Characteristics Analysis of Poverty of Elderly and Potential Elderly Households*

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Abstract

The poverty problem of elderly (65 years old and over) in Korea remains pervasive. The one of potential elderly (55-64) will also become a big social issue after retirement from the job market. This paper tries to figure out the factors that affect the elderly and potential elderly household poverties in order to establish adequate welfare policies. The paper merges ten years Korean Welfare Panel Data using two merge key variables (hid and time). This study implements the panel logit analysis on the factors which affect the poverties of the elderly and potential elderly. It analyzes demographic, economic, and systematic related variables. Based on the analysis results, the ordinary income and housing values variables affect positively regular households irrespective of age groups. Main economic activities and sex variables have a negative effect on the poverty problems. The government chooses the policy alternatives for improving the poverty problems, considering the poverty characteristics of age groups, economic activity, sex, and so on. This paper suggests some current and future policy alternatives considering all together the poverty problems of elderly and potential elderly households.

Keywords: Potential Elderly Households, Farmland Pension Systems, Panel Logit Model, Random Model.

* This work was supported by the Ministry of Education of the Republic of Korea and the National Research Foundation of Korea (NRF-2015S1A3A2046745). And this paper submitted the Journal of Transylvania.
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Introduction

From the desperately poor country to the advanced one, Korea has achieved a significant economic growth in the last 40 years. Economic growth notwithstanding, it has also experienced social disparities among income groups, regional difference, and age groups (Kim, 2013). As a result, among these groups, gaps generated other social conflicts. Notably, the income disparities among elderly groups gave rise to the social welfare issues. In Korea, poverty problems of the elderly are more severe than in any other country due to such unique experience that, after the Second World War many people moved into South Korea. Moreover, after the Korean War (1950-1953) the swift rise in baby boomers, whom now are retired from jobs market or will retire soon, become a growing concern. As a consequence, the total number of baby boomers is relatively bigger comparing to any other country. It means that the problems related to potential elderly (55-64 years old) in the near future will be more severe than those of other countries especially under the existing weak security system. Furthermore, Korea has the lowest rate of birth, and in the same time, the highest aging speed in the world (Cho and Park, 2015). If it urgently does not deal with these social problems, eventually it would be facing a social disaster. Therefore, it is recommendable to prepare as soon as possible a reasonable welfare policy for the poor elderly and potential elderly groups. However, there are some difficulties in securing a social consensus on the welfare policy. Economic welfare without the increase of tax becomes a substantial social matter of contention, even though politician's views differ. Some argue that it is possible to offer economic welfare without a tax increase, others consider that it is impossible to have a good level of prosperity and quality of living standards without an increase of taxes (Cho and Park, 2014 and 2015).

Thus, the welfare issues become a significant social problem in Korea owing to a weak welfare system (Cho and Park, 2015). The annuity payment cannot cover the living costs of elderly people. This is because the history of the welfare system is very short, comparing to any other developed country. This study tries to figure out the factors which affect the poverty of elderly and potential elderly households in order to establish the tailored welfare policy considering the level of income and age groups. For such a purpose, this paper categorizes two income groups (regular and poor groups) and two age groups (elderly and potential elderly groups), using ten-year welfare panel data. Chapter 2 reviews the characteristics of elderly and potential elderly poverty. Chapter 3 merges the ten-year welfare panel data for the cross-section and longitudinal analysis and implements the panel logit analysis to figure out the poverty characteristics of age and income groups. Chapter 4 makes a conclusion and suggests some policy implications to establish a tailored welfare policy for each group.

Poverty Problems of Elderly and Potential Elderly Households

Elderly poverty represents one of the most serious issues in Korea. Either the elderly poverty or the poverty of the potential elderly, the Korean weak social security system still ranks as the single most important factor on both challenges, though with considerable levels. Eventually Korea recorded the highest poverty rate for elderly among 34 members of the Organization for Economic Cooperation and Development (OECD). One-half of Korean people aged 65 years and above lives in relative poverty, nearly four times higher than the OECD average of 13%. Elderly poverty is thus an urgent social problem (Jones and Urasawa, 2014). Moreover, the poverty problem of potential elderly (baby boomers) who are 55-64 years old would also become a significant matter of concern. Over the past few years, a

contributing factor to elderly poverty in Korea has been its low net pension replacement rate of about 46%, which is also far below the OECD average of 65%. The National Pension System in Korea, first introduced in 1988, is a "partially-funded defined benefit plan that provides a survivors' pension and disability pension as well as a relatively generous old age pension with a 60% average replacement" (Moon, 2002). However, this scheme is not enough to cover the elderly poverty because it is still in its infancy.

The fertility rate also declined at an unprecedented rate, and the elderly population growth already outpaced the historical national average. The "compressed population aging" in Korea has been driven by increasing life expectancy and falling fertility (Yoon, 2013). As a result of increased longevity, the change of population structure greatly affects the economic security of the overall elderly population. Regarding their financial security, the elderly are the most vulnerable group to uncertainty, even though diverse income compensation programs have been established to transfer resources to the elderly (Moon and Lee, 2010). Lots of elderly households fall under poverty line after retirement.

We can easily forecast the poverty of potential elderly who already retired from the job market due to the weak security system. According to Min and Lee (2014), only 29% of total elderly uses the public pension and their assets for securing their living costs; others experience the lack of living costs. There are several studies on the reduction of the elderly poverty considering the public pension (Kim and Kwon, 2007; Kim, 2008; Suk, 2010; Yoon, 2013). More specifically, Kim (2008) notes the pension effects for solving the elderly poverty. She concludes that the pension system contributes to gradually release the elderly poverty. However, its effect is not big due to the weak pension system. Moon and Lee (2010) focused on the economic status of the elderly women poverty without indicating other factors which influence the elderly poverty problems. Min and Lee (2014) analyzed the decision factors which affect the elderly poverty rate among 23 OECD countries. However, their study did not distinguish between poor elderly and regular elderly and then could not figure out the exact policy target groups for solving the elderly poverty issues.

Yoon (2013) notes that labor force participation remains relatively high comparing to the OECD average for men aged 50 and older (potential elderly) and for women aged 60 and older (elderly) in Korea. For the 65-and-older age group, the participation rate is 30% compared with an OECD average of 13% in 2011. The average effective age of retirement for men in Korea is 71, the second oldest among OECD countries. Although likely to remain in the labor force, these older workers also tend to retire early from their main career, at around age 55. In other words, the Korean elderly retires early from their main career; however they should work continuously for their living costs under a weak security system. Eventually to cover their living expenses they are working under temporary or part-time job conditions. This reflects the unstable job market for the elderly people.

In 2008 the Korean government introduced the housing pension system, which liquidates elderly housing asset at the monthly base for solving the monthly living cost targeting the urban elderly. In 2011 for the rural elderly the Korean government adopted the farmland pension system, which liquidates the farmland assets at the monthly base to solve the shortage of elderly living costs. Still, these policies are not popular until now because of two aspects: firstly, the elderly people do not know well about these policies for the reason that they are established recently, and secondly, their children also do not want that their parents participate in the pension system because these policies reduce the bequest from their parents (Cho, 2015). And then the poverty problems of the Korean elderly remain pervasive even though there are some policies which can reduce the elderly poverty (Cho and Ma, 2007;

Kim, 2007; Lee, 2014; Cho and Park, 2014).

Previous studies had some blows in three aspects. At first, these studies did not mention the specific factors which affect the elderly poverty. Therefore, we cannot figure out what kind of policies is necessary for reducing the elderly poverty. Second, most of the studies used cross-sectional data. And then they did not figure out the poverty trend of elderly household or their longitudinal characteristics. Third, they did not analyze the poverty problems of potential elderly who are the "unique Korean baby boomers." Hence, they cannot handle the poverty problems of potential elderly which will become a substantial social issue eventually. Therefore, this study analyzes cross-sectionally and longitudinally the specific factors which affect the poverties of elderly and potential elderly households using ten years welfare panel data. It will suggest the adequate welfare policy alternatives depending on the age groups (elderly households and potential elderly households).

Data and Analysis Method

Data and Variable Selection

The Korea government has annually surveyed the Korean Welfare Panel Data (KWPD) since 2006. These data sets are constructed by the Korean Institute for Health and Social Affairs (KIHASA) and the Social Welfare Research Center at Seoul National University (SWRC SNU). This data includes the welfare, economic, and social data about households, their members, disable groups, and welfare perception data (Cho and Park, 2014). This paper uses the household data to establish the panel data sets. It merges the household panel data sets from 2006 to 2015. Using two key variables which are household ID variable (hid) and time one (year), each year data set is merged over the time. In this case "hid" represents the entities or panels (i) and "year" represents the time variable (t). Based on the theoretical background and data availability, this study selects a binary dependent variable.

The term panel data refers to multi-dimensional data frequently involving measurements over time. It includes observations of multiple phenomena obtained over multiple time periods for the same groups or individuals. It includes the repeated measurements at various time points for the same subject. And then, it produces more observations by pooling cross-sectional and time series data and an increase in the degree of freedom stemming from more observations, reducing multicollinearity (Torres-Reyna, 2007; Min and Choi, 2012a; Wikipedia "Panel Data," 2015). Panel data can control unobservable individual heterogeneity and provide precious information about cross-sectional variations and dynamics and avoid problems in time series data, e.g. multicollinearity, aggregation bias and nonstationarity. It can also identify individual and time effects which cannot be identified by pure cross-sectional or time series data (Min & Choi, 2012 a&b). To figure out the poverty of elderly and potential elderly household, the binary variable which is the regular or poor household is used as the dependent variable.

Eventually, dependent variable is the poverty line which is composed of binary variable (0: poverty household, 1: regular household). This study defines the poverty line depending on the household income. The regular household means over 60% of equalized household median disposable income and the poor household notes under 60% of equalized household median disposable income (see KWPD, 2006-2015). Depending on the theoretical aspects and data availability, the independent variables are composed of: demographic related variables such as sex, education, and region; economic related variables such as ordinary income and housing value; and systematic variables such as subjective minimum living cost (SMLC) and main economic activity. Total seven independent variables are used in this

analysis. This paper uses the log values of income-related variables and housing value variables (Cho & Park, 2014; 2015).

Analysis Method

The dependent variable of regression analysis using the panel data set can be categorized as continuous and binary variables. The logit or probit analyses can be used in the case when the dependent variable is a binary one in the cross-sectional analysis. The same method can be applied to the panel data analysis, but the objective characteristics of the panel in the error term should be considered additionally. The binary dependent variable model can be presented as Eq.1.

$$y_{it} = \begin{cases} 1, & y_{it}^* > 0 \\ 0, & y_{it}^* \leq 0 \end{cases} \qquad \text{Eq.1}$$

In Eq.1, y_{it}^* is the latent real dependent variable which is unobserved, and y_{it} is the observed value. This study assumes the linear regression model on y_{it}^* as Eq.2

$$y_{it}^* = \alpha + \beta x_{it} + u_i + \varepsilon_{it} \qquad \text{Eq.2}$$

If we assume that error term ε_{it} follows the logistic distribution instead of the normal distribution, it is a panel logit model. Depending on the situation if the error term (u_i) is the fixed effect or the random effect, we should use different estimation method. If we assume that u_i is the random variable, this paper will assume that u_i~N (0, σ_u^2) is the normal distribution and ε_{it} is the logistic distribution. The maximum likelihood method also is used.

Analysis Results of Elderly and Potential Elderly Households

Analysis Results of Elderly Households

Table 1 represents the descriptive statistics of the poverty of elderly households. Variable 'povertyline' is composed of 0 and 1. The poor household is 0, and regular household is 1. 'Overall' number means the frequency of 0 or 1 of povertyline variable over total observed objectives (2581 households*10 time periods).

Table1. The Descriptive Statistics of Poverty of Elderly Household

	Overall		Between		Within
Povertyline	Freq.	Percent	Freq.	Percent	Percent
0	15457	63.14	2197	85.12	73.98
1	9022	36.86	1708	66.18	55.95
Total	24479	100.00	3905 (n=2581)	151.30	66.09

Table 1 notes that 63.14% of the elderly households are under the poverty line, which means the poor household, and only 36.86% of total elderly households are the regular households over the research time periods. This result indicates that about two-third of total elderly households are poor households. It also reflects the weak security system for the elderly households. As in the previous description, povertyline variable is composed of 0 or 1. Table 1 show that 'between' frequencies are a total of 2,581 panel objectives and total frequency is 3905. This 'between' panel objectives means the frequencies that 0 or 1 exist more than one time at least over total panel objectives in each observed time series value. This notes that povertyline variable is not fixed, but can be changed in a panel group. In other

words, between frequencies is only noted the variation among panel objectives without considering variation of time series. The case of "within" frequency only suggests the relative frequency (percent). It only considers the variation of time series within a panel objective. For instance, the relative frequency of povertyline=0 is 73.98%. It indicates that the relative frequency of povertyline=1 (regular household) is on average 55.95% over overall survey periods and average percentage is 66.09.

Table 2 presents the analysis results of the panel logit model as a random model. In the case that u_i assumes the probability effect, $u_i \sim N(0, \sigma_u^2)$ assumes normal distribution and ε_{it} assumes logistic distribution. Based on these assumptions, the method of maximum likelihood is used. To become a consistent estimator, the assumption which $\text{cov}(x_{it}, u_i)$=0 should be accepted.

Table 2. Analysis Results of Estimation of Panel Logit Model for the Elderly Household

Group variable: hid				Number of obs. =		20375
Random effects u_i ~ Gaussian				Number of groups =		2445
Integration method: mvaghermite				Integration points =		12
Log likelihood = -3229.6361				Wald chi^2 (7) =		1536.42
				Prob. > chi^2 =		0.0000
povertyline	Coef.	Std. Err.	*t*	P>|*t*|	[95% Conf.	Interval]
h0_reg5	-.0835	.0602	-1.39	0.166	-.2015	.0345
h0_edu	.2407	.0540	4.45	0.000	.1347	.3466
h0_maineco	-.1698	.0189	-8.98	0.000	-.2068	-.1327
ln_mls	-1.138	.1309	-8.70	0.000	-1.395	-.8820
ln_oincome	12.36	.3244	38.11	0.000	11.730	13.002
ln_hvalue	.0304	.0455	0.67	0.505	-.0589	.1197
sex	-1.701	.1485	-11.45	0.000	-1.992	-1.410
_cons	-85.64	2.233	-38.34	0.000	-90.019	-81.26
/lnsig2u	1.50	0.86			1.33	1.66
sigma_u	2.11	0.09			1.94	2.30
rho	0.58	0.02			0.53	0.62
Likelihood-ratio test of rho=0: chibar2(01) = 901.73 Prob >= chibar2 = 0.000						

Table 2 shows the estimation results of panel logit model. Most of the variables note the expected signs. However, region and housing value variables are not statistically significant. It might be that rural elderly require less living costs than that of urban elderly because they can easily get food in their community. Housing value also does not affect the poverty line significantly as the house being a real estate that cannot be changed into the monthly income. Certain amounts of elderly people are house-rich and cash-poor group. Education variable notes that higher educated households decrease the probability to fall into poverty level. Ordinary income and housing value variables note similar results. However, main economic activity, SMLS, and sex variables show negative signs. These variables indicate the expected signs. Job categories (from one to nine), are ordinarily coded from regular job to temporary or jobless. SMLS also might show the expected sign because poor household should consider the dwelling costs in counting his or her living costs. Comparing with the male household, female household easily falls below povertyline. Moreover, the test result of the likelihood-ratio test of rho=0 notes that the null hypothesis (σ_u^2=0) is rejected. It indicates that the

characteristics of objective of panel should be considered.

The marginal effects after the estimation of the logit model are estimated like it is shown in Table 3.

Table 3. The Measurement of Marginal Effects after the Estimation of Panel Logit Model for the Elderly Household

y = Pr (povertyline=1 assuming u_i=0) (predict, pu0) = .14717988							
variable	dy/dx	Std. Err	t	P>|t|	[95% C.I.]		X
h0_reg5	-.0104	.0076	-1.38	0.168	-.0253	.0044	2.814
h0_edu	.0302	.0070	4.31	0.000	.0164	.0439	3.717
h0_mai~o	-.0213	.0025	-8.40	0.000	-.0262	-.0163	6.827
ln_mls	-.1429	.0177	-8.07	0.000	-.1776	-.1081	4.489
ln_oincome	1.552	.0739	20.98	0.000	1.407	1.697	7.309
ln_hvalue	.0038	.0057	0.67	0.505	-.0074	.0150	8.398
sex*	-.2624	.0282	-9.29	0.000	-.3178	-.2071	.6765
(*) dy/dx is for discrete change of dummy variable from 0 to 1							

If the education level of elderly households increases one level under the other constant conditions, the probability which belongs to the regular household instead of the poor household increases 30%. Especially in the same context, Log value of ordinary income and that of housing value increases 155% and 3.8% respectively. In summary, higher education, more ordinary income, and higher housing values increase the probability that the elderly household belongs to the regular household. Particularly, ordinary income constitutes the most important factor in escaping from falling into the poor household. Therefore, the government should make an effort to improve the ordinary income of elderly households. The asset (housing and farmland) pension which guarantees the certain amount of monthly income can also be a good policy alternative.

Fixed effect logit model eliminates all 0 or all 1 cases of povertyline variable of each panel objective during the time series periods. Table 4 presents the significance of coefficients of three different models. Pooled logit model (POOL) which does not consider the objective characteristics of the panel, random effect model (RE), and fixed effect model (FE) are compared one with another.

Table 4. The Comparison of Significance of Three Different Models for the Elderly Household

Variable	POOL	RE	FE
h0_reg5	-0.039	-0.083	0.056
h0_edu	0.195***	0.243***	-0.218
h0_maineco	-0.134***	-0.171***	-0.139**
ln_mls	-1.137***	-1.141***	-0.535***
ln_oincome	8.481***	12.364***	11.899***
ln_hvalue	0.159	0.030	-0.502***
sex	-1.307***	-1.705***	-0.438
_cons	-58.224***	-85.606***	

lnsig2u _cons	1.482***		
Statistics N	20375	20375	10836

Legend: * p<.1; ** p<.05; *** p<.01

For instance, education variable in Pool and RE is statistically significant and has + signs. FE has – sign and is not significant statistically. Sex variable in Pool, Re, and FE is – sign, but that in FE is not significant statistically. It identifies that the female household easily fall into the poor household. h0_maineco variable in three models has – signs. It notes that unstable economic activity of elderly household cause the poor household. Other variables can be explained with the same method. In the fixed logit model, 1241 groups (9539 obs) dropped because of all positive or all negative outcomes (Min and Choi, 2012a).

To test the hypothesis of which fixed effect should be considered or not, pooled logit and fixed effect logit models should be compared with each other. The null hypothesis can be set up as follows:

H_0: Fixed effect does not exist.

Hausman test can be implemented in order to test this hypothesis. P value of the test statistics is lower than 0.01 and the null hypothesis is rejected at 1% level (see Table 5). And then this paper notes that the fixed effect of each panel objective exists.

Table 5. Hausman Test for the Section of Analysis Model

	(b)	(B)	(b-B)	sqrt (diag(V_b-V_B))
	FE	POOL	Difference	S.E.
h0_reg5	.0559	-.0825	.1385	.2447
h0_edu	-.2175	.2427	-.4603	.1722
h0_maineco	-.1385	-.1710	.0325	.0146
ln_mls	-.5352	-1.141	.6061	.0540
ln_oincome	11.89	12.36	-.4655	.1862
ln_hvalue	-.5017	.0301	-.5318	.0697
sex	-.4381	-1.705	1.267	.2718
b = consistent under Ho and Ha; obtained from xtlogit				
B = inconsistent under Ha, efficient under Ho; obtained from xtlogit				
Test: Ho: difference in coefficients not systematic				
chi^2 (7) = (b-B)' [(V_b-V_B) ^ (-1)] (b-B) = 402.24			Prob. > chi^2 = 0.0000	

Therefore, the choice of the fixed effect logit model is better than that of a pooled logit model in the analysis.

Analysis Results of Potential Elderly Households

In Table 6 is shown the descriptive statistics of the poverty of potential elderly households. The poor household is 0, and regular household is 1. This table is composed of overall, between, and within categories the same as with Table 1. Overall number means the frequency of 0 or 1 of povertyline variable over total observed objectives (999 households*10 time periods).

Table 6. The Descriptive Statistics of Poverty of Potential Elderly Household

Overall			Between		Within
Povertyline	Freq.	Percent	Freq.	Percent	Percent
0	2432	26.59	574	57.46	48.09
1	6716	73.41	891	89.19	81.14
Total	9148	100.00	1465	146.65	68.19
(n = 999)					

Table 6 notes that only 26.59% of the potential elderly households are under the poverty line which means the poor household, and 73.41% of total potential elderly households are regular households, in other words, more than two-third of total potential elderly households are regular households. However, for these potential elderly households there is high level of possibility to fall into the poor household category after the retirement. Therefore potential elderly households after the retirement form their job markets should make an effort to maintain their income level for escaping to become a poor household.

Table 6 similarly shows that between frequencies are a total of 999 panel objectives and total frequency is 1,465. This between panel objectives means the frequencies that 0 or 1 exist more than one time at least over total panel objectives in each observed time series value. This indicates that povertyline variable is not fixed, but can be changed into a panel group. In other words, between frequencies only note the variation among panel objectives without considering variation of time series. The case of within frequency only suggests the relative frequency (percent). It only considers the variation of time series within a panel objective. For instance, the relative frequency of povertyline=0 is 48.09%. It notes that the relative frequency of povertyline=1 (regular household) is on average 81.14% over overall survey periods and average percentage is 68.19.

The results of the analysis indicate that after the retirement many potential elderly households fall under the poverty line due to a weak security system. Therefore, there is a need to establish policy alternatives by which the potential elderly will not fall below the poverty line after the withdrawal from the job market.

Table 7 presents the analysis results of panel random model of potential elderly households.

Table 7. Analysis Results of Panel Logit Model of Potential Elderly Household

Group variable: hid				Number of obs. = 8344		
Random effects u_i ~ Gaussian				Number of groups = 982		
Integration method: mvaghermite				Integration points = 12		
Log likelihood = -1124.7119				Wald chi^2 (7) = 480.45		
				Prob. > chi^2 = 0.0000		
povertyline	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
h0_reg5	.1480	.1151	1.29	0.199	-.0776	.3738
h0_edu	.1575	.1102	1.29	0.153	-.0584	.3736
h0_maineco	-.1596	.0295	-5.41	0.000	-.2175	-.1017
ln_mls	-1.246	.2059	-6.05	0.000	-1.650	-.8428
ln_oincome	11.92	.5594	21.31	0.000	10.82	13.01
ln_hvalue	.1778	.0783	2.27	0.023	.0242	.3314
sex	-1.356	.2923	-4.64	0.000	-1.928	-.7830
cons	-84.69	4.026	-21.03	0.000	-92.58	-76.80
/lnsig2u	1.8530	.1354			1.5876	2.1184
sigma_u	2.5257	.1710			2.2118	2.8840

rho	.6597	.0304		.5979	.7166
Likelihood-ratio test of rho=0: chibar2(01) =475.98 Prob >= chibar2 = 0.000					

Most of the variables note the expected signs. However, region and education variables are not significant statistically. It might be that rural potential elderly require less living costs than that of urban elderly, because the same as the elderly household they can easily get food in their community. Edu variable also does not affect significantly the poverty line since they are located at the peak in terms of household income irrespective of education level. Ordinary income and housing value variables note similar results, the same as in the case of the elderly households, even though the coefficients of potential households are higher than those of elderly households. However, main economic activity, SMLS, and sex variables show negative signs. These variables of potential elderly households have the same expected signs with the elderly households' situation. Moreover, the test result of the likelihood-ratio test of rho=0 notes that the null hypothesis ($\sigma\_u^2 =0$) is rejected. It indicates that the characteristics of objective of panel should be considered.

The following process is to measure the marginal effects after the estimation of Panel Logit Model, as shown in Table 8.

Table 8. The Measurement of Marginal Effects after the Estimation of Panel Logit Model for the Potential Elderly Household

y = Pr (povertyline=1 assuming u_i=0) (predict, pu0) = .99865364							
variable	dy/dx	Std. Err	t	P>|t|	[95% C.I.]		X
h0_reg5	.00019	.00016	1.22	0.223	-.00012	.00052	2.564
h0_edu	.00021	.00015	1.37	0.172	-.00009	.000516	4.670
h0_mai~o	-.00021	.00007	-2.88	0.004	-.00036	-.00006	4.314
ln_mls	-.00167	.00056	-3.02	0.003	-.00275	-.00058	5.189
ln_oin~e	.01602	.00447	3.58	0.000	.0072	.024799	8.129
ln_hva~e	.00023	.00013	1.90	0.058	-7.7e-06	.000486	8.530
sex*	-.0013	.00043	-3.03	0.002	-.0021	-.0004	.8022
(*) dy/dx is for discrete change of dummy variable from 0 to 1							

Region and education variables are not significant statistically. If one unit of log value of ordinary income variable changes, the probability which belongs to the regular household instead of the poor household increases 16%. Other variables can be explained in the same way. In summary, higher ordinary income and higher housing value variables increase the probability that the potential elderly household belongs to the regular household. On the other hand main job activity, SMLS and sex variables increase the probability that the potential elderly households belong to the poor household. It gives some lessons to establish a policy to solve the problem of potential elderly poverty.

Table 9 presents the significance of coefficients of three different models. Pooled logit model (POOL) which does not consider the objective characteristics of panel, random effect model (RE), and fixed effect model (FE) are compared one with another.

Table 9. The Comparison of Significance of Three Different Models for the Potential Elderly Household

Variable	POOL	RE	FE

h0_reg5	0.044	0.149	0.208
h0_edu	0.098**	0.171	0.070
h0_maineco	-0.167***	-0.156***	-0.061*
ln_mls	-1.097***	-1.235***	-0.669***
ln_oincome	7.071***	12.010***	11.174***
ln_hvalue	0.212***	0.187**	-0.187
sex	-0.804***	-1.388***	-1.309*
_cons	-48.973***	-85.570***	
lnsig2u _cons	1.884***		
Statistics N	8344	8344	3722

Legend: * p<.1; ** p<.05; *** p<.01

For instance, region variable is not statistically significant in all three models. Education variable is statistically significant in POOL model. Education variable only is significant in POOL model. Maineco variable is significant in three different models. Housing value variable is significant in Pool and RE models and not significant statistically in FE. Statistics N indicates the number of sample used in each model.

As in the previous analysis in Table 5, to test the hypothesis whether the fixed effect should be considered or not, fixed effect logit model and pooled logit model should be compared with each other in the potential elderly household analysis. The null hypothesis can be set up as follows.

H_0: fixed effect does not exist.

In the Table 10, Hausman test is implemented in order to test this hypothesis for the potential elderly. P value of the test statistics is lower than 0.01 and the null hypothesis is rejected at 1% level.

Table 10. Hausman Test for the Potential Elderly Households

	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	FE	POOL	Difference	S.E.
h0_reg5	.2078	.1493	.0585	.2667
h0_edu	.0703	.1711	-.1007	.3493
h0_maineco	-.0613	-.1558	.0944	.0221
ln_mls	-.6689	-1.2348	.5659	.1536
ln_oincome	11.17	12.009	-.8354	.2580
ln_hvalue	-.1866	.1868	-.3735	.1289
sex	-1.308	-1.387	.07906	.7361
b = consistent under Ho and Ha; obtained from xtlogit				
B = inconsistent under Ha, efficient under Ho; obtained from xtlogit				
Test: Ho: difference in coefficients not systematic				
chi^2 (7) = (b-B)' [(V_b-V_B) ^ (-1)] (b-B)= 61.91			Prob. >chi^2 =0.0000	

The analysis of potential elderly notes that the fixed effect of each panel objective exists. Therefore, choice of the fixed effect logit model is better than the pooled logit model.

Conclusion and Policy Implications

The elderly poverty represents an important social problem in many countries. Especially Korea has a unique experience as a consequence of the World War II (Japanese Colonization) and the Korean War due to which Korea is facing currently two different baby boomer groups. This study analyzed the poverty problems of elderly (baby boomers after the World War II) and potential elderly people (55-64 years old, who are baby boomers after the Korean War). In order to analyze the poverty problems of these two age groups cross-sectionally and longitudinally, this paper established the ten years panel data set from 2006 to 2015. It merged Ten Years Welfare Panel Data using household (hid) and time (birth year) variables as the merge key variables. It used the povertyline variable (binary variable) in order to figure out the poverty characteristics of the Korean elderly households and the potential elderly households. In the theoretical aspect, total seven independent variables were used such as three demographic related variables like region, education, and sex; economic related variables such as ordinary income and housing value; and systematic variables such as subjective minimum living cost (SMLC) and main economic activity. This paper used the log values of income-related variables and housing value variables. In terms of methodological aspect, it also used three different methods such as the pooled ordinary least square, fixed effect logit, and random effect logit models. About 24479 observations for the elderly household were used in poverty analysis and about 9148 observations for the potential elderly.

In overall aspects, the povertyline might be the standard or the minimum level which the government should handle for solving the elderly poverty issue. It is directly related to the happiness of each household. On one hand, 63.14% of elderly households are under the poverty line over the research time periods, which mean poor households. Only 36.86% of total elderly households are regular households. This result notes that about two-third of total elderly households are poor households. On the other hand, 26.59% of total potential elderly households fall into the poor households. Consequently, 73.41% are regular households. It means that many potential elderly households fall under the poverty line after the retirement. Therefore, two different policies have to be established. In overall aspect, the government should establish policies to support directly the poor elderly household and to prevent indirectly that the potential elderly household will not fall under the poverty line after the retirement from the job market.

More specifically, in the case of elderly households, demographic variables note the expected signs. However region is not statistically significant. Education variable shows positive sign and sex variable note negative sign. It indicates that higher educated elderly households decrease the probability to fall into poverty level. It also notes that female elderly households easily become poor. Economic related variables also show the expected signs. Especially ordinary income variable constitute a key variable to prevent falling under the poverty line of the elderly households. Eventually the probability that elderly households belong to the regular household increases 155% according to one-unit increased of ordinary income. It suggests that the government should guarantee the ordinary income through a stable job or social pension system. Housing value also shows positive sign, but its impact is quite small. It means that higher housing price does not directly guarantee the higher ordinary income. It indicates that the elderly household is typical asset-rich and cash-poor group. And then the government should establish a policy by which the elderly household can liquidate the fixed asset for the monthly living costs (Cho and Park, 2014 and 2015). Fortunately, the housing and farmland pension systems for the elderly household are good policy alternatives for solving the above-mentioned problems. Systematic variable, such as main economic activity and subjective minimum loving cost show negative signs. The economic activities of

elderly people usually are focused on unstable jobs for making the living costs under the weak pension system. SMLS of the poor household also includes the monthly dwelling costs. Therefore the poor households who do not own their own housing need more living costs. Consequently, the government should focus on creation of stable jobs, such as social enterprise for the poor elderly households, and to promote as well joining to the housing or farmland pension for the regular households who have certain amount of real estate. Especially the government should establish some policies to support the poor female elderly households.

The poverty factor of potential elderly households can be summarized as follows: in marginal effect analysis, if one unit of log value of ordinary income variable changes, the probability that belongs to the regular household instead of the poor household increases 16%. Other variables can be explained in the same way as the case of regular elderly households. More concise, economic variables such as log value of ordinary income and that of housing value increase the probability that the potential elderly household belongs to the regular household. Systematic variables, such as main job activity and the log value of minimum living costs decrease the probability that the potential elderly households belong to the regular household, and increase the probability that they belong to the poor household. It gives some lessons to establish policy alternatives that will solve the problem of potential elderly poverty. In conclusion, the key variable 'which does not fall into poverty line' in both elderly group and potential elderly group is "ordinary income" variable. Demographic variables, such as education and sex, note the expected signs, except region. Region variable is not significant statistically irrespective of age groups. This might be due to the contradictory effects of two different areas. The urban areas can provide better job opportunity but with higher living costs, yet the rural areas will present the reverse results in urban areas.

The differences of overall marginal effects among independent variables for the elderly household are much higher than those for the potential elderly. Moreover, the marginal effect of each variable for the elderly household is much higher than that for the potential elderly. It means that each variable for the elderly household constitutes a very effective policy, especially "ordinary income" and "subjective minimum income variable" are extremely sensitive. These two variables can be good policy alternatives to prevent poverty problems of elderly households. As previously indicated, the housing or farmland pension system which guarantees the monthly income might be one of the best policy alternatives to solve the shortage of ordinary income. It can provide to elderly people a stable monthly income without an additional budget. The National Pension System also should improve the coverage proportion of the monthly living costs. However, it requires lots of governmental investment.

A half of potential regular households will fall under the poverty line eventually if the government will not implement policies which support the ordinary income and other economic related variables. Therefore the government should prepare the welfare scheme or pension for the potential elderly in advance. Especially if referring to the potential elderly household (the baby-boom generation after the Korean War). The after World War II and Korean War's baby boomers, along with the low birth rate problems will considerably increase the welfare demand required from the budget. Therefore the Korean government should prepare, as an urgent matter, a solution to these welfare issues of potential elderly households along with the elderly households.

Based on these findings, this paper suggests some policy alternatives for the elderly and potential elderly. At first, education variable affects the regular household positively. It means

that the better education guarantees a higher income irrespective of age groups and regions. Subjective minimum living cost negatively affects the regular households in two age groups and three different analysis models (POOL, RE, and FE models). Regional variable affects negatively regular household for the elderly households, but it does positively to the regular households for the potential elderly households, even though it is not significant statistically. It means the government should consider the poverty problems of elderly households who already retired from the job market in the urban areas (Seoul and Metropolitan City) because the living cost in the urban areas is much higher than the living cost in the rural areas. The government should also consider the poverty problems of potential elderly households in the rural areas because their job opportunities are relatively limited comparing with those of urban areas.

As indicated, the ordinary income variable highly affects in a positive way the regular households irrespective of age groups and povertyline. Housing value affects the regular household contradictorily, depending upon age group and regions. A key policy alternative which decreases the elderly and potential poverty problems is to improve the ordinary income. Therefore the government should focus on improving the ordinary income irrespective of age groups and regions to solve the poverty problems of elderly and potential elderly households. This paper could suggest the current and future policy alternatives because it considers simultaneously the poverty problems of potential elderly households. Fortunately the Korean government already established the farmland and housing pension systems. These pension systems might be one of the best policy alternatives in improving the ordinary monthly income for the elderly people without any additional budget support. These systems can be applied to the potential elderly people who retired from the job market. The government should provide to elderly people stabled jobs opportunities, such as social enterprise, as well to create new jobs.

This paper also has some limitations. It tries to analyze the poverty problems for the elderly and potential elderly groups for the first time. However it should have more concern about variables selection considering the poverty characteristics of age groups and regions. Lastly this paper uses three different models for analyzing the poverty problems for the elderly and potential elderly. However, each method should be tested for the more robust results.

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