

**Economic Determinants of Elderly Labour Supply:
Evidence from Korea.**

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Summary

This study looked into the effect of factors that influence the supply of labour in the aged groups in Korea, where the pension system is not yet fully established. As a result of the analysis, it was found that factors like age, rental/finance income, and transfer from adult children had a positive correlation with retirement, while other factors such as good health and being head of the house had a negative relationship.

Traditionally, in developed countries having a stable and long history of social security system pension has been proved to induce earlier retirement among prospective retirees. However, in Korea which comparatively has a limited pension system we predict that there must be other determinants which play important role in optimal retirement decision.

After all, it is suggested that mandatory retirement is a major factor of retirement in Korea. Also, "I cannot find a job" was the No. 2 reason that respondents chose for their retirement. This suggests that a considerable number of the elderly, who lost their jobs because of the mandatory retirement age, may still want to continue working, but could not find a job and, thus, became involuntary retirees. Considering that the national pension system is not fully established in Korea, if these retirees have no proper sources of income, they are likely to suffer a serious financial instability. It should also be noted that the Korean government has a policy to reduce the amount of pension given to the recipients as much as possible, for fear of aggravating the financial conditions of the national system. In these circumstances, it may be considered as one choice to change the mandatory retirement age, as the population becomes aged and the financial standing of the national pension system is expected to grow worse.

Therefore, it is possible to discuss the abolishment or change of the mandatory retirement system, only after looking into the width of change of the supply of labour of the elderly

according to the variation of the wage rate.

Separately, a study should be done, also, on the elderly who remain full-time or part-time workers, because there are no mandatory retirement ages in their professions. It should be examined if they are choosing to continue to work because they want to do so or if they are working because they have no other choice in order to make their living.

Meanwhile, the finding that the rental income has a very close correlation with retirement is greatly significant not only in the labour market of the elderly, but also in the real estate market itself. The elderly are weaker, in terms of the physical labour force than young workers, and they have a strong tendency to rely on the asset income. Therefore, people tend to prefer real estate income as the source of stable income in the later years of their lives. Such a demand of real estate can hardly be seen as the real demand for apartment or land for residence or farming.

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Abstract

I examine the effect of age, health state, the structure of various incomes on elderly labour supply in Korea. Using a data set from “Korean Labour and Income Panel Study (KLIPS)” in 2003, we investigate how salary, financial or rental income and other factors affect elderly employee’s behavior in labour market. This is analysed by an intertemporal model of labour supply to test how prospective retirees with different income structure choose their retirement age.

Traditionally, in developed countries having a stable and long history of social security pension system has been proved to induce earlier retirement among prospective retirees. However, in other countries such as Korea which experienced rapid industrialization and comparatively have a limited pension system we predict that there must be other determinants which play important role in optimal retirement decision.

On the basis of empirical retirement tests among male elderly, 55~70 years old in Korea, we conclude that rental income and financial transfer from adult children have a strongly positive effect on retirement decision and that mandatory retirement is a main factor determining retirement.

Keywords: labour supply; retirement, rental income; mandatory retirement

1. Introduction

Since the Korean War and the 1960s through 1970s, Korea has seen a dramatic growth and development from an underdeveloped farming country to an industrialized nation. A rapid industrialization and a drastic growth of exports led to an increase in per capita income, stable prices, low unemployment and improved quality of life. As a result, the GDP and the per capita GDP, which were merely \$8.1 billion and \$254 in 1970, surged to become \$969.9 billion and \$20,000 respectively in 2007.¹

Those who contributed to Korea's rapid industrialization are now mostly aged over 50. Some of them have already retired, and others continue to work. This study aims to look into factors that influence the decision-making process concerning retirement.

Industrialized developed countries have gone through a rapid aging process as the average life span has gotten longer, yet the rate of the aged participating in the labour market has been decreasing. In particular, in some countries, the participation rate in economic activities of people aged 60 to 64 has tumbled by

¹ Bank of Korea's website (www.bok.or.kr)

more than 75% over the last 30 years. In the 1960s, most of the industrialized countries saw about a 70% to 80% participation rate of the people aged 60 to 64 in the economic activities. Yet, in the 1990s, Belgium, Italy, France and the Netherlands saw more than a 20% drop of that rate, while Germany saw a 30% decrease and Spain 40%. The United States showed a drastic fall from 82% to 53% in that participation rate. These countries are also seeing a tendency of early retirement of workers. One possible theory to explain this drop and the early retirement is that the government's public pension system is promoting early retirement, thus aggravating the financial status of public pension.

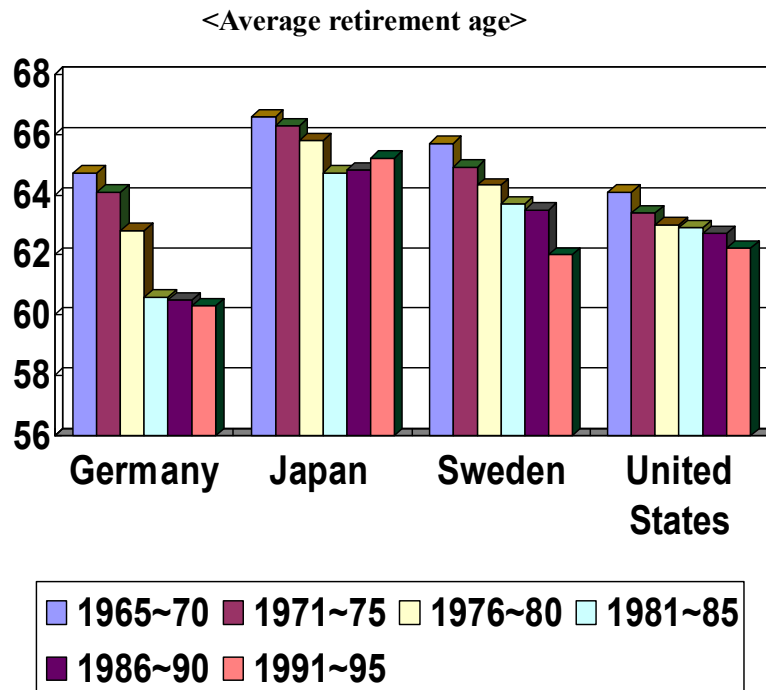


Figure 1.1 Average retirement age

<Data source: Monthly Labour Review(1998), by Murray Gendell>

Korea, meanwhile, is facing a more rapid aging process of the demographic structure than other developed countries. In 2000, Korea entered the group of aging society with more than 7% of the total population over 65 years of age. Such a rapid aging process of the population is expected to only continue, considering the declining birth rate and the increasing aged population. The aging of the labour force would lower the overall rate of participation in economic activities. In the long run, the lower weight of youth and middle-aged groups that have a relatively high productivity is highly likely to result in a lack of human resources and a drop of labour productivity. Yet, Korea expanded the national pension system to cover all only in the mid-1990s. Only in 2006, was the national pension system expanded to all kinds of workplaces. An average monthly pension benefit per person in 2003 was merely USD 170,² so the national pension system in Korea is still in the start-up phase.³ As a result, the participation rate of the aged in the economic activities of Korea is at the highest level, in comparison with those of the OECD member nations.

² National Pension Service's website, www.nps.or.kr

³ Please see the appendix

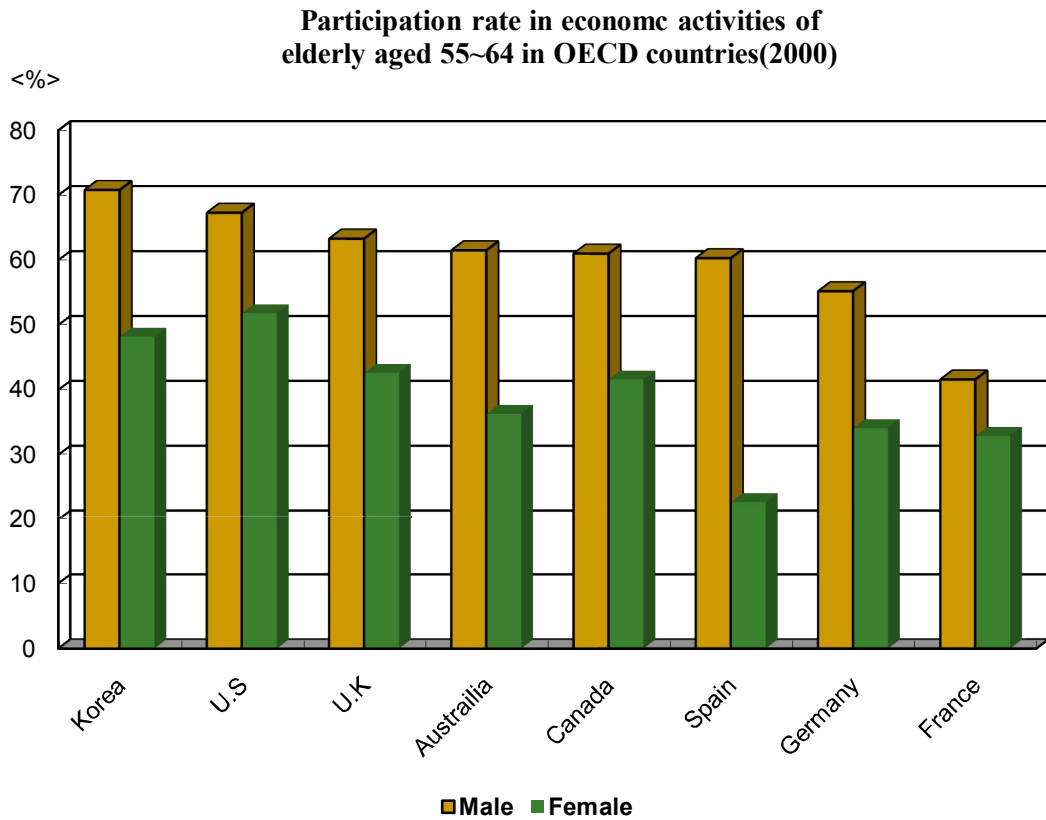


Figure 1.2 Participation Rate in Economic Activities

<Data source: OECD>

This study aims to look into the factors that cause the aged group of Korea to retire, through the intertemporal model. This study will determine which individual character variables and economic variables are statistically significant and closely related to the decision-making process about retirement.

2. Background

For the past several years, Korea has seen a continuous drop in the birth rate, which has now become lower than that of the United States and West European countries. The TFR (Total Fertility Rate), referring to the average number of children that would be born to a woman over her lifetime, was 4.5 in 1970, and it recorded a continuous drop to 2.8 in 1980 and 1.5 in 2000. As a result, the TFR of Korea saw a decrease by 3, which is much higher than those of Japan (0.8), Germany (0.7) and England (0.8) during the same period.

Meanwhile, the average life span of Koreans has drastically increased. It was 62.3 in 1971, which leaped by 13.6 to be 75.9 in 2000. If this tendency continues, the average life span is expected to reach 81.5 in 2030, which would be the second highest in the world, next to that of Japan.⁴

⁴ Jang, J., 2003 "Labour market and policy in Ageing society", Korea Labour Research Institute.

Table 2.1 Total Fertility Rate trend

	S.Korea	Japan	U.S.	France	Germany	Italy	U.K.
1970	4.53	2.13	2.46	2.47	2.03	2.43	2.43
1975	3.47	1.91	1.80	1.96	1.48	2.14	1.81
1980	2.83	1.75	1.84	1.99	1.53	1.61	1.90
1985	1.67	1.76	1.84	1.83	1.41	1.42	1.80
1990	1.59	1.54	2.08	1.78	1.45	1.33	1.85
1995	1.65	1.42	2.02	1.71	1.24	1.19	1.71
2000	1.47	1.36	2.13	1.89	1.36	1.23	1.65
1970-2000 decreased no	3.06	0.77	0.33	0.58	0.67	1.2	0.78

<Source: Korea National Statistical Office>

Table 2. 2 Average Life Expectancy⁵

	2000	2010	2020	2030
U.S.	77.1	78.4	79.5	80.4
Japan	80.2	80.9	81.7	82.5
Italy	78.5	79.6	80.5	81.3
China	70.5	73.0	75.0	76.8
India	63.4	66.6	69.6	72.2
S.Korea	75.9	78.8	80.7	81.5

The increase of the weight of the aged population leads to the increase of the cost to support them. In Korea, the rate of supporting the aged (population over 65 / population aged from 15 to 64) was 12.1% in 2004, and increased from 8.1% of 1994 by 40%. It is expected to increase further in the future--21.3% in 2020 and

⁵ Jang, J., 2003 "Labour market and policy in Ageing society", Korea Labour Research Institute.

35.7% in 2030.⁶ Currently, Korea is considered to have relatively young demographics. However, by the year 2030, the population of 50 to 64 year-olds is expected to reach 33%. Such an increase of people older than 50 causes a decrease in the weight of the working people in the total population, and in the long run, it would turn out to be a decrease in the absolute size of the labour force.

The participation rate of men over 60 years of age in economic activities in Korea increased from 45% in 1980 to 55% in 1997. However, after the economic crisis that hit the nation in the late 1997, the number dropped to be around 50%.⁷

Meanwhile, in the case of industrialized, developed Western countries, the participation rate of the aged in the economic activities has been only decreasing. These countries have well-established and generous public and private pensions, together with various kinds of systems to guarantee incomes for the aged, and these may have resulted in the early retirements. This led to the increase of the number of the elderly receiving pensions and the decrease of the people who contribute to pay the premiums. As a result, the pension system for the elderly is in a bankruptcy crisis.

The high participation rate in the labour market of the Korean elderly can be

⁶ OECD, "OECD Health Data 2003"

⁷ Korea National Statistical Office

seen as a result of the structural characteristics of the Korean labour market, which is the high number of self-employed people. Korea has the highest rate (40% of the total workforce) of self-employed people among the OECD member nations. According to statistics, when a person gets older, he or she is more likely to be self-employed. In the case of people aged from 55 to 64, about 55% to 60% of those working are self-employed and, for those over 65, 75% are self-employed, according to the statistics.⁸

Table 2. 3 Job status of the elderly in Korea (in %)

	male		female	
	aged 55-64	aged 65~	aged 55-64	aged 65~
waged permanent worker	21.6	6.6	3.9	1.0
waged temporary worker	13.6	10.7	19.4	0.8
waged daily worker	10.4	5.8	16.7	14.8
employer	8.7	4.8	2.9	0.6
self-employed	44.5	67.4	26.2	42.2
unpaid family worker	1.2	4.8	30.8	33.0

<Source: Korea National Statistical Office>

The fact that the weight of self-employment is high in the elderly group of workers makes it hard to think that the high retirement age of Korea is a result of

⁸ Bang, H., 2004, "Ageing population and labour market", Korea Labour Research Institute.

positive reasons. That is, it is highly likely that these people are choosing to be self-employed because they have to be responsible for their own living expenses due to an insufficient social security system. Therefore, as Korea's national pension system matures, it is possible for Korea to see the tendency of early retirement that the developed countries in the past have experienced.

3. Literature Review

3.1 Model of Labour Supply and Retirement Behavior of the Elderly

3.1.1 One-Period vs. Life-Cycle Model

In developed countries, the earliest research on the labour supply of the elderly dates back to the 1940s (Wentworth, 1945), but it is after the 1970s that economists began to study seriously the economic behaviour and retirement decisions of the elderly. The research during the period introduced economic models; the usefulness of the ‘Life-Cycle Model’ compared to the ‘One-Period Model’ has been discussed and the structures of social security and occupational pension systems debated. However, since the 1980s, research on the labour supply and retirement behaviour of the elderly has been much more vigorous. As the age structure of societies has changed dramatically and early retirement has spread in most of the developed countries, the financial soundness of social security systems became so doubtful that interest in elderly labour soared. Furthermore, during that period, such micro-data as the Retirement History Study (RHS) and National Longitudinal Surveys (NLS) in the U.S. have started to be

used for empirical research.

The model for the labour supply of the elderly depends on the framing of the choice between labour and leisure. Utility-maximizing elderly workers allot their time so that the last dollar spent on leisure activities yields the same utility as the last dollar spent on goods. Under such a circumstance, the introduction of public pensions generates both an income and a substitution effect among elderly workers who work.

Early research on retirement analysed effects during one period. Such a one-period analysis has a limitation in that it regards social security as a kind of income transfer. However, social security has the characteristic of being a way to save money; in addition, pension benefits that will be paid later depend on income before retirement and contributions. In other words, future pension benefits will increase depending upon the amount of social security tax paid in previous periods. It shows the limitation of one-period analysis.

On the other hand, in the 'Life-Cycle Model', behavioral decisions at one moment are affected by expectations about the future as well as past and current circumstances. It is assumed that people can borrow (save) money from (for) the future. It is also assumed that people can assess their wage rates, life expectancies,

interest rates, etc., in the future under a simple model without uncertainty.

Most of the early research has assumed that people know current information well and can assess changes in the future correctly. However, in reality, the future is uncertain and people's expectations often prove to be wrong. Very often the expectations of people about their health and economic circumstances are wrong, but the research has focused on the unanticipated change in the pension system and people's response to it.

Hauseman and Wise (1985) analysed the data from RHS and concluded that the additional social security benefits earned by working an additional year exert an important influence on the retirement decision, as does the amount of social security wealth accumulated by the worker. In addition, they also concluded through a simulation test that the increase in pension benefits can explain only a third of the decrease in the labour supply that happened during the period. However, Burtless (1986) has maintained that the effect of an increase in pension benefits on a decrease in the labour supply was statistically significant, but not so huge in terms of influence. Some researchers would not even agree with the conclusion that an increase in pension benefits has little effect (Moffitt, 1987; Krueger and Pischke, 1989).

3. 1. 2 Retirement process: complete retirement vs. partial retirement

In earlier research on retirement, people have been separated into two groups; whether retired or not. However, the category of ‘partial retirement’ has been added recently. According to Quinn (1980, 1981) and Fuchs (1982), partial retirements are more often found among the self-employed. At any age, they are more likely than wage and salary workers to continue working full-time on their career jobs, and when they do begin to retire, they are less likely to leave the labour force in one move. In the RHS, only half of the self-employed (compared to 3/4 of the wage and salary workers) went directly from their full-time career job to complete retirement (Quinn et al., 1990). Those who did not were evenly split between part-time employment on their career jobs (a rarity in the wage and salary sector) and part-time or full-time work on a new job.

Quinn, Burkhauser and Myers (1990) used all 10 years of the RHS and focused on exit routes from career jobs (defined as full-time jobs held for at least 10 years). They confirmed that many older Americans did not leave full-time career jobs and the labour force at the same time. Among wage and salary workers, more than a quarter did something else. The vast majority found new jobs, often part-time and sometimes self-employed, while only a few (disproportionately women) were able

to drop to part-time while staying on their career jobs.

3. 2 Determinant for labour supply or retirement

3. 2. 1 Social security and public pensions

Burkhauser (1979, 1980) studied the determinants of the labour supply and retirement of older employees by using a multi-period model. Through empirical results he has maintained that the present value of a pension is a critical factor and additional labour supply is decreasing as the guaranteed present value is larger. In addition, he found that retirement is likely to be postponed as the difference between the incomes of early retirement and retirement at the age of 65 is growing larger.

Most of the research in the 1970s has drawn the same conclusion: that Social Security or public pension systems have a positive effect on early retirement.

Diamond and Hausman (1984) estimated a duration model, examining factors influencing retirement and data from the National Longitudinal Survey of Mature Men from 1966 to 1976. In the model it was found that that pension and social

security have the expected strong positive effects on the hazards of retirement.

Individuals with larger permanent incomes were less likely to retire.

However, Blinder, Gordon and Wise (1980) came to the opposite conclusion.

They maintained that Social Security inspires people to work longer instead of causing early retirement.

3. 2. 2 Income, Earning, Assets

Quinn, Burthause and Myers (1990) found that there is a nonlinear relationship between wage rate and retirement. According to their conclusion, it is possible for workers to move from a full-time position in a career job, through what are called “bridge” jobs: the relative importance of these jobs is discussed. Bridge jobs can be full-time or part-time; typically they are subsidiary in nature and lower-paid compared to career employment. In principle, after leaving the labour force, someone could reenter. What little evidence there is suggests that this happens in only a minority of instances. United States data show that while usually people who leave the labour force towards the end of their working life do not re-enter at a subsequent date, a minority does: about 10 per cent of those who retired (defined as those who left the labour force for at least two years) later reentered

3. 2. 3 Mandatory retirement

Over the past few years, the ‘mandatory retirement’ system has become illegal in the U.S. Before the ‘Age Discrimination in Employment Act (ADEA)’ in 1978, about one third or half among the retired did so because of mandatory retirement.

Burkhauser and Quinn (1983) and Quinn and Burkhauser (1983) have studied how much ADEA has affected early retirement. Their results show that there has been little effect. They found that mandatory retirement, social security and occupational pensions have been so closely related that if each effect of them(mandatory retirement, social security and occupational pensions) has been controlled, it is found that main factor that causes retirement to be postponed is not the abolition of mandatory retirement but Social Security.

3. 2. 4 Health state

After the minimum age for a pension beneficiary is raised to 67, the analysis must include the effect of health on the labour supply. At first, most of the research has been done by depending on subjective reports. However, some researchers have begun to doubt the credibility of subjective information about health. They

suspect that retired workers are likely to justify their retirement by 'poor health'.

In sum, the state of health appreciated subjectively is an endogenous variable.

4. Theoretical Model

4.1 Static Consumption-Leisure Framework

Here, we use the labour-leisure model for the labour supply of the elderly. Individual workers are maximizing the utility, depending on consumption(C) and number of leisure years (Ret) which is defined as life expectancy (T) minus retirement age (R).

$$U = U(C, Ret) = U(C, T - R) \quad (1)$$

Consumption and leisure can be acquired through monetary gain (E_t) or pension benefits (P_t), which are best treated in terms of the present discounted values. Let δ_t be a discount factor reflecting time preference and mortality. The present discounted value of them is

$$PV(E) = \int_0^R E_t \delta_t dt \quad (2)$$

$$PV(P) = \int_R^T P_t \delta_t dt \quad (3)$$

The total payoff from working until a particular age and then retiring is the sum of $PV(E)$ and $PV(P)$:

$$PV(Y) = \int_0^R E_t \delta_t dt + \int_R^T P_t \delta_t dt \quad (4)$$

By combining equations (1) through (4), we obtain the first order condition

$$\left[E_R e^{-rR} - P_R e^{-rR} + \int_R^T \frac{\partial P(R, F)}{\partial R} e^{-rt} dt \right] - \frac{\partial U}{\partial \text{Ret}}(W, PV(Y), \text{Ret}) = 0 \quad (5)$$

From (5), it is shown that the utility value of working one more year equals the utility loss experienced by postponing retirement at R^* (optimal retirement age). By totally differentiating (5), we can check the effect of a change in earnings, pension, or wealth on retirement age. The results are shown in Table 1.

First, a higher earnings stream would result in an ambiguous effect on early retirement. The reason is, generally, that wealthier people with a higher earnings stream would buy more leisure (income effect). On the other hand, a higher earning means the opportunity cost of retirement compared to working has increased. As a result, people work longer rather than retiring (substitution effect). As we can not predict whether the income or substitution effect is larger, we are not able to conclude if the outcome will be positive or negative.

Secondly, a higher pension intercept or higher wealth would unambiguously induce earlier retirement as there is only the income effect. Finally, a higher pension slope also causes an unambiguous early retirement, because both the income and substitution effects take the same direction, making early retirement more attractive.

Table 4.1 The effect of parameter change

Effect of Parameter Change On:	Parameter Change			
	1)Raise Earnings Stream	2)Raise Pension Intercept	3)Raise Pension Slope	4)Increase Wealth
MU of consumption, $\partial U/\partial C$	+	-	-	-
Earnings, ER_0	+	zero	zero	zero
Pension, PR_0	+ or zero	+	+	zero
Rate of pension increase as retirement is postponed, $\partial P/\partial R$	+ or zero	zero	+	zero
MU of leisure, $\partial U/\partial Ret$	+	+	+	+
Net effect of the age of retirement	ambiguous	earlier	earlier	earlier

4.2 Dynamic Programming Framework

In a life-cycle context, individual workers choose working hours that maximize their utility function $U(C_t, L_t)$ through optimizing a weighted value of bundles of consumption (C_t) and leisure (L_t) at each period. If we assume that time is discrete and that equally-sized intervals t go up to a maximum T , the intertemporal separable utility for this optimization problem can be expressed as follows:

$$\max_{C_t, L_t} \sum_{t=t_0}^T (1 + \rho)^{-(t-t_0)} \eta_{t|t_0} U(C_t, L_t) \quad (6)$$

Subject to

$$C_t = w_t(TT - L_t) + Y_{Bt} - S_t, \forall t \quad (7)$$

Where ρ is the rate of time preference, $\eta_{t|t_0}$ the survival probability up to period t given survival up to period t_0 , TT the total time available for labour or leisure, Y_{Bt} non-wage income that includes benefits and S_t the amount of savings, ignoring taxes and wealth. In addition, if we put all relevant information in Ω_t , then the labour-leisure decision in a discrete life-cycle context can be expressed by

$$\max_{d_t^k} E \left[\sum_{t=t_0}^T (1 + \rho)^{-(t-t_0)} \eta_{t|t_0} \sum_{k \in D_t} U^k(C_t^k, L_t^k) d_t^k \mid \Omega_t \right], \sum_{k \in D_t} d_t^k = 1, \forall t \quad (8)$$

where d_t^k takes the value 1 if the k^{th} choice is made in period t and 0 otherwise. D_t is the choice set in period t that depends on eligibility rules and

decisions in the past.

By the dynamic programming method (Bellman, 1957), the recursive solution of equation (8), where the retirement problem at period t , is expressed as a function of the optimal retirement decision at period $t+1$. In the end, defining the discount factor by equation (8) can be formulated as the value function V_t at time t :

$$\begin{aligned}
V_t &= \max_{d_t^k} E \left[\sum_{s=t}^T \lambda^{(s-t)} \eta_{s|t} \sum_{k \in D_s} U(C_s^k, L_s^k) d_s^k \mid \Omega_t \right] \\
&= \max_{d_t^k} E \left[\sum_{k \in D_t} U(C_t^k, L_t^k) d_t^k + \sum_{s=t+1}^T \lambda^{(s-t)} \eta_{s|t} \sum_{k \in D_s} U(C_s^k, L_s^k) d_s^k \mid \Omega_t \right] \\
&= \max_{d_t^k} E \left[\sum_{k \in D_t} U_t(C_t^k, L_t^k) d_t^k + \lambda \eta_{t+1|t} E \left\{ \max_{d_s^k} E \left(\sum_{s=t+1}^T \lambda^{s-(t+1)} \eta_{s|t+1} \sum_{k \in D_s} U(C_s^k, L_s^k) d_s^k \mid \Omega_{t+1} \right) \mid d_t^k = 1 \right\} \right] \\
&= \max_{d_t^k} \left[\sum_{k \in D_t} U(C_t^k, L_t^k) d_t^k + \lambda \eta_{t+1|t} E[V_{t+1} \mid d_t^k = 1] \right] \tag{9}
\end{aligned}$$

where $\eta_{s|t} \equiv \eta_{s|t+1} \eta_{t+1|t}$ for $s \geq t+1$. Using Bellman's dynamic programming equation, given:

$$V_t^k = U_t^k + \lambda \eta_{t+1|t} E[V_{t+1} \mid d_t^k = 1] \tag{10}$$

the value function is expressed by the dynamic programming problem

$$V_t = \max_{d_t^k} \sum_{k \in D_t} V_t^k d_t^k \tag{11}$$

At the final period T, the values V_T^k are equal to U_T^k .

5. Data Source & Variable Definition

5.1 Data Source and Data Description

This study analyzed the data of 942 men from the 6th year survey (2003) of the Korean Labour and Income Panel Study (KLIPS) on middle-aged and aged people. This survey measured the state of retirement into the following four kinds - ① retired ② retired from a major workplace yet continuing to work on small things for diversions ③ not retired, and ④ never been employed even once. In this study, the respondents of cases ① and ② were chosen as “the retired.”

The definition of retirement depends on the subjective judgment of the subject of the survey. On top of asking individual respondents whether they are retired or not, the KLIPS also asked how many hours a week do you work. Therefore, this study made an analysis on retirement based on an objective definition seen from their working hours, instead of relying only on the answers of the respondents whether they are retired or not.

Originally, the number of respondents over 50 years of age in the 6th year survey of the KLIPS was a total of 3,530. Among them, this study considered only male respondents aged 55 to 70, because the number of working women in this age group is very low in the Korean society. Also, people under 55 or over 70 must be mostly pre-

retirement or already retired, so it would not be very meaningful to make a comparison between a group of retirees and those before retirement. The main characteristics of this sample are presented in Table 2.

First, the number of retirees was 366 (38.9%) and that for non-retirees was 576 (61.1%), so the rate of non-retirees was high. In terms of age, more than half of the non-retirees belonged to the younger age group of 55 to 60. On the other hand, the majority of the retirees belonged to the highly aged group, with 38% from 66 to 70. In terms of education, the rate of retirees was high in the group of respondents with a university education and beyond. Under the assumption that people given high levels of education have high levels of lifelong income, it is suggested that non-retirees are highly likely to be working for the sake of making living expenses. This is also seen from the variables of rental and financial income as well as transfers from children. The incomes of the retirees were higher than those of the non-retirees. In terms of occupation or job status, a high rate of non-retirees had jobs like farmers and fishermen or ran their own businesses, so they did not have a mandatory retirement age and a high rate of them had blue-collar jobs. On the other hand, the majority of retirees had white-collar jobs like officers and workers with permanent wages before retirement.

Table 4.2 Main characteristics of the sample from the 6th year KLIPS

Variables		Non-retirees		Retirees		Mis-sing	Total		
		no	%	no	%		no	%	
observations		576	61.1	366	38.9	0	942	100.0	
1	Age	Age0(55~60)	321	55.7	91	24.9		421	44.7
		Age1(61~65)	172	29.9	136	37.2		314	33.3
		Age2(66~70)	83	14.4	139	38.0		187	19.9
		Sum	576		366		0	942	
2	Education	informal	16	2.8	18	4.9		34	3.6
		primary(1~6 yr)	163	28.3	82	22.4		245	26.0
		Secondary(7~12 yr)	314	54.5	195	53.3		509	54.0
		university(13~)	83	14.4	71	19.4		154	16.3
		Sum	576		366		0	942	
3	Family size	single	11	1.9	15	4.1		26	2.8
		2~3	311	54.0	225	61.5		536	56.9
		4~6	244	42.4	118	32.2		362	38.4
		7~	10	1.7	8	2.2		18	1.9
		Sum	576		366		0	942	
4	Monthly Rental Income	USD zero	511	88.7	281	76.8		792	84.1
		1 ~200	19	3.3	21	5.7		40	4.2
		200~500	17	3.0	21	5.7		38	4.0
		50~1000	14	2.4	21	5.7		35	3.7
		1000~	15	2.6	22	6.0		37	3.9
		Sum	576		366		0	942	
5	Monthly Financial Income	USD zero	519	90.1	309	84.4		828	87.9
		1 ~200	31	5.4	29	7.9		60	6.4
		200~500	16	2.8	11	3.0		27	2.9
		500~1000	4	0.7	9	2.5		13	1.4
		1000~	6	1.0	8	2.2		14	1.5
		Sum	576		366		0	942	
6	Monthly	USD zero	528	91.7	275	75.1		803	85.2

Transfer from Children	1 ~300	21	3.6	42	11.5		63	6.7
	300~600	4	0.7	20	5.5		24	2.5
	600~	4	0.7	10	2.7		14	1.5
	Sum	557		347		38	942	
7 Job	Specialist/Officer	113	19.7	130	35.7		243	25.8
	Sales/Service	87	15.1	57	15.7		144	15.3
	Agri/Fishery worker	112	19.5	33	9.1		145	15.4
	Manufacturing	170	29.6	110	30.2		280	29.7
	Simple labour	93	16.2	34	9.3		127	13.5
	Sum	575		364		3	942	
8 Job Status	Perm waged worker	191	33.2	204	55.7		395	41.9
	Temp/Daily worker	84	14.6	46	12.6		130	13.8
	Employer/Self-employed	286	49.7	115	31.4		401	42.6
	Unpaid family worker	14	2.4	1	0.3		15	1.6
	Sum	575		366		1	942	
9 Health Status	Bad	110	19.1	164	44.8		274	29.1
	average	206	35.8	97	26.5		303	32.2
	good	260	45.1	105	28.7		365	38.7
	Sum	576		366		0	942	
10 House Head	No	17	3.0	20	5.5		37	3.9
	Yes	559	97.0	346	94.5		905	96.1
	Sum	576		366		0	942	
11 Join Pension	No	262	45.5	245	66.9		507	53.8
	Yes	314	54.5	121	33.1		435	46.2
	Sum	576		366		0	942	

When asked about health conditions, 45.1 percent of non-retirees answered “good,” much higher than the 28.7 percent of retirees. This suggests that retirement and health are closely related.

Asked whether they hold a pension, the rate of the people who said “yes” was unexpectedly higher in non-retirees (54.5%) than in retirees (33.1%). It seems that this is because Korea has a short history of the pension system and the non-retiree group that is relatively younger than the retiree group has a higher rate of pension holders. This suggests that pension has an endogenous relation with retirement, when it comes to the analysis of retirement of Korean workers.

Meanwhile, the average retirement age was found to be 57.3⁹, after a calculation of those who answered that they are retired. In terms of academic background, the retirement age of the people who were uneducated and those who had an informal or only a primary school level of schooling was found to be 58 (higher than the average age). In terms of the reasons people chose to retire, the majority of people (31%) answered, “I didn’t want to work anymore.” or “I wanted to enjoy my leisure.” Among the respondents, 26% said they couldn’t find a job, 17% had health-related reasons and 10% stated it was due to the mandatory retirement age.

⁹ See Figure 1, 2

In Korea, the prescribed age of mandatory retirement depends on the company and its size. For most of the companies, the age is 55~60 years of age. However, most of the employees should retire involuntarily before the official mandatory retirement age.

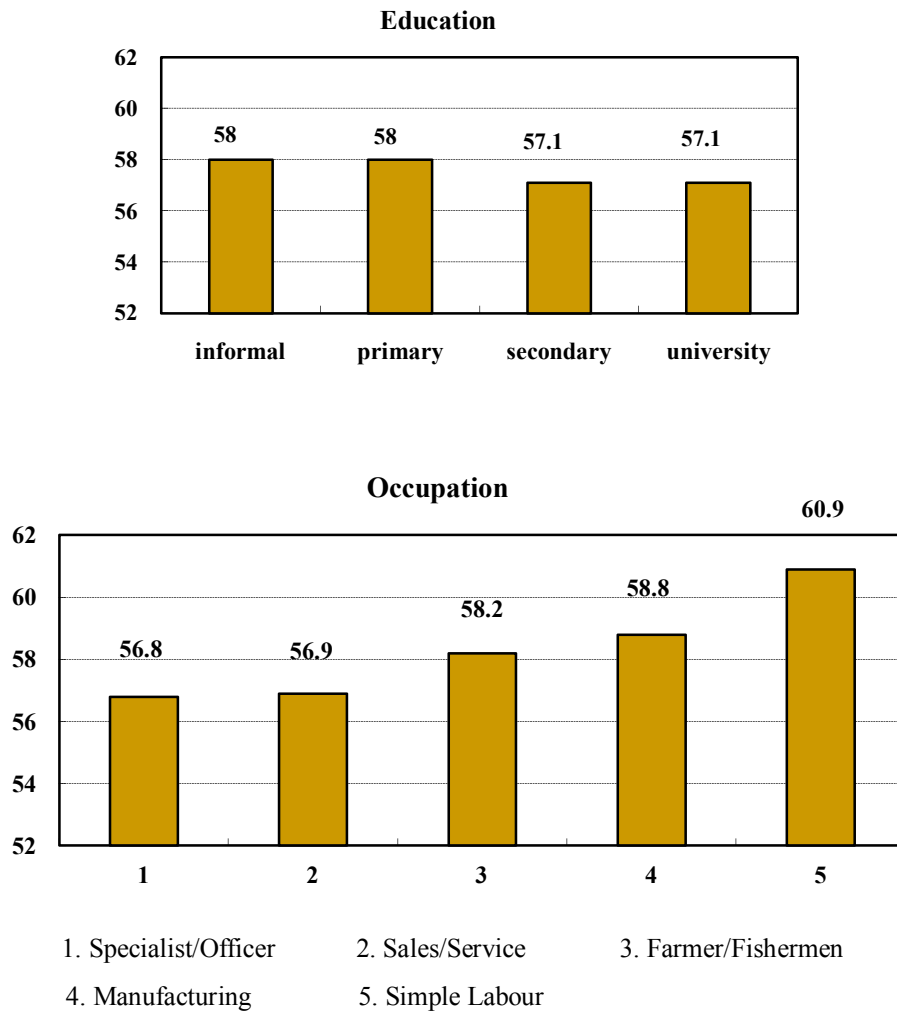
Table 4.3 The distribution of prescribed and actual age of ‘mandatory retirement’

Age	company regulations	actual retirement age
55	0.17	0.35
56	0.18	0.38
57	0.27	0.43
58	0.42	0.49
59	0.46	0.54
60	0.69	0.63
61	0.75	0.68
62	0.84	0.72
63	0.87	0.76
64	0.88	0.79
65	0.98	0.85
66	0.99	0.87
67	0.99	0.89
68	0.99	0.89
69	1.00	0.90
70	1.00	1.00

Some of the elderly people in the sample may still be willing to work; however, they are unable to work because of the mandatory retirement regulation. Hence,

this empirical analysis cannot perfectly capture the ‘unconstrained’ labour supply decision of the elderly.

Figure 4.1 Average Retired-Age



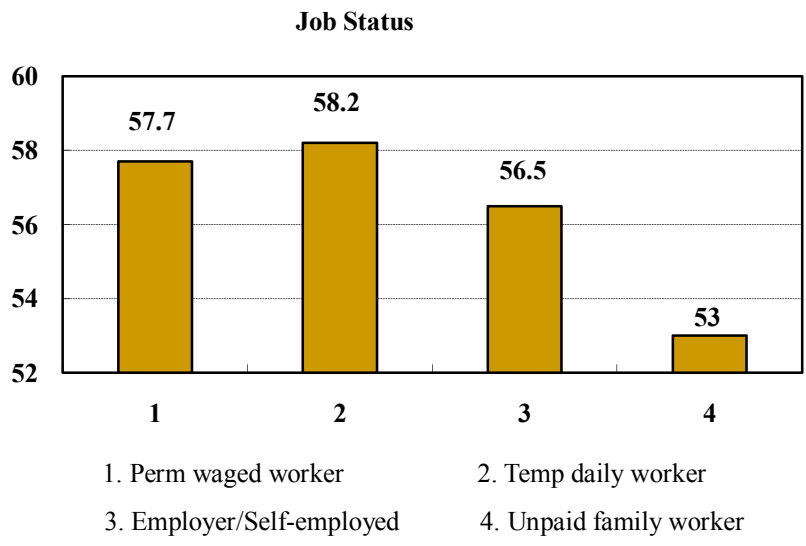


Figure 2. Reasons for Retirement

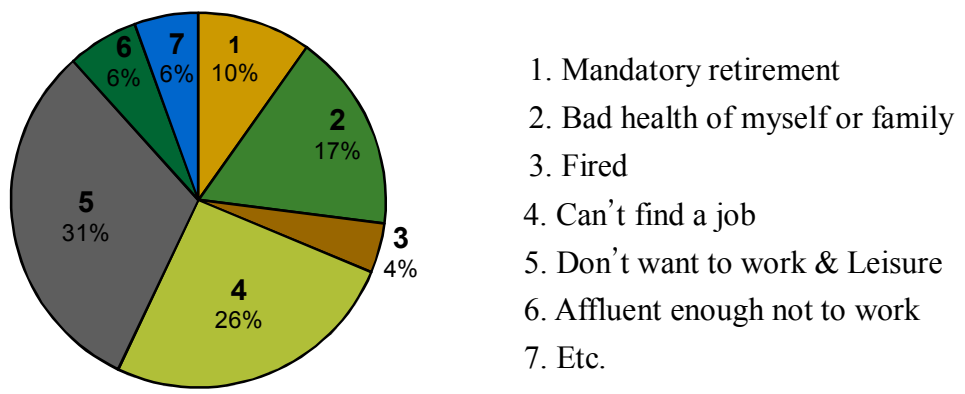
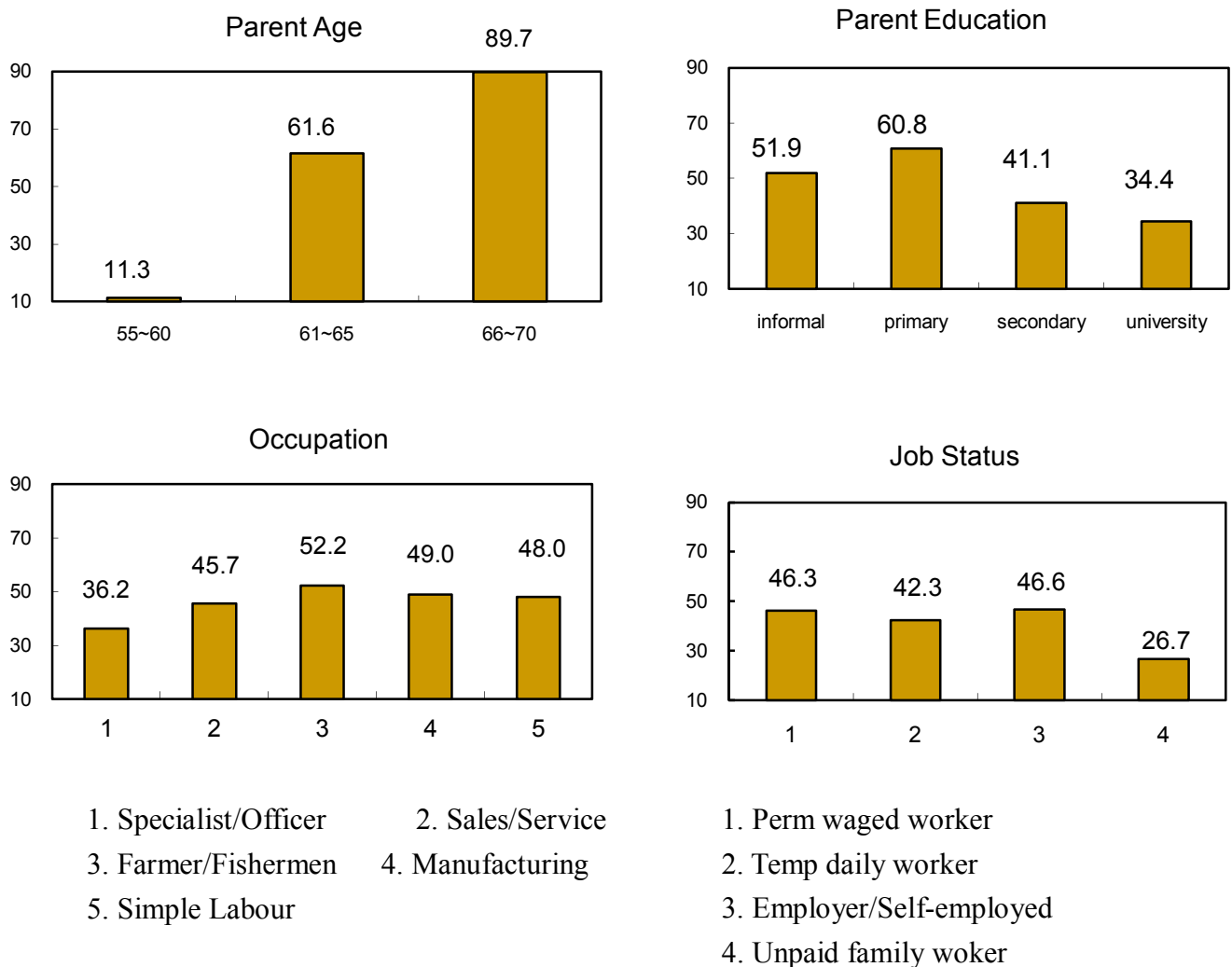


Figure 4.3 Average Monthly Transfer from Adult Children(USD)



Among the respondents, 89.7% of the 66 to 70 age group were taking financial support from their children. On the other hand, only 11.3% of the 55 to 60 group were taking financial support. The average amount of the monthly financial support was USD 45.5, when the respondents who don't take financial support were taken into account.¹⁰

¹⁰ See Figure 3

5.2 Variable Definition

5.2.1 Definition of Retirement

A study about retirement age cannot help but propose a definition of retirement. There are largely two kinds of defining retirements at the individual level—the subjective and objective methods. A subjective method here means asking a person directly whether he or she is retired or not. In an objective method, meanwhile, a person is considered retired when over a certain age and he or she is not, currently, participating in an economic activity. Unfortunately, these two methods may lead to different conclusions about whether a person is currently retired or not.

In any case, when an individual data analysis is done, the retirement age is likely to be measured relatively low, since the examination does not consider that a person may be seen as a retiree now but may start to work again or do other kinds of small activities.

This paper will use the subjective method and depend on the answers of respondents, to define retirement in the first test. Later, in the second test, this paper will take the same group of individuals and get the data about their working

hours per week, and based on the result, these individuals will be categorized into three groups - full-timers who work more than 30 hours a week, part-timers who work 1 to 30 hours a week and the unemployed (the retired) who do not work. In this case, unlike the first test, the dependent variable includes three, not two, kinds of values.

5. 2. 2 Explanatory Variables

The explanatory variables include (1) individual characteristic variables: age, education, health status, occupation¹¹, job status¹², house head and family size (2) Economic factor variables: rental income, financial income, monthly transfer from adult children (See Table 2)

In Korea, investment in real estate has been a main way for many people to increase their wealth for getting ready to retirements while investment in financial assets is comparatively less. In addition, to support the cost of living, the ratio of receiving financial assistance from their children in Korea is comparatively higher than other countries.

¹¹ For retirees, their main job before retirement

¹² For retirees, their main job before retirement

5. 2. 2. 1 Individual characteristic variables

The individual characteristic variables include age, education, health status, occupation¹³, job status¹⁴, house head and family size in determining retirement behaviour. ‘Age’ variable will be used as continuous or grouping one. For grouping case, there are three age groups, including Age0 (55~60 years old), Age1 (61~65 years old), and Age2 (66~70 years old). Health status has 2 categories include ‘good or average’ and ‘poor’. They also record five occupation groups, including Occupation1 (Specialist or Officer), Occupation2 (Sales or Service) Occupation3 (Farmer or Fisher), Occupation4 (Manufacturing) and Occupation5 (Simple labour). The job status includes 4 categories, Status1 (Permanent waged worker), Status2 (Temporary daily worker), Status3 (Employer or Self-employed) and Status4 (Unpaid family worker). House head is a dummy variable depending on whether he is a house head.

5. 2. 2. 2 Economic factor variables

Economic factor variables include rental income, financial income and monthly transfer from adult children. These are monthly amount which they obtain

¹³ For retirees, their main job before retirement

¹⁴ For retirees, their main job before retirement

from their house or land (rental income), financial asset (financial asset), or adult children.

6. Empirical Studies

6.1 Empirical Study 1

In order to analyze the influence on the retirement of the aged, this paper used the logistic regression Method. The following is the definition of the analysis model:

$$P(y = 1 / X) = \frac{\exp(\beta_0 + X\beta)}{1 + \exp(\beta_0 + X\beta)}$$

In the model, y is the value of the variable that refers to whether the aged people are retired or not. If the person is retired, the value is 1, otherwise 0. β_0 , meanwhile, is the parameter of the constant term, and β is the regression parameter of explanatory variables.

Table 3 is the result of the model analysis. Among them, Model 1 is the result when age was treated as the continuous variable among explanatory variables. As a result of the analysis, it was found that most of the variables had a statistically significant influence, except for the education level and family size.

Table 6.1 Regression result of Model 1, 2

Variables			Model 1	Model 2
Age (61~65)	Continuous	C	0.19 (.02) ***	
	55~60	D		-1.09 (.20) ***
	66~70	D		0.75 (.23) **
Education		C	0.002 (.03)	-0.001(.03)
Family size		C	0.02 (.07)	-0.01 (.07)
Rental inc		C	0.19 (.04) ***	0.19 (.04) ***
Financial inc		C	0.10 (.05) *	0.10 (.05) *
Transfer from children		C	0.21 (.05) ***	0.22 (.05) ***
Occupation (Specialist /Officer)	Sales or Service	D	-0.06 (.31)	-0.09 (.31)
	Farmer or Fisher	D	-1.66 (.42) ***	-1.59 (.41) ***
	Manufacturing	D	-0.51 (.25) *	-0.49 (.25) *
	Simple Labour	D	-1.49 (.33) ***	-1.49 (.32) ***
Job Status (Perm waged)	Temp or Daily	D	-0.66 (.27) *	-0.71 (.27) **
	Employer or Self-Employed	D	-1.48 (.25) ***	-1.43 (.24) ***
	Unpaid family worker	D	-3.28 (.91) ***	-3.21 (.94) **
Health State		D	-1.79 (.21) ***	-1.78 (.21) ***
House Head		D	-0.78 (.32) *	-0.83 (.32) **
Constant			-8.42 (1.56)	3.89 (.61)
n			904	904
Log pseudo-likelihood			-414.28	-424.40
Pseudo R2			0.3118	0.2950

* p<0.1, ** p<0.01, *** p<0.001

C: continuous D: dummy

Standard error in the parentheses

In particular, rental income and transfers from children were found to be relatively more strongly associated with retirement than financial income. This supports the argument that the real estate income and money from the transfer from children are the major sources of income for the aged in Korea, where the history of the pension is short.

Among the character variables of occupations, groups like “farmers and fishermen” and “simple labourer” were found to have a probability of being retired remaining only at the 19% (=exp [-1.66]) and 22.5% level, compared with the base group of “specialist/officer” under the same conditions. This mirrors the characteristics of the Korean society, where mandatory retirement is the majority case and jobs that have no mandatory age limit lead to a large supply of labour of the aged class. This is also confirmed in the job status variables. In comparison between permanent waged workers and the base group, the probability of retirement under the same conditions was found to be 22.8% for the “employer and self-employed” group and 3.8% for the “unpaid family worker” set. This is also speculated to be because the mandatory retirement age is the major reason for people to retire in Korea.

In the other groups, age, health state, etc., remained in the territory of common

sense, as they showed a correlation of + and – respectively. Also, in the household, if a person is the head of the house, the probability of being retired remained at 45.8% as expected, compared with persons who are not heads of the house.

Model 2 is the result of processing Model 1 by dividing age into groups with a dummy variable, and it did not show a big difference from the result of Model 1.

As mentioned earlier, age has a clearly positive correlation with retirement, regardless of whether it is seen as a continuous variable (Model 1) or it is considered together in the boundary of the 3 groups (Model 2). However, as the age goes up, the possibility of retirement increases by 1.21 times ($\exp [0.19]$, Model 1). It is a simple fact that, when a person gets older, he or she is more likely to retire, but this has a different level of application according to the target groups, and the logit analysis result, including the interaction term of Table 4, makes an examination into this aspect. Model 3, which includes the interaction term of the job status and age, shows an interesting result.

Table 6.2 Regression result of Model 3, 4

Variables			Model 3	Model 4
Age		C	0.25 (.03) ***	0.20 (.04) ***
Education		C	-0.003 (.03)	0.002(.03)
Family size		C	0.03 (.07)	0.02 (.07)
Rental inc		C	0.19 (.04) ***	0.18 (.04) ***
Financial inc		C	0.10 (.05) *	0.10 (.05) **
Transfer from children		C	0.22 (.05) ***	0.22 (.05) ***
Occupation (Specialist /Officer)	Sales or Service	D	-0.12 (.31)	3.72 (3.75)
	Farmer or Fisher	D	-1.51 (.40) ***	8.16 (4.07) *
	Manufacturing	D	-0.56 (.26) *	-2.95 (3.36)
	Simple Labour	D	-1.62 (.35) ***	-3.66 (4.56)
Job Status (Perm waged)	Temp or Daily	D	-1.01 (4.02)	-0.68 (.29) *
	Employer or Self-Employed	D	7.36 (2.73) **	-1.49 (.26) ***
	Unpaid family worker	D	-9.01 (7.49)	-3.22 (.91) ***
Health State		D	-1.81 (.21) ***	-1.81 (.21) ***
House Head		D	-0.79 (.31) *	-0.81 (.31) *
Interaction	Age*Sales/Service	D		
	Age*Farmer/Fisher	D		-0.06 (.06)
	Age*Manufacturing	D		-0.15 (.06) *
	Age*Simple labour	D		0.04 (.05)
	Age*Temp of Daily	D	-0.005 (.06)	0.03 (.07)
	Age* Employer or Self-Employed	D	-0.14 (.04) **	
	Age*Unpaid family worker	D	0.08(.12)	
Constant			-11.88 (2.16)	-9.11 (2.55)
n			904	904
Log pseudo-likelihood			-408.17	-409.53
Pseudo R2			0.3220	0.3197

* p<0.1, ** p<0.01, *** p<0.001

C: continuous D: dummy

Standard error in the parentheses

In every job status, when a person is older, he or she is more likely to retire. Yet, in comparison with the permanent waged worker (coef=.25), which is the base group, the employer/self-employed group (coef=.11) did not show a big increase in the possibility of retirement as the person gets older. Such an interpretation is also possible in Model 4, which analyzed the interaction of age and occupation. For example, the farmer/fisherman group is found to have a not so remarkable level of increase in the possibility of retirement as the age goes up, in comparison with other groups of jobs.

6.2 Empirical Study 2

This study divides the state of labour of respondents, which is the dependent variable, into three kinds – full-timer, part-timer and unemployed (retired). Among these, a full-timer is a person who works more than 30 hours a week, when a part-timer works 1 to 30 hours a week and the unemployed (the retired) do not work. When there are more than two dependent variables, the Logit model cannot be used. Therefore, the Multinomial Logit model in the following is used:

$$\Pr(y_i = k / X_i) = \frac{\exp(\alpha_k + \beta_k X_i)}{\sum_{j=1}^3 \exp(\alpha_j + \beta_j X_i)} \quad k = \begin{cases} 1. \text{full-timer} \\ 2. \text{part-timer} \\ 3. \text{unemployed} \end{cases}$$

When full-timers, among dependent variables, were chosen as the base group, the analysis result is as in Table 5. Among them, when the unemployed with zero working hours are considered to be in retirement, in test 1, the result of analysis of Test 2 is not so different from that of Test 1. Variables that were found to be statistically significant in Test 1 are also found to have a close relation with retirement this time as well. What is interesting here is that the farmer/fishermen group among occupation groups and the employer/self-employed group among the job status groups showed significant results in the opposite directions to the part-timers and the unemployed. Also, in case of the temporary/daily worker group among job status sets, part-timers showed a positive result. These groups of jobs mostly come without a mandatory retirement age, and this is the case of people who are in such professions. After all, when dividing the aged into one group with jobs with mandatory retirement and the other group without mandatory retirement, the former case directly turns from full-timers to retirees when a person reaches a certain age; whereas, the latter group is speculated to slowly approach the retirement stage by decreasing times of labour. This again confirms the fact that a major reason for retirement in Korea is the mandatory age.

Table 6.3. Regression result of Empical Study 2

Variables			Part-Timer	Unemployed (Retired)
Age		C	0.04 (.03)	0.17 (.02) ***
Education		C	0.06 (.04)	0.01 (.03)
Family size		C	-0.07 (.10)	-0.03 (.07)
Rental inc		C	0.04 (.05)	0.17 (.04) ***
Financial inc		C	0.01 (.07)	0.10 (.05) *
Transfer from children		C	0.01 (.09)	0.28 (.05) ***
Occupation (Specialist /Officer)	Sales or Service	D	-0.36 (.45)	0.24 (.32)
	Farmer or Fisher	D	1.21 (.39) **	-1.26 (.45) **
	Manufacturing	D	0.18 (.35)	-0.60 (.27) *
	Simple Labour	D	-0.41 (.49)	-1.46 (.34) ***
Job Status (Perm waged)	Temp or Daily	D	1.54 (.35) ***	0.08 (.28)
	Employer or Self-employed	D	0.52 (.32) *	-1.34 (.26) ***
	Unpaid family worker	D	0.41 (.96)	-3.26 (.89) ***
Health State		D	-0.19 (.31)	-2.01 (.21) ***
House Head		D	0.49 (.70)	-0.69 (.31) *
Constant			-5.25 (2.32)	-7.01 (1.57)
n			902	
Log pseudo-likelihood			-648.51	
Pseudo R2			0.2409	

* p<0.1, ** p<0.01, *** p<0.001

C: continuous D: dummy

Standard error in the parentheses

7. Conclusion

This study looked into the factors that influence the supply of labour in the aged groups in Korea, where the pension system is not yet fully established. As a result of the analysis, it was found that factors like age, rental/finance income, and transfer from adult children had a positive correlation with retirement, while other factors such as good health and being head of the house had a negative relationship. In particular, concerning occupation or job status, it was found that workers, in the blue collar industry or without a mandatory retirement age, tend to retire in later years than workers in the white collar industry or without mandatory retirement age under the same conditions otherwise. This is rather far from factors like health or leisure that the respondents directly answered, when asked about the reasons behind their retirement.

After all, it is suggested that mandatory retirement is a major factor of retirement in Korea. Also, "I cannot find a job" was the No. 2 reason that respondents chose for their retirement. This suggests that a considerable number of the elderly, who lost their jobs because of the mandatory retirement age, may still want to continue working, but could not find a job and, thus, became involuntary retirees. If they have sufficient income, such as various asset incomes or transfer from adult children, there is no big financial problem. Yet, considering that the national pension system is not fully established in Korea, if these retirees have no proper sources of income, they are likely to suffer a serious financial instability. It should also be noted that the Korean government has a policy to reduce the amount of pension given to the recipients as much as possible, for fear of

aggravating the financial conditions of the national system. Therefore, the financial difficulty of these retirees may become a major social problem in the future. In these circumstances, it may be considered as one choice to change the mandatory retirement age, as the population becomes aged and the financial standing of the national pension system is expected to grow worse.

In this case, if the mandatory retirement age would become higher or if the mandatory retirement system itself would be abolished, new research should be done to see how these changes would affect the supply of labour of the elderly. Generally speaking, the elderly workers have higher wages than younger workers, and their reservation wage in reality is showing a big gap from the pay that is decided by the law of supply and demand. Therefore, it is possible to discuss the abolishment or change of the mandatory retirement system, only after looking into the width of change of the supply of labour of the elderly according to the variation of the wage rate.

Separately, a study should be done, also, on the elderly who remain full-time or part-time workers, because there are no mandatory retirement ages in their professions. It should be examined if they are choosing to continue to work because they want to do so or if they are working because they have no other choice in order to make their living. As mentioned earlier, the pension system of Korea, unlike those of other developed countries, is only in the beginning stage, and it is only in the year 2008, when Korea saw the first full old-age pension recipient in the national pension system. Besides, the amount of per capita pension remains only to be USD 170 (in 2003). Therefore, it is, in fact, difficult for a retiree to decide to stop working when depending only on the pension without

other income. Under these circumstances, research should be done, without any further delay, to see how the supply of labour of the elderly would be affected if the public pension of Korea is activated. This is an assignment of importance that should be done before changing the pension system.

Meanwhile, the finding that the rental income has a very close correlation with retirement is greatly significant not only in the labour market of the elderly, but also in the real estate market itself. It means that the real estate income in Korea is playing a role that is similar to the pension income of the developed countries in the West, and it also suggests that the desire for stable income of the elderly is an important axis in the demand of the real estate market. The elderly are weaker, in terms of the physical labour force than young workers, and they have a strong tendency to rely on the asset income. Furthermore, the Korean stock market is instable as it repeats low rate and fluctuations of a sharp crash and rise. Therefore, people tend to prefer real estate income as the source of stable income in the later years of their lives. Such a demand of real estate can hardly be seen as the real demand for apartment or land for residence or farming. The Korean government, which has recently been presenting a variety of policies to fight the overheating real estate market, should consider that one axis of real estate demand is the source of income for the elderly. Considering the characteristics of the Korean society, it would also be of value, in the near future, to observe the correlation between the stabilization of public and private pension, such as the national pension and the change of the real estate demand.

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<Appendix > National Pension in Korea

1. Pension scheme

A public pension plan called the National Pension System (NPS) in Korea was introduced in 1988 for the private sector employees¹⁵ of ages 18 to 59, and its coverage was extended to include all the work places in 2006.

The contribution rate for the National Pension Scheme was initially set at 3% in 1988, and has been gradually increased since then, reaching 9% in 1998. It is shared equally between employees and their employers. The contribution rate for the self-employed started at 3% in 1995 and has been increased by 1% per year from 2000 until reaching 9% in 2005.

Full pension can be currently claimed at age 60 to retired persons insured for 20 years or more. In 2013, the normal pensionable age is to be increased to 61 and then on, one year every five years, eventually reaching 65 in 2033.

The National Pension Scheme is a defined-benefit plan, financed mainly on the pay-as-you-go basis with partial funding. As at the end of March 2001, it had fund reserves of 76.8 trillion won. The fund reserves have been invested mainly to

¹⁵ Civil servants, military servants, and private school teachers have their own different pension plan (financially independent)

construct social overhead capitals. They have been invested in the financial sector as well, including investments to private bonds, stocks, and shares. The medium and long-term financial projections are to be conducted every five years from 2003, promoting the fortification of the financial sustainability of the National Pension Scheme in the future. (Takayama [2004])

2. History

1988: Implementation in workplaces with 10 or more employees

1992: Extension to the employed in workplaces with 5 or more employees

1995: Extension to the employed in workplaces with less than 5 employees in rural areas, farmers and fishermen

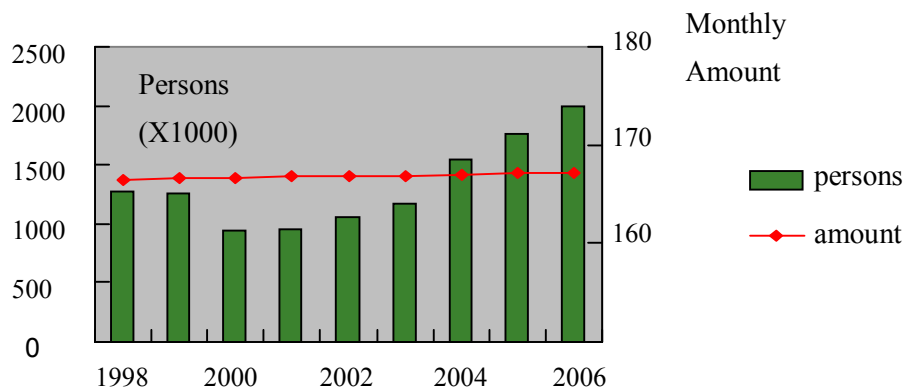
1999: Extension to the urban self-employed, employees and employers in workplaces with less than 5 employees

2006: Extension to the all work places

3. Pension Type

Type	Requirements
Full Old-age Pension	A person reaching 60 with an insured period of 20 years or more
Reduced Old-age Pension	A person reaching 60 with an insured period 10 ~ 20 years. Being paid from 55 of age
Active Old-age Pension	A person from 60 to 65 of age who meets the requirement for a full old-age pension who participates in economic activities
Early Old-age Pension	A person from 55 to less than 60 of age with an insured period exceeding 10 years
Special Old-age Pension	A person aged from 50 to less than 60 who cannot meet the requirement for an old-age pension (10 years) because of their old age.

4. Number of Pension Beneficiaries & Average Monthly Amount



< Source: National Pension Service in Korea >