the total population. In 2000, the table shows that the education level of the population is higher. The population who completed the university and graduate schools is about 1.2 percent of the population.

## II.2 Labor Force

As the age composition of the population varies, the age composition of Korean labor forces changes in a similar manner. As revealed in Table 7, the shares of younger age groups tend to decline, while the shares of older age groups tend to rise. Hence, the Korean labor force in recent years has more elderly people.

The rate at which people participate in economic activity is calculated in two different methods. The first method is the traditional measure used in the literature dealing with the issues of aging population and is defined as the ratio of those actively working to the population 15 years old and more. The second method we suggest here is the ratio of the active working labor force to the total population and this measure incorporates the population under the age of 14 years. The rate of population participation

by the first method, as indicated in the table, is 54 percent in 1960 and 60 percent in the year 2002, increasing at a very low rate. The participation rate measured by the second method is 30 percent in 1960 and 48 percent in the year 2002, and it increased at a higher rate than the first measure. This is due to a decreasing trend of the population under the age of 14 years.

In 1981, 56 percent of labor employed in Korea were graduates of primary school and under, while only 10 percent of them were the graduates of university and higher education. (see Table 8). In 2001, the graduates of primary school and under decreased to 13 percent of the labor employed, while graduates of university and higher institutions increased to 25 percent of those employed. If we take into account the numbers of the students currently enrolled at university and higher institutions, the employed who were educated at university and higher will be substantially higher. In addition, the workers in the ages of 25~39, the younger groups of the laborers, educated at higher education institutions, are more than the elderly group of the workers in the age of 40 years and over.

### III Growth Framework.

In order to show the mechanism through which aging population affects economic growth, we will use the well-known neoclassical growth model and the AK model.<sup>4</sup> In these models, we assume that the saving rate is constant and predetermined for expository purposes.

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<sup>4</sup> For extensive discussions and references, see Aghion and Howitt (1998, chapter 1), Barro and Sala-i-Martin (1995), Obstfeld and Rogoff (1997, chapter 7), and Stiglitz and Uzawa (1969)

### III.1 Models

First, we consider the Solow growth model.<sup>5</sup> It assumes there is a diminishing return to rising capital to labor ratio. The production function takes the form

$$y = f(k) = Bk^a \quad (1)$$

where  $y$  is output per unit of labor,  $Y/L$ , and  $k$  is capital per unit of labor;  $k = K/L$ .  $Y$  and  $K$  are output and capital.

Labor input in the production function is man-hours worked adjusted for quality, including aging. When  $n$ ,  $f$ , and  $I$  are the growth rates of population, age-augmented labor productivity, and labor participation, respectively, labor grows at the rate  $n + f + I$ .

It is written as:

$$\dot{L} = (n + f + I)L \quad (2)$$

where a dot over a variable denotes a derivative with respect to time (that is,  $\dot{X}$  is shorthand for  $dX / dt = dX(t) / dt$ ).

Output is divided between consumption and investment. Total output saved is the sum of private saving, government saving, and foreign borrowing. Note that foreign borrowing equals the negative international balance on goods and services. Defining the sum of government saving and foreign borrowing as a proportion of private saving,  $s$ , the proportion of the amount saved to output is private saving rate times  $(1 + s)$ . The private saving rate,  $s$ , is assumed to be exogenous.

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<sup>5</sup> Solow (1956), and see Barro and Sala-i-Martin (1995), pp. 14-37.

Output devoted to gross investment yields new capital and covers depreciation of the existing capital. The existing capital depreciates at rate  $d$ . In equilibrium, the fraction of output devoted to saving equals the fraction of output to gross investment. This is written

$$\dot{k} = (1+s)SBk^a - (n+f+l+d)k \quad (3)$$

where  $1/(1+n+f+l) \approx 1$  is assumed.

In the long run equilibrium, output, capital, and the rate of return on capital are described by

$$\bar{y} = \left[ \frac{(1+s)SB}{n+f+l+d} \right]^{\frac{a}{1-a}} \quad (4)$$

$$\bar{k} = (y/B)^{\frac{1}{a}} = \left[ \frac{(1+s)SB}{n+f+l+d} \right]^{\frac{1}{1-a}} B^{\frac{-1}{a}} \quad (5)$$

$$f'(\bar{k}) = Ba\bar{k}^{a-1} \quad (6)$$

where  $\bar{y}$  and  $\bar{k}$  are the long run equilibrium values of  $y$  and  $k$ .

From (4) to (6), it is clear that  $\frac{\partial y}{\partial s} > 0$ ,  $\frac{\partial k}{\partial s} > 0$ , and  $\frac{\partial f'(k)}{\partial s} < 0$ .

The output level depends on the saving rate. A rise in the saving rate temporarily raises the rate of capital accumulation. It will have no long-run effect on the growth rate, but it will have the long-run effect on the level of output and capital per labor. This level effect differs from the growth rate effects to be obtained from the AK model, as we will discuss later. A rise in the saving increases output, capital, and decreases the return on capital.

Now, we consider the AK model.<sup>6</sup> The AK model provides the essential macro mechanics of endogenous growth model. The production function assumes that output is linear to capital, so that there is constant return to raising the capital-to-labor ratio. The production function takes the following form:

$$y = Ak \quad (7)$$

The path of capital accumulation follows

$$\dot{k} = (1+s)Ak - (n+f+l+d)k \quad (8)$$

The growth rate of  $k$  is denoted by  $h$ :

$$\dot{k} = hk \quad (9)$$

We know that the rate of growth in output equals  $h$ ; hence, the rate of output growth is described by

$$h = (1+s)A - (n+f+l+d) \quad (10)$$

Figure 1 shows the working mechanism of the AK model. Let us assume that  $A$  is given by  $A_0$ . Line  $A$  is horizontal at  $A_0$ . Line  $h$  is positively sloping. The equilibrium is attained at  $h_0$  where line  $A$  intersects line  $h$ . When the saving rate and capital productivity rise, line  $h$  shifts to right, resulting in a higher  $h$ . Comparing equations (4) and (10), we find that the direction of a change in an exogenously given parameter is the same in the two models. Thus, our discussions below are based on the results of the AK model.

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<sup>6</sup> For detailed discussions, see Aghion and Howitt (1998, pp.24-30), Barro and Sala-i-Martin (1995, pp.39-42), and Pagano (1993).

### III.b The implications of an aging population

We examine the effects of an aging population on growth from the above AK model. We consider here two cases where the aging population leads to a fall in the saving rate and a decrease in the age-augmented labor productivity. If the aggregate saving ratio decreases, it will lower growth in output per worker. Lowering growth in the labor force resulting from a general decline in the productivity of labor is reflected in a slowdown in the growth in output per worker. While the life expectancy rises, if the elder workers are encouraged to stay in the labor force, while the lifetime expectancy rises, i.e, a rise in  $I$ , it would prevent the decrease in the growth of the working age population and economic growth.

One can extend the framework to an open-macroeconomic perspective. A rise in capital productivity causes capital inflows and an appreciation of home currency. Consequently the current account will be in a deficit. Hence,  $S$  rises, resulting in a rise in output growth. A decrease in the government saving induced by a rise in the health costs and pension commitment for the elder persons reduces  $S$  and thus national saving. This would lower the capital stock or crowd out net exports.

The above theoretical growth models provide the basis of a general structured simulation model for analyzing macro economic issues of an aging population. A simulation model needs to incorporate the saving rate and the growth rates of population, labor efficiency, and participation rate in different age groups.<sup>7</sup> To make it richer, it would extend to link the sector of the government saving, foreign saving, capital inflows, exchange rate, interest rates, and monetary policy feedback rules in an open economy.

### III.c Aggregation over ages

The aggregate saving rate and labor productivity are related to the structure of aging.

They are written implicitly as  $s=(s_1, s_2, \dots, s_j)$ , and  $f=(f_1, f_2, \dots, f_j)$ , where  $s_j$  and  $f_j$  are the saving rate and labor productivity of age group  $j$ . A plausible weight would be based on the income shares.

Aggregate income and saving are the sum of income and saving of individual aging groups. Let  $N_j$ ,  $Y_j$ , and  $S_j$  be the number of persons, output, and saving in  $j$ th age group. Aggregate saving and output are

$$S = N_1 S_1 Y_1 + N_2 S_2 Y_2 + \dots = \sum_{i=1} N_i S_i Y_i \quad (11)$$

$$Y = N_1 Y_1 + N_2 Y_2 + \dots = \sum_{i=1} N_i Y_i \quad (12)$$

The aggregate saving rate may be expressed as,

$$s = \frac{S}{Y} = \frac{N_1 Y_1}{Y} s_1 + \frac{N_2 Y_2}{Y} s_2 + \dots = \sum_{i=1} \frac{N_i Y_i}{Y} s_i = \sum_{i=1} m_i s_i \quad (13)$$

where  $m_i = \left(\frac{N_i}{N}\right)\left(\frac{Y_i}{Y}\right)$ ,  $\bar{Y} = (\sum_i N_i Y_i) / N$ ,  $N = \sum_i N_i$ .

Equation (13) shows that the aggregate saving rate is the weighted average of each age group's saving rate and the weights are each individual age group's share in total population times the shares in aggregate income. Equation (13) indicates that to investigate the impact on the aggregate saving rate of a change in the age structure, the age profile of income information is necessary. The growth rate of aggregate labor efficiency or productivity can be generated in similar schemes.

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<sup>7</sup> Kwack and Lee (2003) covers the cost and production structure of the Korean economy in details.

#### IV. Saving Rate under the Life-Cycle/Permanent-Income Hypothesis

The saving rate plays an important role in determining the macroeconomic effects of population aging.<sup>8</sup> Instead of the saving rate assumed earlier, this section discusses the behavior of the saving rate under the life-cycle/permanent income theory (Friedman (1957) and Modigliani and Brumberg (1954)).<sup>9</sup>

Consider an individual who lives for T periods where there are perfect capital markets. His /her utility is

$$U = u(C_t) \quad u'(\cdot) > 0, \quad u''(\cdot) < 0, \quad (14)$$

where  $u(\cdot)$  is the instantaneous utility function and  $C_t$  is consumption in period t. The individual has net wealth of  $W_{t-1}$  and labor income of  $Y_t$ . The individual's budget constraint is

$$\dot{W}_{tt} = r_t W_{t-1} + Y_t - C_t \quad (15)$$

We assume that he determines his consumption over his lifetime. We set the lagrangian for his utility maximization problem subject to the budget constrain as:

$$L = \int_0^{\infty} [U(C_t) + I_t (\dot{W}_{tt} - r_t W_{t-1} - Y_t + C_t)] e^{-rt} dt \quad (16)$$

The first-order conditions are

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<sup>8</sup> The life cycle income hypothesis together with the neo-classical growth theory is close to the growth model of Ramsey (1928).

<sup>9</sup> I follow, more or less, the descriptions of Romer (1996, chapter 7). For further details, see Barro and Sla-I-Martin (1995, pp.60-66), and Weil (1989).

$$u'(C_t) = I_t \quad \frac{\dot{I}_t}{I_t} = (r - r_t) \quad (17)$$

From (17), the time path of consumption is described by

$$\frac{\dot{C}_t}{C_t} = \frac{1}{q}(r_t - r), \quad q = -\frac{u''(c)C_t}{u'(c)} \quad (18)$$

Let us assume that the consumer has time-additive isoelastic preferences given by

$$U_t = \frac{C_t^{1-q}}{1-q}, \quad q > 0 \quad (19)$$

Equilibrium per capita consumption from (18) obeys the familiar first-order Euler condition

$$\frac{\dot{C}_t}{C_t} = \frac{1}{q}(r_t - r) \quad (20)$$

In the long-run equilibrium, consumption is constant. This case arises when the time rate of discount equals interest rate. For simplicity without loss of generality, we assume that the individual's time rate of discount and interest rate are equal and are zero, as done by Romer (1996, p310).<sup>10</sup> When the interest rate and the discount rate are not equal, the assumption would have only modest effects on the analysis in this section.

Under the assumption of zero interest rates. the budget condition over his lifetime is written in a discrete form:

$$C_t = \frac{1}{T} \left( W_0 + \sum_{t=1}^T Y_t \right) \quad (21)$$

$W_0$  is his initial net worth and labor incomes of  $Y_1, Y_2, \dots, Y_T$  in the T periods of his life.

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<sup>10</sup> Our presentation below follows the description of Romer (1996) on life cycle hypothesis, until the specification of life cycle /permanent income..

The individual's saving in period  $t$  is the difference between income and consumption. Saving is high and low when income is high and low relative to its permanent-income or life-cycle income. Thus, saving is utilized to smooth the path of consumption over the consumer's lifetime. Saving is described by

$$S_t = \left( Y_t - \frac{1}{T} \sum_{t=1}^T Y_t \right) - \frac{1}{T} W_0 \quad (22)$$

The saving rate,  $s_t$ , is  $S_t/Y_t$ , that is,

$$s_t = \left( 1 - \frac{1}{TY_t} \left( \sum_{t=0}^T Y_{t+t} \right) \right) - \frac{W_0}{TY_t} \quad (23)$$

Let us assume that the individual expects his future income to grow at the current rate of growth,  $g$ , until he retires at  $t+w$ :

$$\sum_{t=0}^T Y_{t+t} = Y_t \sum_{t=0}^w (1+g)^t = Y_t \left( \frac{1-(1+g)^w}{-g} \right) \quad (24)$$

According to the binomial theorem,

$$(1+g)^w = 1 + wg + \frac{w(w-1)}{2!} g^2 + \frac{w(w-1)(w-2)}{3!} g^3 + \dots \quad (25)$$

Substitution of  $(1+g)^w$  in (24) by the second order approximation of equation (25)

yields:

$$\sum_{t=1}^T Y_t = Y_t \frac{w}{2} g \quad (26)$$

Combining of (23) and (26) leads to

$$s_t = \left( 1 - \frac{ng}{T} \right) - \frac{A_0}{TY_t}, \quad n = w/2 \quad (27)$$

Equation (27) is our theoretical specification of life cycle income hypothesis on individual household saving rates.<sup>11</sup>

The properties of the saving rate given in (27) are:

$$\frac{\partial s}{\partial T} = (\mathbf{n}g + (A_0 / Y_t))T^{-2} > 0$$

$$\frac{\partial s}{\partial \mathbf{n}} = -\frac{g}{T} < 0$$

$$\frac{\partial s}{\partial g} = -\frac{\mathbf{n}}{T} < 0$$

$$\frac{\partial s}{\partial Y_t} = (A_0 / T)Y_t^{-2} > 0$$

$$\frac{\partial s}{\partial A_0} = -(TY_t)^{-1} < 0$$

A rise in the expected length of earning periods relative to the life expectancy,  $\mathbf{n} / T$ , decreases the saving rate, as shown by Modiglian and Sterling (1983). It is worth pointing that the current rate of income growth represents the expected rate of future income growth. The effect of a rise in the growth rate of income on the saving rate is negative. A negative relationship between the growth rate of income and saving rate comes about as a result of a rise in the expected growth rate of future income leads to a rise in the life cycle or permanent income. Modiglian and Rhomberg (1954) presented a positive relationship. Farrell (1970) carefully analyzed the magnitude of growth rate effects on aggregate saving and concluded that the growth rate effects are not necessarily

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<sup>11</sup> Life cycle income hypothesis is better suitable in explaining individual household saving behaviors than national saving including government saving and foreign saving.

positive.<sup>12</sup> For growth rate of 4 percent, the saving to income ratio will be negative. Russell (1977) argued that Modiglian and Rhomberg (1954) did not assume perfect foresighted knowledge of future income. They assume that in each year, he extrapolates his current income over his future earning-span. Earlier Modigliani (1966) noted that even if he did correctly foresee his income stream, he used his current income, because of the difficulty to borrow due to capital market imperfection.<sup>13</sup> If we assume that the income at the preceding period represents the life cycle / permanent income, the transitory income equals a change in the income, and, thus, equation (23) yields a positive growth rate effect.<sup>14</sup>

## V. Econometric Specification and Empirical Results

### V.1 Equation Specification

In Section IV, we set up a life-cycle/permanent-income hypothesis on saving rates. We assume that the amount saved is the sum of  $\mathbf{a}$  portion of the current income and  $(1 - \mathbf{a})$  portion of the transitory income which is the current income minus life cycle income. The saving rate hypothesis can be written:

$$s_t = \mathbf{a} + (1 - \mathbf{a})\left(1 - \frac{\mathbf{ng}}{T}\right) - (1 - \mathbf{a})\frac{W_0}{TY_t} \quad (28)$$

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<sup>12</sup> Fry and Mason (1982) argue that the sign on the growth rate of effect on aggregate saving rate is either positive or negative. Were saving concentrated among younger (or older) households, the effect would be positive (or negative).

<sup>13</sup> See Modiglian (1986) for summarized description of life-cycle hypothesis.

<sup>14</sup> Bentzel and Berg (1983) assume that life cycle /Permanent income is a geometrically declining weighted average of past income.  $Y_t^p = \sum_{i=0}^n I^i Y_{t-1-i} = Y_{t-1} + \sum_{i=1}^n I^i Y_{t-1-i}$ . They assume that the value of weight parameter is small enough to ignore the second term.

If the estimated  $\alpha$  equals zero, (28) is the same as equation (27), a pure form of life cycle hypothesis of the saving rate.

Korean financial markets were not perfect and were extensively regulated by the government, even though the intervention of the government has been greatly restrained in recent years. Especially, loans by banks to individuals were very restrictive. Until recently, no significant credit and mortgage loans were available to consumers. Restrictions and imperfections in consumer loan markets are likely to raise household saving rates.<sup>15</sup> In light of this expectation, let us introduce a measure of the restriction on loans by banks to households. It is very hard to find appropriate measures of the capital market imperfections, namely actual loans relative to the amount households are willing to borrow from banks. Outstanding commercial bank loan to the individual sector as the proportion of Korean GDP is considered here to be a proxy for such imperfections.<sup>16</sup> As we will discuss later, the Korean household sector is divided into eight groups by age. The information on net worth of an individual age group is unavailable.<sup>17</sup> Instead, the available net worth of the individual sector of the economy is utilized.

In addition, the saving rate of individuals at a higher per capita income level would be higher than at a lower per capita income level. Hence, we introduce per capita income. The age interval is a period of five years beginning from 25 years age up to 54 years old. However, there are two distinct groups; 24 years old and below, and 55 years old and above. These two groups differ from the other groups in terms of the age interval. To capture the possible differential effects, let us introduce two dummy variables, i. e.

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<sup>15</sup> See Deaton, Angus, (1991), Ando, A., L. Guiso, D. Terlizzes, and D. Dorsantivil, (1992), and Jappelli, and Pagano, (1989), and Zeldes (1989).

<sup>16</sup> Bentzel and Berg (1983) uses a similar credit-to-GDP ratio in Sweden.

D24, and D55 for the group of age 24 and below, and age 55 years and above, respectively..

The proposed econometric specification takes into account the life-cycle saving rate hypothesis and the other determinants we have introduced- the imperfections in consumer loan markets, per capita income level, and the two dummy variables. It is specified in a linear form:<sup>18</sup>

$$s_j = \mathbf{b}_{1j} + \mathbf{b}_{2j}T_j + \mathbf{b}_{3j}g_j + \mathbf{b}_{4j}\frac{W}{GDP} + \mathbf{b}_{5j}\frac{LB}{GDP} + \mathbf{b}_{6j}Y_j + \mathbf{b}_{7j}D24 + \mathbf{b}_{8j}D65 \quad (29)$$

In (29), for age group  $j$ ,  $s_j$  is real saving per unit of the household real disposable income,  $T_j$  is the years of lifetime horizon of the household, which is the nationwide average life expectancy minus the mean ages of age group  $j$ ,  $g_j$  is the growth rate of the household real disposable income, and  $Y_j$  is the household real disposable income.<sup>19</sup>  $W$  is real net worth of the individual sector of the economy at the beginning of period;  $LB$  is real loans outstanding of commercial banks to the individual sector of the economy;  $D24$  is the dummy variable for 24 and under age group;  $D65$  is the dummy variable for 55 and older age group.

## V.2 Empirical Results

Since our interest is the saving rate behavior of households in different ages, let us consider eight different age groups, i.e, the ages of, 24 years & below, 25~29 years, 30~34 years, 35~39 years, 40~44 years, 45~49 years, 50~54 years, and 55 years & above,

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<sup>17</sup> The National Statistical Office, *Annual Report on the Family Income and Expenditure Survey* does not contain net worth or asset holding information by ages. It seems no such data are available in Korea.

<sup>18</sup> Time subscript is dropped in the text, unless it is necessary to avoid ambiguities.

based on the breakdown in the National Statistical Office, *Annual Report on the Family Income and Expenditure Survey*, and *Report on Population and the Housing Survey*. It would have been more informative if it were possible to break down further the age group of 55 years and older into several different age groups, for example, the ages of 55~59 years, 60~64 years, 65~69 years, and 70 years and older. Since the mean ages of the group of 55 years and older are in the range of 58 to 60 years old, we regard this group as the age group of 55~64 years.

Equation (29) was estimated with the pooled cross-age session time series annual data of the Korean household sector between 1977 and 2002. The primary sources of the data are *Annual Report on the Economically Active Population Survey*, *Annual Report on the Family Income and Expenditure Survey*, *Report on Population and Housing Census in Korea*, *Major Statistics of the Korean Economy*, *Korea Statistical Yearbook* and [www.nso.go.kr](http://www.nso.go.kr) by the National Statistical Office (NSO); *National Account*, and *Flow of Fund Accounts in Korea* published by the Bank of Korea; and *Report on Wage Survey by Occupational Category* published by the Ministry of Labor.

Computation of household nominal income, disposable income, consumption, and saving for different age groups was done using data from the National Statistical Office, *Annual Report on the Family Income and Expenditure Survey* and *Report on Population and Housing Survey*. The real disposable income and consumption are obtained by dividing the nominal disposable income and consumption by the implicit GDP deflator and consumption deflator, respectively. The real saving is the difference

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<sup>19</sup> Theoretically, it is real labor income. Since the household's non-labor income is small, the household's disposable income is used.

between the real disposable income and the real consumption, and the savings rate is the ratio of the real saving to the real disposable income.

To compute the expected lifetime horizons of each individual age group, the data used are the Korean average life expectancy data from the NSO's *Major Statistics of the Korean Economy*, *Korea Statistical Yearbook* and [www.nso.go.kr](http://www.nso.go.kr), while the mean ages of each individual age group are from the NSO's *Annual Report on the Family Income and Expenditure Survey*. The lifetime horizon of an age group is the difference between the Korean average life expectancy and the mean age of each individual age group.

The household real net worth is the net worth of the individual sector divided by the implicit GDP price deflator. The net worth of the individual sector is from the Bank of Korea's *Flow of Fund Accounts in Korea*. The loans of commercial banks to the individual sector are also from the Bank of Korea's *Flow of Fund Accounts in Korea*. The real bank loans are the bank loan outstanding divided by the implicit GDP deflator.

Before presenting the regression results, let us observe the real saving rates by the age groups in Table 9. The Korean household saving rates appear to be humped shapes.<sup>20</sup> The saving rates in the four age groups covering the ages from 30 to 49 years are higher, around 28 percent, while the saving rates for the younger and elderly groups, are lower, about 24 and 25 percent, respectively. The saving rate of the age group of 55 years & above is slightly higher than the saving rate of the age group of 50~54 years, particularly in the recent years. The higher saving rate instead of more dissaving according to the life-cycle hypothesis would be a reflection of Korean retirement plans to let retirees receive

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<sup>20</sup> Hump phenomenon also is reported to have happened in Japan. See Horioka (1990), and Takayama and Kitamura (1994).

lump sum payment at the time of their retirement.<sup>21</sup> In addition, the persons in the ages of 55 years and older realize the need for more saving for the future, as they believe that their life expectancy is longer.<sup>22</sup> Chart 1 shows the trend of saving rates by ages over time. The trend follows, more or less, the prediction of the life cycle hypothesis, although it does not follow by a 100 percent

The preliminary regression finding is that the bank loans to the GDP ratio, LB/GDP, were found to be marginally significant.<sup>23</sup> Regressions were run with and without this variable. We found that the estimated equations had low Durbin-Watson statistics. This is not surprising, as our equations are likely to miss many factors affecting the behavior of household saving rates. However, the overall results are very satisfactory.

Table 10 presents eight regressions. The eight equations differ, depending on whether the data used for the income variable is the household's real disposable income or the per capita real GDP. Further, the saving rate of a one year time lag was tried to estimate a rate of adjustment of the saving rate. The coefficient estimates of the one year lagged saving rate variable are about 0.45 in equations (10.3), indicating that the adjustment of the saving rate is slow.

As it can be observed from the estimated equations, all the variables have expected signs of their coefficient estimates. The coefficient estimates of the variables excluding the ratio of the bank loan to GDP are highly significant. Other things being equal, the

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<sup>21</sup> The lump payment is a legal option, see Hyun and Cho (2000). For a discussion on Korean corporate retirement system, see Bang (1998)

<sup>22</sup> In the presence of lifetime uncertainty, individuals want to undertake precautionary wealth accumulation. In this case, the saving rate will not be negative among retirees. See Abel (1985), Hayashi and Ando (1988) and Yaari (1965).

<sup>23</sup> The variable with a lag of one year was tried, but did not yield significant coefficient estimates. Also, the consumer loans by financial institutions yielded very insignificant coefficient estimates. Collins (1994, p.249) used the growth in domestic credit to GDP as an indicator of consumer credit constraints. She reported no significant relationship between the national saving rate and this variable.

coefficient estimates for the lifetime horizon,  $T$ , indicate that as a longer lifetime horizon is expected, the saving rate of the household rises. The sign on the growth rate of per household real disposable income is consistently negative. This suggests that the households calculate their life cycle income in a forward-looking manner. The result of a negative growth rate effect differs from the finding of a significant positive relationship between the national and private saving to GDP ratios and unanticipated real GDP growth by Collins (1994) in the household sample period of 1971-1988. Collins (1994) inferred that Koreans regarded current income growth as transitory income.<sup>24</sup> In the period from 1989 to 2002 that is included in our sample, but not included in the sample period of Collins, the Korean economy has continued to maintain high growth rates and has become highly open and more liberalized. In this period, we expect that Koreans would have expected their income to grow at higher rate and hence regarded their income changes as permanent income change.<sup>25</sup> A closer look at our result and Collins's finding suggest that our result does not contradict to the Collins's finding and the difference is due to the difference in the sample periods under investigation. A rise in the ratio of the real net worth per GDP is found to reduce the saving rate, as expected. The household real disposable income has a positive effect on the saving rate, namely, as real income per household is higher, households save more than what would be when their income were low.

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<sup>24</sup> In Collins (1988, p.344), she stated that "current income is negatively related to income in the previous 2 years" Her interpretation of this result is that high current income is viewed as transitory.

<sup>25</sup> Fry and Mason (1982) found a positive effect on the national saving rates, using the pooled cross country time series data of seven Asian developing countries, Burma, India, Korea, Malaysia, Philippines, Singapore and Taiwan in the sample period of 1962-1972. Most studies for OECD countries appear to suggest that the coefficient estimates on growth rate variables are unstable, and the signs on them also vary. See Graham (1987, 1989) and Koskela and Viren (1989).

The coefficients of two dummy variables are statistically significant. D24 has a negative coefficient, and D65 has a positive coefficient. The saving rate of the age group of 24 years and lower is lower than the average ratio of the saving to the current income. The saving rate of the age group of 55 years and older is higher than the average ratio. This might be a reflection of the individual decision to save more for precautionary purpose as they get closer to their retirement.

The duration of lifetime expectancy,  $T$ , is a demographic factor in the specification. We have not seen empirical studies on saving rates that used the lifetime horizon. Hence, we are interested in testing whether the results obtained with and without the variable differ statistically. We computed the  $F$  statistics, 162 from equations (10.3) and (10.4). These statistics exceed the critical value of  $F_{(1,201)}$  ratio at one percent level of significance, 6.85. Hence, we reject the null hypothesis that the coefficient of  $T$  variable is zero. Hence, the lifetime horizon variable is one of the most statistically significant determinants and greatly contributes to the explanation of saving rate variations.

Table 11 summarizes the computed elasticities of saving rates with respect to a change in the determinants at their sample mean values. The elasticities computed from equations (10.1)-(10.3). Our discussions are made on the elasticities computed with equation (10.2). The elasticities with respect to a change in the lifetime horizon and the growth rate of real disposable income are 0.58 and  $-0.03$ , respectively. A one percent rise in the net worth to GDP ratio reduces the saving rate by 0.3 percent. On the other hand, a one percent rise in per household real disposable income increases the saving rate by 0.33. Hence, the saving rates are inelastic to a change in the determinants.

Large numbers of past empirical studies on economy-wide national saving rates found the importance of younger age dependency ratio and older age dependency ratio.<sup>26</sup> On testing (not reported here) whether the two dependency ratios serve as additional determinants of the household saving rates, the test results were not affirmative. In light of negative outcomes, we decided to run regressions of a variant of the specification commonly used.<sup>27</sup> The specification is follows:

$$s = b_1 + b_2g + b_3D24 + b_455 + b_5YDEP + b_6ODEP \quad (30)$$

where YDEP is younger age dependency ratio defined as the ratio of the population of 14 years old and under to total population, and ODEP is older age dependency ratio as the ratio of the population of 65 years old and above. The two dependency ratios are constructed using the data from the *Annual Report on the Economically Active Population Survey*, and *Major Statistics of the Korean Economy*, and [www.nso.go.kr](http://www.nso.go.kr). The regression results are given in Table 12. The coefficient estimates of the growth rate in income variables are close to those given in Table 10 and are negative. The coefficient estimates of D24 are significantly negative, as the same as in Table 10. The sign of the coefficient estimates of D65 differs from a positive sign reported in Table 10. The estimates are insignificant at a 5 percent level of significance. The younger age dependency ratio has a negative coefficient. The estimates are insignificant. The elder age dependency ratio has insignificant coefficient estimates. In the light of this evidence, the

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<sup>26</sup> Leff (1969) introduced a relationship between aggregate saving ratios and dependency ratios. Since then, many empirical studies reported statistically significant negative relationship and also insignificant relationship. It seems that the empirical results are inconclusive. For a summary of the empirical studies that obtained a negative result, see De Serres and Pelgrim (2002), Heller and Symansky (1997, p.11), Meredith (1995, p.37), Ram (1982), Turner, Giorgio, De Sees, Vour'ch, and Richardosn (1998, p. 46).

<sup>27</sup> The specification without D24 and D55 is the one used by Heller and Symansky (1997).

two dependency ratio variables do not seem to be of importance in explaining the household saving rate behavior in Korea during our sample period.<sup>28</sup>

Heller and Symansky (1997, p. 35) reported their regression results which indicated that for the Asia “Tigers”, the national saving rates were positively related to the growth rate and negatively to the dependency ratios. They also maintained that the private saving rates were not statistically related to the economic growth and the dependency ratios. This would raise an interesting issue: why would the national and private saving rates behave differently? Statistically, the younger age and older age dependency ratio variables are downward and upward time trend variables, respectively. When the dependency ratio variables enter into the time series regression equations, a careful interpretation of the coefficients of dependency ratio variables is needed.

Finally, we want to estimate the movements of saving rates resulting from future aging population in Korea. Let us assume that all other variables except the duration of lifetime horizon remain unchanged. The National Statistical Office has published population projection by age and average life expectancy in Korea. Using the data, the age profile of the population projection was constructed in accordance with the age groups we used. For the years 2010, 2020, and 2030, we choose two benchmarks for the age groups. The first benchmark, called survey mark, is the number of households in individual age groups, as included in the NSO’s *Annual Report on the Family Income and Expenditure Survey* for the year 2002. The second benchmark, called population projection, is the numbers of people in individual age groups, as included in the NSO’s *Population Projections* for 2002. The growth rates of the numbers of households for

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<sup>28</sup> Collins (1994) reported no statistically significant relationship between the national saving and the economy’s dependency ratios (shares of the population under age 15 or over 65) in the Korean case.

individual age groups from the year 2002 are assumed to be equal to the growth rates of projected populations for individual age groups. We computed the lifetime duration,  $T_j$ , that is the average life expectancy of Korea minus the mean years of individual  $j$ th age group in the year 2002. We generated  $s_j$  using the elasticity of the saving rate with respect to a change in  $T_j$ ,

namely,  $s_{j,t} = s_{j,t-1}(1 + E_{j,t})$ ,  $E_{j,t} = (0.45 \times T_{j,t-1} / s_{j,t-1}) \times \Delta T_{j,t} / T_{j,t-1}$ . Further, we

assumed that the income share of  $j$ th age group remains at the level of the income share that existed in the year 2002. With this assumption, we generated the mean saving rates of household sector, which are the income share weighted averages of individual age group's saving rates.

The results are provided in Table 13. Whether we use the survey mark distribution of population or the population projection distribution, saving rates of individual age groups are identical. This is due to our use of the growth rates of projected populations in both cases. However, the two different benchmark figures bring out different mean household saving rates because the levels of relative household shares affect the weights. All other things remaining unchanged, the projected rise in the Korean life expectancy and the resulting rise in the duration of lifetime lead to higher saving rates for all age groups. The mean saving rate aggregated on the basis of survey distribution changes from 27.7 percent in the year 2002 to 29.5 percent in the year 2030, about 6.5 percent increase. On the other hand, the mean saving rate aggregated on the basis of population projections changes to 29.7 percent in the year 2030, about 7.2 percent increase. The rise in the saving rates enables households to save more during the period of income earning working ages, to smoothen consumption over longer life span.

Would the aggregate economy wide aggregate domestic saving rate rise or fall, when the life expectancy rises? Before providing an answer to this question, we pay attention to four measures of domestic saving rates. They are given in Table 14. The domestic saving rates measured in real term, (a) and (b) of the table, are higher than the corresponding saving rates measured in nominal terms, (c) and (d). The reason for the difference is owing to the differential movements in the price levels. The rates of change in the levels of the implicit price deflators for consumption expenditures are higher than the rate of change in the levels of the GDP deflators. The saving rate of households under consideration is conceptually closer to net real saving rate.

As shown in equation (13), the prediction of the real net domestic saving rate requires statistics on the saving rates of age groups and the distribution of both population and income by different age groups. For simplicity, we consider three broad age groups: (a) 14 years old and less, (b) between 15 years old and 64 years old, and (c) 65 years and above. We have the data on the age group distributions of population. It needs to be recalled that the mean saving rates of households in Table 13 are regarded as the saving rates of the group of ages 15 years and 64 years. It is difficult, or impossible, to obtain statistics on saving rates of (a) 14 years old and less and (c) 65 years and above, and to obtain the income profile of three age groups. Considering this difficulty, we need to make some heroic assumptions. First, the income shares of the group of 14 years and less, the group of between 15 years old and 64 years and the group of 65 years old and above are 0, 0.9 and 0.1, respectively.<sup>29</sup> The assumption of zero income shares to the group of

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<sup>29</sup> From a life-cycle prospective, the time profile of income rises with age when young, to reach the peak earning, and then, begins to decline with retirement, when old.

14 years old and below is reasonable given the child labor regulations and leads to no need for its saving rate information. The assumption to the two other groups is made without reliable statistical basis from Korea. According to Faruqee and Laxton (2000) that contain the age profile of earnings in the United States, available from the Bureau of Census, U.S. Department of Labor, the earning of the age group of 65 years old and older seems be approximately 70 percent of the earning of the age group of between 25 years and 64 years old. Let us assume that the number of the working persons are 15 percent of the population in the age group of 65 years old and older. This assumption and 70 percent of the earning by the age group of 65 years old and older lead us to approximate that the income share of the age group of 65 years old and older is 10 percent, when the income share of the age group of between 15 years old and 64 years is 90 percent.<sup>30</sup> Secondly, the saving rate of the group of 65 years old and above is 90 percent of the saving rate of the group of between 15 years and 64 years old, using Japanese experience given by Takayama and Kitamura (1994), and alternatively, the saving rate of the group of 65 years old and above is 50 percent of the saving rate of the group of between 15 years and 64 years old, using U.S. experience given by Atanasio (1994).

With the above assumptions and the projected population shares, we calculated the weighted average figures and the rates of growth in the weighted average figures. Using the growth rates and the actual saving rate for the year 2002, 29.88, the net domestic saving rates are computed and presented in Table 15. The real net saving rate is predicted to rise to 31 percent by the year 2020 and decline to 29 percent or less in the

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<sup>30</sup> 0.1 income share comes from  $70\% \times 15\% \times 0.9 = 0.095$ .

year 2030. The fall in the year 2030 is due to the increase in the population share of the group of 65 years old and above and to the reduction of the population share of the group of between 15 years old and 64 years old. In the light of these results, we are tempted to conclude that the real net saving rate of Korea will fall after some times in the future, even though Korean saving rate will be still high as compared with other countries.

## VI. Conclusion

Korea will face an increase in aging population in the next 20 years and beyond. The increasing population distribution towards the elderly age groups will have an influence on the economic growth and the social development in Korea. This paper deals with the effects of the aging population in Korea on saving rates

Under the extended life cycle income hypothesis on saving rates, the real saving rate of household is affected by the duration of lifetime, growth rates of income, credit availability, and per household real disposable income. We have empirically tested the saving rate hypothesis with the Korean data of cross-age pooled time series data over the period of years, 1977-2002.

Recognizing the limitations of the data, our empirical results suggest that the patterns of the Korean household saving rates are consistent with the life-cycle income hypothesis. Real saving rates increase when the duration of lifetime and per household real income rise, and they decrease when the growth rate of real income and net worth-to-GDP ratio rise. Young age and old age dependency ratios are found to have played an insignificant role in determining the saving rates.

Other things being equal, a rise in the life expectancy and larger shares of elder population are expected to bring out a reduction in the economy wide real net saving rate. This will likely have an adverse effect on economic growth of Korea.

It is best to conclude with caveats. In order to gain more and obtain parameter estimates, further analysis is desirable, with different sets of data to include age distribution of assets holdings and the distribution of saving and income by more extended age groups of age 55 years old and older. Parameter estimates and their assumptions play the important role in the conduct of policy analysis.

This paper is far from providing the required conclusive answers concerning to what extent and by how much would the aging population influence the economy in Korea. In the light of all the above discussions in this paper, it sheds some light on how useful it would be if issues related to economic growth could be analyzed with simulations of a well-structured framework of the Korean economy. It is important to note the urgency to design the policies to cope with the issues raised by the increasing aging of Korean population.

Figure 1: The AK model

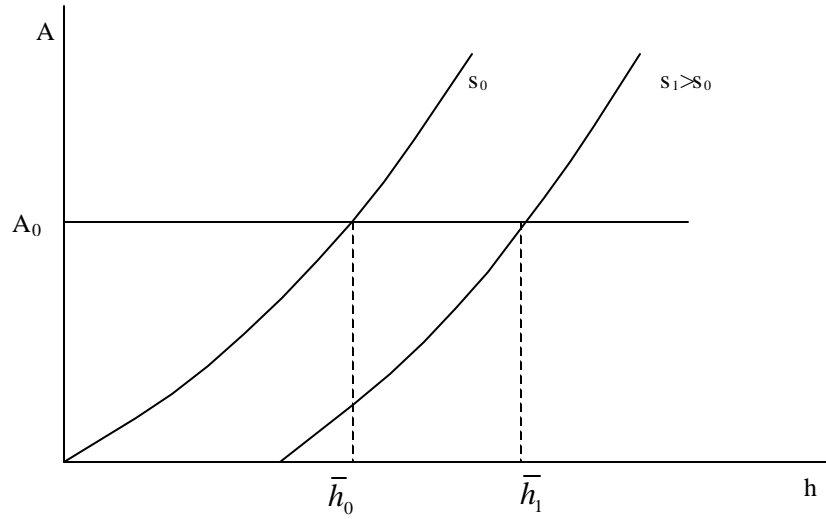






Table 1: Population and Life Expectancy by Sex

year	Population (1000persons)			Life Expectancy (years)			Growth Rate (%)			Life Expectancy		
	Total	Male	Female	Total	Msle	Female	Total	Male	Female	Total	Male	Female
1960	24989	12544	12445	52.4	51.1	53.7						
1961	25632	12873	12759	53.9	52.4	55.2	2.54	2.59	2.49	2.74	2.56	2.74
1962	26291	13211	13080	55.4	53.8	56.7	2.54	2.59	2.49	2.74	2.56	2.74
1963	26968	13558	13410	56.9	55.2	58.3	2.54	2.59	2.49	2.74	2.56	2.74
1964	27662	13914	13747	58.5	56.6	59.9	2.54	2.59	2.49	2.74	2.56	2.74
1965	28373	14279	14094	60.1	58.1	61.6	2.54	2.59	2.49	2.74	2.56	2.74
1966	29160	14684	14476	61.9	59.7	64.1	2.74	2.79	2.68	2.97	2.76	4.01
1967	29708	14948	14759	62.2	59.7	64.7	1.86	1.78	1.94	0.52	0.04	0.99
1968	30266	15217	15048	62.5	59.7	65.4	1.86	1.78	1.94	0.52	0.04	0.99
1969	30834	15491	15343	62.9	59.8	66.0	1.86	1.78	1.94	0.52	0.04	0.99
1970	31435	15780	15655	63.2	59.8	66.7	1.93	1.85	2.01	0.52	0.04	1.01
1971	32052	16097	15956	63.5	60.1	67.0	1.94	1.99	1.90	0.45	0.52	0.39
1972	32682	16420	16262	63.8	60.4	67.2	1.94	1.99	1.90	0.45	0.52	0.39
1973	33323	16749	16575	64.1	60.7	67.5	1.94	1.99	1.90	0.45	0.52	0.39
1974	33978	17085	16893	64.3	61.1	67.8	1.94	1.99	1.90	0.45	0.52	0.39
1975	34678	17445	17233	64.6	61.4	68.0	2.04	2.09	1.99	0.45	0.52	0.39
1976	35203	17659	17544	64.9	61.7	68.3	1.50	1.22	1.79	0.45	0.52	0.39
1977	35737	17876	17861	65.2	62.0	68.6	1.50	1.22	1.79	0.45	0.52	0.39
1978	36278	18095	18183	65.5	62.4	68.8	1.50	1.22	1.79	0.45	0.52	0.39
1979	36828	18317	18511	65.8	62.7	69.1	1.50	1.22	1.79	0.46	0.54	0.40
1980	37407	18549	18858	66.3	63.0	69.9	1.56	1.26	1.86	0.78	0.43	1.09
1981	38343	19172	19171	66.8	63.2	70.6	2.47	3.30	1.65	0.78	0.43	1.09
1982	39326	19837	19489	67.4	63.5	71.4	2.53	3.41	1.64	0.78	0.43	1.09
1983	39910	20129	19781	67.9	63.8	72.2	1.47	1.46	1.49	0.79	0.44	1.12
1984	40406	20375	20031	68.2	64.1	72.5	1.24	1.21	1.26	0.40	0.51	0.43
1985	40806	20576	20230	68.4	64.5	72.8	0.99	0.98	0.99	0.40	0.51	0.43
1986	41214	20772	20442	69.1	65.1	73.4	0.99	0.95	1.04	0.95	1.02	0.83
1987	41622	20960	20662	69.8	65.8	74.0	0.99	0.90	1.07	0.96	1.03	0.83
1988	42031	21155	20876	70.3	66.3	74.6	0.98	0.93	1.03	0.75	0.80	0.70
1989	42449	21357	21092	70.8	66.8	75.1	0.99	0.95	1.03	0.76	0.80	0.70

1990	42869	21568	21301	71.3	67.3	75.5	0.98	0.98	0.99	0.63	0.67	0.55
1991	43268	21775	21493	71.7	67.7	75.9	0.93	0.96	0.90	0.63	0.67	0.56
1992	43663	21979	21684	72.3	68.2	76.4	0.91	0.93	0.88	0.75	0.74	0.64
1993	44056	22177	21879	72.8	68.8	76.9	0.90	0.90	0.90	0.76	0.75	0.64
1994	44453	22376	22077	73.2	69.2	77.2	0.90	0.89	0.90	0.49	0.58	0.33
1995	45093	22705	22388	73.5	69.6	77.4	1.43	1.46	1.40	0.49	0.59	0.33
1996	45545	22939	22606	74.0	70.1	77.8	1.00	1.03	0.97	0.58	0.70	0.46
1997	45991	23170	22821	74.4	70.6	78.1	0.97	1.00	0.95	0.58	0.71	0.46
1998	46430	23396	23034	75.0	71.1	78.7	0.95	0.97	0.93	0.77	0.81	0.70
1999	46858	23617	23241	75.6	71.7	79.2	0.92	0.94	0.89	0.78	0.81	0.70
2000	47275	23831	23444	76.1	72.3	79.8	0.89	0.90	0.87	0.77	0.81	0.70
2001	47343	23835	23508	76.7	72.9	80.3	0.14	0.02	0.27	0.77	0.81	0.70
2002	47640	23984	23656	77.3	73.5	80.9	0.63	0.62	0.63	0.77	0.81	0.70

Korea Statistical Office, Major Statistics of Korean Economy; Economic Planning Board, Korean Economic Yearbook, 1984.

Some life expectancy figures are not available. The figures are made by a linear interpolation between two bench mark year figures.

For life expectancy, [www.nso.go.kr](http://www.nso.go.kr).



Table 2: Population by Age

year	Total	(in thousand)							Shares of Age Group(%)						
		0~14	15~64	65~80+	65~69	70~74	75~79	80+	0~14	15~64	65~80+	65~69	70~74	75~79	80+
1960	24989	10687	13458	844	379	255	126	84	42.8	53.9	3.4	1.5	1.0	0.5	0.3
1961	25632	10980	13772	861	388	257	133	84	42.8	53.7	3.4	1.5	1.0	0.5	0.3
1962	26291	11286	14094	880	397	259	139	84	42.9	53.6	3.3	1.5	1.0	0.5	0.3
1963	26968	11603	14427	898	407	261	147	84	43.0	53.5	3.3	1.5	1.0	0.5	0.3
1964	27662	11934	14769	917	416	263	154	84	43.1	53.4	3.3	1.5	1.0	0.6	0.3
1965	28373	12279	15121	937	426	265	162	84	43.3	53.3	3.3	1.5	0.9	0.6	0.3
1966	29160	12684	15516	960	437	267	172	84	43.5	53.2	3.3	1.5	0.9	0.6	0.3
1967	29708	12803	15899	978	436	278	173	90	43.1	53.5	3.3	1.5	0.9	0.6	0.3
1968	30266	12931	16294	997	436	290	173	97	42.7	53.8	3.3	1.4	1.0	0.6	0.3
1969	30834	13069	16703	1017	435	302	174	105	42.4	54.2	3.3	1.4	1.0	0.6	0.3
1970	31435	13241	17153	1040	435	316	175	114	42.1	54.6	3.3	1.4	1.0	0.6	0.4
1971	32052	13234	17712	1070	454	318	180	118	41.3	55.3	3.3	1.4	1.0	0.6	0.4
1972	32682	13227	18294	1101	474	320	186	121	40.5	56.0	3.4	1.5	1.0	0.6	0.4
1973	33323	13220	18900	1134	495	321	192	125	39.7	56.7	3.4	1.5	1.0	0.6	0.4
1974	33978	13213	19533	1168	517	323	197	129	38.9	57.5	3.4	1.5	1.0	0.6	0.4
1975	34678	13208	20263	1206	543	325	204	134	38.1	58.4	3.5	1.6	0.9	0.6	0.4
1976	35203	13093	20813	1249	557	342	209	141	37.2	59.1	3.5	1.6	1.0	0.6	0.4
1977	35737	12979	21385	1294	572	361	214	147	36.3	59.8	3.6	1.6	1.0	0.6	0.4
1978	36278	12868	21979	1341	587	380	218	155	35.5	60.6	3.7	1.6	1.0	0.6	0.4
1979	36828	12759	22597	1389	603	401	224	162	34.6	61.4	3.8	1.6	1.1	0.6	0.4
1980	37407	12656	23305	1445	620	425	229	171	33.8	62.3	3.9	1.7	1.1	0.6	0.5
1981	38343	12759	24060	1500	639	442	241	179	33.3	62.7	3.9	1.7	1.2	0.6	0.5
1982	39326	12886	24878	1560	659	460	254	187	32.8	63.3	4.0	1.7	1.2	0.6	0.5
1983	39910	12801	25496	1614	674	475	270	195	32.1	63.9	4.0	1.7	1.2	0.7	0.5
1984	40406	12592	26140	1673	691	489	288	205	31.2	64.7	4.1	1.7	1.2	0.7	0.5
1985	40806	12305	26759	1741	712	506	308	215	30.2	65.6	4.3	1.7	1.2	0.8	0.5
1986	41214	12030	27383	1800	739	518	317	226	29.2	66.4	4.4	1.8	1.3	0.8	0.5
1987	41622	11746	27998	1876	774	536	328	238	28.2	67.3	4.5	1.9	1.3	0.8	0.6
1988	42031	11487	28583	1962	817	554	341	250	27.3	68.0	4.7	1.9	1.3	0.8	0.6
1989	42449	11261	29135	2053	866	571	353	263	26.5	68.6	4.8	2.0	1.3	0.8	0.6
1990	42869	11078	29648	2144	904	596	368	276	25.8	69.2	5.0	2.1	1.4	0.9	0.6

1991	43268	10948	30108	2212	919	620	386	287	25.3	69.6	5.1	2.1	1.4	0.9	0.7
1992	43663	10833	30547	2283	935	647	403	298	24.8	70.0	5.2	2.1	1.5	0.9	0.7
1993	44056	10727	30968	2363	958	681	415	309	24.3	70.3	5.4	2.2	1.5	0.9	0.7
1994	44453	10581	31421	2450	989	721	421	319	23.8	70.7	5.5	2.2	1.6	0.9	0.7
1995	45093	10537	31901	2656	1048	767	459	382	23.4	70.7	5.9	2.3	1.7	1.0	0.8
1996	45545	10411	32360	2775	1098	790	483	404	22.9	71.1	6.1	2.4	1.7	1.1	0.9
1997	45991	10292	32792	2908	1158	812	514	424	22.4	71.3	6.3	2.5	1.8	1.1	0.9
1998	46430	10217	33162	3051	1221	838	552	440	22.0	71.4	6.6	2.6	1.8	1.2	0.9
1999	46858	10202	33452	3205	1288	872	588	457	21.8	71.4	6.8	2.7	1.9	1.3	1.0
2000	47275	10233	33672	3371	1366	911	614	480	21.6	71.2	7.1	2.9	1.9	1.3	1.0
2001	47343	9860	33903	3579	1465	967	632	515	20.8	71.6	7.6	3.1	2.0	1.3	1.1
2002	47640	9792	34074	3773	1534	1029	657	553	20.6	71.5	7.9	3.2	2.2	1.4	1.2

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Sources: Korea Statistical Office, Major Statistics of Korean Economy. Economic Planning Board,  
Korea Economic Yearbook, 1984, for 1860-80  
figures.

The figures between the beginning and end periods are estimated by linear interpolations.  
Population figures are in 1000 persons; Other figures are in  
percent.

Table 3: Dependency Ratios and Index of Aging

Year	Young Age Dependency Ratio		Elderly Dependency Ratio		Index of Aging		Age Index of Aging	
		%		%		%		%
1960	79.41		6.27		7.90		1.61	
1961	79.73	0.40	6.26	-0.25	7.85	-0.66	1.60	-0.14
1962	80.07	0.43	6.24	-0.24	7.79	-0.67	1.60	-0.12
1963	80.43	0.45	6.23	-0.23	7.74	-0.68	1.60	-0.10
1964	80.81	0.47	6.21	-0.22	7.69	-0.69	1.60	-0.08
1965	81.21	0.49	6.20	-0.21	7.63	-0.70	1.60	-0.06
1966	81.75	0.66	6.19	-0.19	7.57	-0.85	1.60	0.01
1967	80.53	-1.51	6.15	-0.59	7.64	0.92	1.60	0.13
1968	79.36	-1.46	6.12	-0.55	7.71	0.91	1.60	0.17
1969	78.25	-1.41	6.09	-0.50	7.78	0.91	1.61	0.21
1970	77.19	-1.36	6.06	-0.39	7.85	0.97	1.61	0.35
1971	74.72	-3.26	6.04	-0.35	8.09	2.91	1.62	0.40
1972	72.30	-3.29	6.02	-0.35	8.33	2.93	1.63	0.44
1973	69.94	-3.31	6.00	-0.36	8.58	2.96	1.63	0.48
1974	67.65	-3.34	5.98	-0.36	8.84	2.98	1.64	0.52
1975	65.18	-3.71	5.95	-0.43	9.13	3.28	1.65	0.74
1976	62.91	-3.56	6.00	0.83	9.54	4.39	1.66	0.42
1977	60.69	-3.58	6.05	0.82	9.97	4.40	1.67	0.47
1978	58.55	-3.60	6.10	0.80	10.42	4.40	1.68	0.52
1979	56.46	-3.63	6.15	0.79	10.89	4.41	1.69	0.57
1980	54.31	-3.89	6.20	0.86	11.42	4.75	1.70	0.80
1981	53.03	-2.37	6.24	0.56	11.76	2.94	1.71	0.29
1982	51.80	-2.36	6.27	0.56	12.11	2.92	1.71	0.40
1983	50.21	-3.12	6.33	0.95	12.61	4.06	1.72	0.46
1984	48.17	-4.14	6.40	1.10	13.29	5.24	1.73	0.58
1985	45.98	-4.65	6.51	1.64	14.15	6.29	1.74	0.65
1986	43.93	-4.57	6.57	1.03	14.96	5.59	1.75	0.61
1987	41.95	-4.61	6.70	1.91	15.97	6.52	1.76	0.63
1988	40.19	-4.30	6.86	2.41	17.08	6.71	1.77	0.60

1989	38.65	-3.90	7.05	2.62	18.23	6.52	1.78	0.54
1990	37.37	-3.38	7.23	2.59	19.35	5.98	1.79	0.48
1991	36.36	-2.72	7.35	1.58	20.20	4.30	1.80	0.36
1992	35.46	-2.50	7.47	1.71	21.07	4.22	1.80	0.34
1993	34.64	-2.35	7.63	2.08	22.03	4.43	1.81	0.34
1994	33.67	-2.82	7.80	2.16	23.15	4.99	1.82	0.38
1995	33.03	-1.93	8.33	6.56	25.21	8.49	1.83	0.45
1996	32.17	-2.63	8.58	2.95	26.65	5.59	1.83	0.39
1997	31.39	-2.48	8.87	3.36	28.25	5.83	1.84	0.39
1998	30.81	-1.85	9.20	3.68	29.86	5.53	1.85	0.33
1999	30.50	-1.02	9.58	4.05	31.42	5.07	1.85	0.27
2000	30.39	-0.35	10.01	4.39	32.94	4.75	1.85	0.23
2001	29.08	-4.40	10.56	5.30	36.30	9.70	1.87	0.67
2002	28.74	-1.20	11.07	4.78	38.53	5.97	1.87	0.34

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Young age dependency ratio is the ratio of 14 age and under to ages of 15 - 64 years population.

Elderly dependency ratio is the ratio of 65 age and above to ages of 15 - 64 years population.

Index of aging is the ratio of the elderly population to the population under age 14 years.

Age index of aging is an average of three age groups, weighted by the population shares; 1,2, and 3 are assigned to the population under age 14, active, and elderly population, respectively.

Table 4: Abridged Life by Age ( in Years)

Age	Time	Total	Male	Female	Time	Total	Male	Female
0 year old	1981	66.19	62.28	70.54	1999	75.55	71.71	79.22
1~4	1981	67.11	63.09	71.57	1999	75.01	71.16	78.69
5~9	1981	63.71	59.67	68.21	1999	71.15	67.3	74.82
10~14	1981	59.1	55.05	63.6	1999	66.24	62.4	69.9
15-19	1981	54.35	50.31	58.84	1999	61.31	57.48	64.96
20-24	1981	49.75	45.75	54.18	1999	56.47	52.67	60.07
25-29	1981	45.2	41.25	49.55	1999	51.65	47.91	55.19
30-34	1981	40.64	36.75	44.92	1999	46.85	43.16	50.32
35-39	1981	36.12	32.28	40.31	1999	42.09	38.46	45.48
40-44	1981	31.72	27.98	35.77	1999	37.41	33.87	40.68
45-49	1981	27.51	23.93	31.31	1999	37.41	33.87	40.68
50-54	1981	23.51	20.14	27	1999	28.47	25.28	31.25
55-59	1981	19.72	16.64	22.86	1999	24.21	21.26	26.67
60-64	1981	16.18	13.43	18.86	1999	20.16	17.51	22.21
65-69	1981	12.97	10.62	15.13	1999	16.35	14.06	17.96
70-74	1981	10.12	8.22	11.74	1999	12.83	10.96	14.02
75-79	1981	7.6	6.2	8.76	1999	9.76	8.32	10.57
80-84	1981	5.37	4.62	6.19	1999	7.23	6.18	7.73
85-89					1999	5.29	4.56	5.55
90-94					1999	3.82	3.4	3.94
95 & over					1999	2.74	2.57	2.79

National Statistical Office, Abridged Life Tables, 1999;www.nso.go.kr, 05/01/03

Table 5: Population Projections for Korea

Age Groups	2003		2010		2020		2050	
	millions	%	millions	%	millions	%	millions	%
Total	479.25	100.00	495.94	100.00	506.50	100.00	443.37	100.00
0~14	97.19	20.28	85.52	17.24	70.34	13.89	46.50	10.49
15~64	342.38	71.44	357.41	72.07	359.48	70.97	244.17	55.07
15~19	32.37	6.75	34.56	6.97	27.19	5.37	18.03	4.07
20~24	40.40	8.43	30.81	6.21	31.60	6.24	19.66	4.43
25~29	39.14	8.17	37.99	7.66	34.20	6.75	20.31	4.58
30~34	44.28	9.24	38.19	7.70	30.57	6.04	20.61	4.65
35~39	41.38	8.63	43.17	8.71	37.74	7.45	22.87	5.16
40~44	43.08	8.99	41.80	8.43	37.69	7.44	24.56	5.54
45~49	35.70	7.45	41.70	8.41	42.33	8.36	26.38	5.95
50~54	25.61	5.34	39.01	7.87	40.83	8.06	30.49	6.88
55~59	21.11	4.41	28.05	5.66	40.34	7.96	32.74	7.38
60~64	19.30	4.03	22.12	4.46	37.01	7.31	28.51	6.43
65~95+	39.69	8.28	53.02	10.69	76.67	15.14	152.71	34.44
65~69	15.98	3.34	17.88	3.60	25.67	5.07	33.67	7.59
70~74	10.91	2.28	15.18	3.06	19.07	3.77	31.62	7.13
75~79	6.85	1.43	10.39	2.09	13.89	2.74	31.50	7.11
80~84	3.78	0.79	5.71	1.15	10.04	1.98	25.05	5.65
85~89	1.62	0.34	2.78	0.56	5.44	1.07	17.48	3.94
90~94	0.47	0.10	0.89	0.18	2.03	0.40	9.59	2.16
95+	0.08	0.02	0.19	0.04	0.53	0.10	3.79	0.85
Growth Rate	0.61		0.49		0.21		-0.44	
Elder	8.28		10.69		15.14		34.44	
Dependency								
Index of Aging	40.84		62.00		109.00		328.43	
Age Index of	1.88		1.93		2.01		2.24	
Aging								

Table 6: Educational Attainment of Population by Age

Year	\ Age	15~19	20~24	25~29	30~34	35~39	40~44	45~49	50~54	55~59	60+	Total
<b>1970</b>												
	Primary School	4.82	3.75	3.68	3.91	3.24	2.34	1.75	1.12	0.75	0.70	28.14
	Middle School	1.77	2.02	1.60	1.27	0.87	0.60	0.43	0.25	0.11	0.13	9.10
	High School	0.55	2.10	1.51	1.26	0.85	0.43	0.25	0.12	0.07	0.06	7.21
	Jr.College	0.00	0.13	0.14	0.12	0.10	0.07	0.06	0.04	0.02	0.03	0.72
	University and Higher	0.00	0.19	0.49	0.51	0.37	0.20	0.10	0.05	0.02	0.02	1.96
<b>1995</b>												
	Primary School	0.02	0.05	0.11	0.35	0.78	1.12	1.44	1.72	1.90	3.46	10.97
	Middle School	0.13	0.30	0.54	1.19	1.97	1.83	1.49	1.10	0.79	0.82	10.17
	High School	1.28	5.38	5.54	5.32	4.80	3.03	1.97	1.22	0.83	0.77	30.14
	Jr.College	0.01	0.68	0.86	0.64	0.42	0.18	0.08	0.03	0.02	0.05	2.98
	University	0.00	0.79	2.34	2.40	1.70	0.99	0.68	0.46	0.34	0.42	10.06
	Graduate School	0.00	0.01	0.14	0.21	0.22	0.16	0.10	0.07	0.05	0.05	1.02
<b>2000</b>												
	Primary School	0.01	0.02	0.04	0.09	0.35	0.80	1.16	1.42	1.57	4.06	9.54
	Middle School	0.07	0.11	0.21	0.42	1.08	1.79	1.63	1.29	0.92	1.22	8.75
	High School	0.91	2.85	4.48	4.97	4.84	4.26	2.64	1.67	1.01	1.29	2.89

Jr.College	0.01	0.98	1.39	1.27	0.95	0.63	0.29	0.16	0.09	0.15	6.20
University	0.00	0.56	2.04	2.19	1.94	1.25	0.69	0.47	0.32	0.47	9.93
Graduate	0.00	0.01	0.14	0.22	0.24	0.23	0.15	0.09	0.06	0.07	1.20
School											
Master	0.00	0.01	0.13	0.19	0.19	0.17	0.11	0.07	0.04	0.05	0.97
Doctor	0.00	0.00	0.00	0.02	0.05	0.06	0.04	0.02	0.01	0.02	0.23

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Sources: National Statistical Office, Korea Statistical Yearbook 2002; 1995 Population and Housing Census Report;

1970 Population and Housing Census Report

The figures in the cells are the shares of the numbers of population(6 years &over) completed their education by age groups.

to total population, (%).They do not cover the population under school attendance, not completed,and never attending.

Table 7: Labor Forces by Age (in 1000 persons)

	Population Total	Population 15&Older	Active Population	Age 15~19	Shares %									Participation Rate	
					20~24	25~29	30~34	35~39	40~44	45~49	50~54	55~59	60+	1st Method	2nd Method
1960	24989	14302													
1966	29160	16476	8957	13.4	11.6	13.7	13.9	12.0	10.8	8.9	7.1	4.8	3.8	54.4	30.7
1970	31435	18193	10062	14.0	10.6	11.4	14.0	12.9	11.1	9.9	6.6	4.9	4.4	55.3	32.0
1975	34678	21469	12193	12.5	11.7	12.3	12.4	13.3	11.4	8.7	7.4	5.4	4.9	56.8	35.2
1980	37407	24750	14431	8.3	13.7	12.8	12.6	12.4	12.2	10.6	7.2	5.4	5.0	58.3	38.6
1981	38343	25798	14683	7.0	13.6	13.3	12.5	11.9	12.4	11.0	7.5	5.4	5.3	56.9	38.3
1982	39326	26438	15032	6.3	13.8	14.4	12.7	11.8	12.3	10.2	7.5	5.6	5.4	56.9	38.2
1983	39910	27110	15118	5.4	13.2	15.0	13.4	11.8	12.0	10.6	7.7	5.3	5.5	55.8	37.9
1984	40406	27813	14997	4.9	12.7	15.8	13.0	12.5	11.7	11.1	7.7	5.2	5.5	53.9	37.1
1985	40806	28500	15592	4.6	12.0	16.1	13.7	12.7	11.3	10.8	8.0	5.3	5.7	54.7	38.2
1986	41214	29183	16116	4.3	12.0	16.0	14.4	12.5	10.8	10.6	8.3	5.2	5.9	55.2	39.1
1987	41622	29874	16873	4.4	11.1	15.9	14.9	12.6	10.7	10.6	8.3	5.2	6.2	56.5	40.5
1988	42031	30545	17305	3.8	10.7	15.6	15.5	12.3	11.0	10.5	8.8	5.6	6.3	56.7	41.2
1989	42449	31188	18023	3.7	10.5	15.1	15.5	11.8	11.3	10.1	9.1	6.0	6.7	57.8	42.5
1990	42869	31792	18539	3.4	10.8	14.4	15.4	12.3	11.4	9.9	8.9	6.4	6.9	58.3	43.2
1991	43268	32320	19048	3.3	11.1	14.0	15.2	12.9	11.3	9.6	8.9	6.7	7.1	58.9	44.0
1992	43663	32830	19426	3.0	11.0	13.4	15.2	13.5	11.0	9.4	8.9	6.8	7.7	59.2	44.5
1993	44056	33331	19803	2.6	11.0	13.6	15.8	14.6	10.8	9.2	8.2	6.6	7.5	59.4	44.9
1994	44453	33871	20326	2.4	10.9	13.6	15.2	15.0	10.8	9.5	8.0	6.7	8.0	60.0	45.7
1995	45093	34557	20797	2.1	10.5	13.5	14.7	15.1	11.7	9.5	8.0	6.5	8.4	60.2	46.1
1996	45545	35135	21188	2.0	10.1	13.6	14.0	15.1	12.4	9.7	7.8	6.5	8.7	60.3	46.5
1997	45991	35700	21604	2.0	9.6	13.8	13.4	14.8	12.9	9.7	7.9	6.8	9.2	60.5	47.0
1998	46430	36213	21456	1.9	8.1	13.4	13.3	16.0	13.7	10.0	7.8	6.7	9.1	59.2	46.2
1999	46858	36657	21634	2.0	7.8	12.8	13.0	15.6	14.5	10.2	8.0	6.5	9.5	59.0	46.2
2000	47275	37043	21950	2.0	7.6	12.6	12.5	14.9	14.8	11.2	8.4	6.3	9.8	59.3	46.4
2001	47343	37482	22417	1.8	8.3	13.1	13.8	14.6	14.5	11.0	7.8	5.7	9.3	59.8	47.4
2002	47640	37847	22877	1.5	8.4	12.5	13.8	14.1	14.6	11.5	8.0	5.8	9.7	60.4	48.0

Survey, 1963-1993; National Statistical Office, Annual Report on the Economically Active Population Survey; Economic Planning Board, Major Statistics of Korean Economy, 1978; Economic Planning Board, Major Statistics of Korean Economy, 1984

1st method is active population / 15 years and older. 2nd method is active population / total population.

Table 8: Educational Attainment of Labors in All Industries by Age

\ Age	~19	20~24	25~29	30~34	35~39	40~44	45~49	50~54	55~59	60+	Total
<b>1981</b>											
Middle School	11.6	17.2	6.9	5.9	5.1	4.4	2.7	1.5	0.5	0.3	56.2
and Lower											
High School	1.8	2.9	7.8	4.9	2.9	1.9	1.0	0.5	0.2	0.1	31.5
Jr.College	0.0	0.4	0.9	0.5	0.3	0.2	0.1	0.1	0.0	0.0	2.5
University and Higher	0.0	0.3	2.3	2.4	1.8	1.4	0.8	0.5	0.2	0.1	9.8
<b>2001</b>											
Middle School	0.1	0.2	0.2	0.5	1.1	2.6	3.1	2.6	1.6	1.4	13.4
and Lower											
High School	0.9	6.8	8.7	8.3	7.1	6.5	4.1	2.3	1.3	0.9	46.9
Jr.College	0.0	2.6	4.5	3.2	1.8	1.4	0.6	0.2	0.1	0.1	14.5
University and Higher	0.0	0.8	5.2	6.5	5.1	3.6	1.8	1.0	0.6	0.6	25.2

Source: Ministry of Labor, Survey Report on Wage Structure

The figures in the cells are the shares of age groups in total labor for the year, (%).

Table 9: Real Saving Rates by Age Groups (%)

\ Year	1985	1990	1995	2000	2002
Under 25	20.32	17.75	27.63	16.39	28.35
25-29	28.64	24.44	28.89	25.71	25.83
30-34	29.68	26.81	32.47	27.22	28.68
35-39	27.21	23.23	27.15	24.48	28.44
40-44	21.58	17.35	27.27	24.22	26.61
45-49	17.95	14.31	26.45	21.55	28.18
50-54	20.35	17.39	30.07	17.23	26.68
55 & over	17.80	22.41	29.26	23.94	28.47
Average	24.89	21.57	28.97	23.67	27.71

Table 10: Household Saving Rates Equations

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Eq. No.	10.1	10.2	10.3	10.4
constant	10.3 [8.67]	10.1 [8.64]	4.77 [4.16]	22.7 [24.3]
T	0.45 [13.3]	0.45 [13.2]	0.31 [9.51]	
g	-0.13 [5.91]	-0.13 [5.96]	-0.03 [1.41]	-0.11 [3.82]
W/GDP	-13.6 [4.27]	-14.5 [4.77]	-11.9 [4.62]	8.83 [2.62]
LB/GDP	-4.81 [0.91]			
YD	0.51 [5.19]	0.51 [5.15]	0.36 [4.21]	-0.11 [0.95]
D24	-7.62 [8.74]	-7.62 [8.76]	-5.19 [6.64]	-2.61 [2.44]
D55	7.26 [7.75]	7.23 [7.73]	4.87 [5.86]	-1.39 [1.51]
s(-1)			0.44 [9.12]	
Adj R2	0.55	0.55	0.68	0.17
SEE	3.16	3.17	2.66	4.32
DW	1.01	1.02	1.72	0.63

---

Figures in [ ] are t-statistic.

Table11: Long-Run Elasticities of Household Saving Rates

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Eq. No.	10.1	10.2	10.3
T	0.58	0.58	0.72
g	-0.03	-0.03	-0.01
W/GDP	-0.28	-0.30	-0.44
YD	0.33	0.33	0.41

---

Long run elasticities are at the sample mean values.

Table 12: Saving Rates Equations: Demographic Factors

Eq. No.	12.1	12.2	12.3
constant	26 [3.41]	25.5 [3.30]	25.4 [63.]
g	-0.11 [3.79]	-0.11 [3.78]	-0.15 [4.74]
D24-	-2.08 [2.29]		-2.08 [2.19]
D55+	-1.43 [1.57]		-1.42 [1.49]
YDEP	-0.14 [0.85]	-0.14 [0.84]	
ODEP	0.59 [0.92]	0.59 [0.91]	
Adj R2	0.18	0.18	0.11
SEE	4.28	4.34	4.48
DW	0.58	0.56	0.58

Figures in [ ] are t-statistic.

Table 13: Prediction of Household Saving Rates

	2002	2010	2020	2030
life expectancy	77.31 71	78.80	80.70	81.50
Survey distribution				
mean	27.75	28.38	29.25	29.51
%		2.25	3.02	0.89
age group				
15~24	28.35	29.00	29.85	30.20
25~29	25.83	26.48	27.32	27.68
30~34	28.68	29.33	30.17	30.53
35~39	28.44	29.10	29.93	30.29
40~44	26.61	27.27	28.10	28.46
45~49	28.18	28.83	29.66	30.02
50~54	26.68	27.33	28.15	28.51
55~above	28.47	29.11	29.92	30.27
Population Distribution				
mean	27.77	28.40	29.27	29.69
%		2.24	3.02	1.40
age group				
15~24	28.35	29.00	29.85	30.20
25~29	25.83	26.48	27.32	27.68
30~34	28.68	29.33	30.17	30.53
35~39	28.44	29.10	29.93	30.29
40~44	26.61	27.27	28.10	28.46
45~49	28.18	28.83	29.66	30.02
50~54	26.68	27.33	28.15	28.51
55~above	28.47	29.11	29.92	30.27

The population projection figures are from National Statistical Office, Population Projection. Life expectancy figures are from NSO.

\*Predictions allow changes in life expectancy, all other factors being unchanged.

Table 14: Measures of National Saving Rates

				2000	2001	2002
Real term	gross real saving rate	$(GDP-C-G)/GDP$	(a)	41.02	40.36	40.41
	net real saving rate	$(NDP-C-G)/NNP$	(b)	31.07	29.63	29.88
Nominal term	gross saving rate	$(GDPV-CV-GV)/GDPV$	(c)	32.64	30.49	29.27
	net saving rate	$(NDPV-CV-GV)/NDPV$	(d)	23.27	20.76	20.13

GDP=real gross domestic products; C=real private consumption expenditures,  
 G=real government consumption expenditures; NDP=real net domestic products.  
 GDPV=gross domestic products; CV=private consumption expenditures,  
 GV= government consumption expenditures; NDPV=net domestic products.

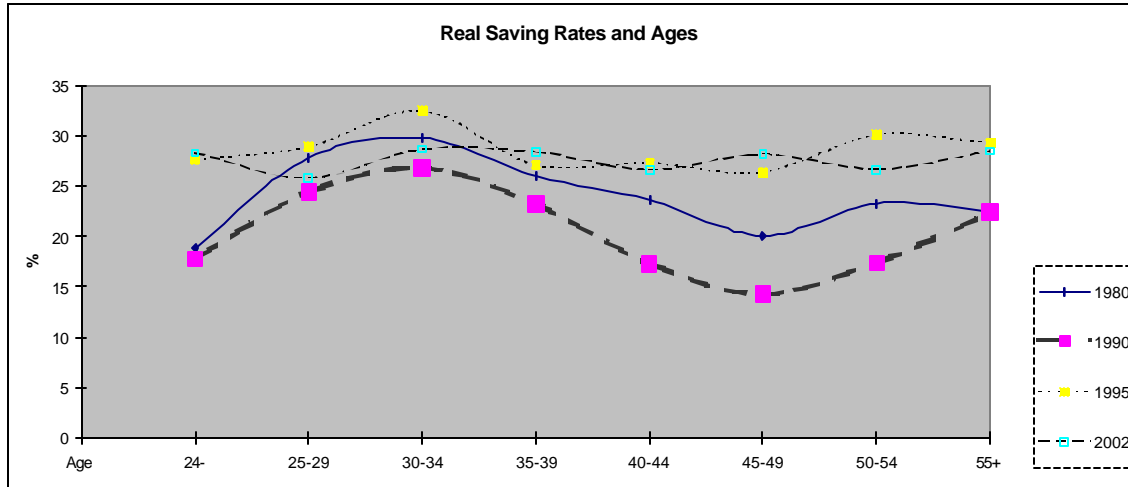
Table 15: Prediction of National Real Net Saving Rate with the Assumed Life Expectancy

		2002	2010	2020	2030
Population	0~14	0.21	0.17	0.14	0.12
Shares	5~64	0.72	0.72	0.71	0.65
	65+	0.08	0.11	0.15	0.23
Real Net Saving Rate					
	s1 growth rate		0.03	0.02	-0.07
		29.88	30.88	31.54	29.44
	s2 growth rate		0.03	0.02	-0.07
		29.88	30.82	31.37	29.04

General rule used is as follows: aggregate saving rate is an average of three age group's saving rates weighted by their population and income shares. The saving rates of 0~14 age group (and 65 above age group) are the mean saving rate for the year 2002 reported in Table 13 times the ratio of 0~14 age group's saving rate (and 65 above age group's rate) to 5~64 age group's saving rate experience in Japan and the U.S.. The income shares are 0, 0.9, and 0.1 for three age groups. So, the saving rate of 0~14 age groups does not have any effect on the net saving rate. s1 and s2 are real net saving rates based on the Japanese and U.S. information, respectively. For s1, the ratio of 0~14 age group's saving rate (65 above age group's saving rate) to (5~64)group's saving rate used are 0.4 (and 0.9), respectively, based on Japanese experiences,

Takayama and  
Kitamura (1994). For  $s_2$ , the ratios are -2 (and 0.5), Atanasio  
(1994).  
We computed the growth rates of the weighted average figures. These growth rates  
together  
with 29.88 for the year 2002, we generated the saving rates for the future.

Chart 1: Real Saving Rates of Korean Households by Ages





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