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Socioeconomic Effects of Retirement Age Extension

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I Introduction

1. Background and Objective
2. Research Methodology

I Introduction

1. Background and Objective

The South Korean population is aging at an unprecedented rate today due to the advances in medical technology and a plummeting birth rate. With the working-age population in Korea beginning to decline in 2017 for the first time in recent decades, the growth rate of real GDP of the Korean economy is also expected to fall. With the total fertility rate in Korea among the lowest in the world, Koreans face a steeply rising burden of having to supporting the elderly, while the shrinking of working-age population is likely to sap the national economy further. In order for the Korean economy to grow continuously in the long run, it is critical, first and foremost, to resolve the shortage of labor.

The recent policy trend, observed in many developed nations worldwide, of importing labor from abroad may help to reduce the overall cost of production in the given industries. At the same time, however, it may also generate new costs by disrupting social cohesion. Another realistic way to overcome the impending shortage of labor supply is to increase the retirement age so as to have the aged Koreans work longer. So far, the consensus has leaned toward labor economics that emphasize the benefits of importing labor from abroad. It is time, how-

ever, that we began to conduct far-reaching and comprehensive research on the segmentation of the labor market by cohorts, income inequality, poverty, and social polarization.

A growing number of governments worldwide today are turning to imported labor as the major solution for their labor shortage problems. The increase of migrant workers, however, exerts profound and diverse social and economic effects on the host society. Before rushing to bring in foreign workers, policymakers must consider how much additional labor is needed to compensate for the shortage of the domestic workforce, what social and economic repercussions may result from the decision, and how this will affect household welfare.

It is therefore worthwhile to analyze how the extension of retirement age, and thereby extending the employment of older Korean workers, will affect the old-age income security prospects across society in the stage of policy design. In this study, we shall take into account the interdependency of economic agents and the household heterogeneity directly in the model to investigate the effects of different policy scenarios.

The partial equilibrium (PE) approach, popular in economic analysis, has a critical deficiency of neglecting the interdependency of economic agents. Any policy decision based on such an approach is therefore unlikely to achieve its intended effect. A computable general equilibrium (CGE) model, on the other hand, reflects both the interdependency of economic

agents and household heterogeneity, thus affording a more rigorous analysis for policymakers before decision-making (Nam, 2016).

By first stipulating a number of scenarios involving different likely combinations of policy instruments and subjecting them to simulations, we can compare and analyze the likely effects that each given policy scenario is to have. CGE-based simulations of policy scenarios is regarded as the most advanced technique for evaluating policy effects before they are implemented. As of 2017, such simulations were being used as the core policy analysis tool in nearly 100 countries (Nam, 2016, p. 2).

In this study, we shall examine the socioeconomic effects of extending retirement age in terms of economic growth, employment, industrial structure, and income distribution, with a particular focus on how extending the employment of older Korean workers would affect the policy on old-age income security. Our analysis will help us gauge income inequality and poverty faced by retirees and thereby produce better policy decisions that are more reflective of the interdependency of economic agents.

Our analysis shall be based mainly on the Input-Output Tables and the National Accounts data provided by the Bank of Korea. Where necessary, we shall resort to Statistics Korea's Economically Active Population Survey data as well as the

Ministry of Employment and Labor (MOEL)'s Work Status Survey by Employment Type data.

2. Research Methodology

In this study, we shall employ a CGE model, involving the heterogeneity and interdependency of economic agents, to perform simulations on the likely socioeconomic effects of policy scenarios extending the retirement age. To this end, we shall first divide the household sector and the labor market by cohort and also by employment type (according to skill levels). We shall then analyze the income and expenditures of each group to estimate the socioeconomic effects of older Koreans working longer.

Next, we shall examine the effect of extending the retirement age on the employment of young people. Questions of particular interest are whether increasing the supply of older workers will help solve the problems of a plummeting birth rate and accelerating population aging, and what effects it would have on the employment prospects for young people. We shall also analyze the income-distributing effects of different policy scenarios on industrial output, employment by sector, and the household sector, and decide policy priorities accordingly.

As for the data for our analysis, we shall first establish a so-

cial accounting matrix (SAM) database of macro- and micro-level data by assembling the Bank of Korea's Input-Output Table and National Account data. To have this database adequately capture the characteristics of different cohorts on the labor market, we shall assign heterogeneity to the household sector by household characteristics (income levels, household types, labor market characteristics, age cohorts, etc.).

Using this database, we shall analyze how extending the retirement age would affect output and employment at the industry level, the size of the middle class (including income redistribution and poverty), and the macroeconomic prospects of economic growth. As for effects on employment in particular, we shall focus on changes in the employment rates of different age groups.

It would be ideal if we could connect our CGE model, by far the most advanced analysis tool, with a micro-simulation model. It is, however, not yet possible to perform such a complex analysis in Korea. With appropriate resources and instruments given, we may employ such a tool to identify policy implications for the middle class and social polarization as well.[1)]

Through this study, we shall be able to (1) delineate the correlation between extending the retirement age (and increasing

1) As for gauging the effect on the size of the middle class, the percentage of middle-class households and/or the middle-class income share ratio may be used. As for the effect on polarization, the Duclos-Esteban-Ray or Foster-Wolfson index may be used.

the employment of older people) and the employment of young people, and (2) gain a systematic and general understanding of the effect of extending the retirement age on old-age income security and efforts to alleviate poverty.[2] Systematization of the method used in this study shall add to the unique research resources and capabilities of the Korea Institute for Social and Health Affairs (KIHASA).

2) An anonymous commentator has pointed out that micro-level analysis of redistribution is not completely captured by the CGE model in this study. As of today, however, there are no technical resources in Korea for seamlessly merging CGE and micro-simulation models into one.

II

Literature Review

1. Literature Abroad
2. Literature on Korea

Ⅱ Literature Review

1. Literature Abroad

A. Literature on Asian Countries

The debate on whether to raise the retirement age is drawing renewed interest in China today, mainly in connection with the effects it could have on the pension fund and other aspects of the Chinese economy.

Peng and Mai (2014) predicts that the working-age population in China will stop growing soon thanks to the decades-long birth control policy, with the proportion of the population made up by the elderly (aged 65 or older) to triple by 2050. The authors analyze the likely macroeconomic effects of extending the retirement age, convinced that a higher retirement age will help China retain for longer a high labor market participation rate. Using a dynamic CGE model, the authors predict that, with the retirement age raised, labor input would increase by 1.37 percent, real GDP by 1.32 percent, and real household expenditures by 1.43 percent by 2030. Although they also project that real wages would drop by 0.43 percent, this would be accompanied by pressure for wages to rise in rural regions as much of the increased employment opportunities would be concentrated in the urban agricultural, manufactur-

ing, and service sectors (Peng and Mai, 2014, pp. 24-25).

Li et al. (2016), in contrast, points out that 87.1 percent of the 3,224 Chinese individuals who participated in a survey in 2015 opposed extending the retirement age. Of these pessimistic respondents, 57.7 percent worried that doing so would decrease employment opportunities for young people, while another 22.2 percent were uncertain that the change would increase post-retirement pension income. Prompted by this popular perception, the authors examine whether there is indeed a zero-sum relationship between generations on the labor market using a linear function in logarithm and time-series data. Their analysis reveals that, with every one-percent increase in the employment rate of the older generation, there is a corresponding 0.69-percent decrease in the employment rate of the younger generation. The authors add that this crowding-out of younger people from the labor market by higher employment for older people would be especially prominent for young adults just graduating from college and seeking to work in city office jobs (Li et al., 2016, p. 14).

B. Literature on Europen Countries

In Europe, where population aging emerged as a major social issue ahead of Asia, a number of governments have already raised the retirement age. Vogel at al. (2015) analyzes how pen-

sion reform and higher retirement ages in the three Western European countries of France, Germany, and Italy, would affect the macroeconomic prospects of those countries. Using an overlapping generation model, the authors compare closed-economy and trading-economy scenarios, finding that increases in endogenous human capital, accompanied by higher retirement ages and pension reforms, would positively affect the whole economy and national welfare, particularly in trading economies. The authors also conclude that the margin of decrease in the level of welfare perceived by households due to changes in demographic structure would amount to 2.2 percent at maximum (Vogel et al., 2015, p. 94).

Staubli and Zweimuller (2013) use microeconometrics to analyze how the extension of retirement age in Austria, in 2000 and 2003, has affected the country's labor market. (The retirement age for men was raised from 60 to 62 and from 55 to 58 for women.) To single out the effect of policy, the authors defined the policy group as consisting of persons who had not yet reached pension age as of the year of analysis, and the control group as consisting of persons who had reached pension age. In an effort to prevent the age effect biasing the estimates, the authors limited their samples to men aged 57-64 and women aged 52-59. The authors base their analysis on the Austrian Social Security Database, which has kept records of tracing surveys since 1972. Their analysis reveals that extending the re-

tirement age increased the employment rate of men aged 57 or older by 9.75 percent and that of women by 11 percent. Although the probability of unemployment also increased at the same time, the authors conclude that extending the retirement age has generally increased the rate of economic participation in Austria. The authors, however, also argue that the employment-increasing effect of higher retirement ages has not been fair, as only workers who were already well-paid and/or who think themselves fit to work will continue to work (Staubli and Zweimuller, 2013, p. 25).

2. Literature on Korea

A. Intergenerational Employment Substitution

Extension of the retirement age would enable older workers to remain on the labor market longer and thereby help enhance their old-age income security. The key subject of debate, however, is that a higher retirement age could adversely affect the employment prospects of young people. Some steadfastly hold onto the lump of labor fallacy, arguing that there are only so many jobs available on a society's job market at any given moment, and older workers lingering there will therefore serve only to decrease the number of jobs available to young people,

making intergenerational competition inevitable.

Lee et al. (2011) analyzes the employment rate trends of Koreans in their 50s and 20s to determine whether there is an employment substitution effect between the two generations. Whereas baby boomers have entered their 50s and the percentage of working women in their 50s has been growing since 2005, the employment rate of people in their 20s has been drawing downward since the same year. The authors conclude that the employment slump of the young generation can be attributed not only to an oversupply of young workers, but also to growing intergenerational competition (Lee et al., 2011, p. 9).

They analyzed the monthly data on Economically Active Population Surveys (EAPS) from 2000 to 2010 using a time series model. Positing the employment rate of people in their 20s as the dependent variable, they use the employment rate of people in their 50s, business cycle variations in the coincident composite index (CCI), and the autocorrelation coefficients, in light of the time-series nature of the given data, as independent variables (Lee et al., 2011, p. 56).

The authors hold that intergenerational competition occurs on the labor market as the number of baby boomers nearing retirement age continues to increase, while employers retain existing workers and reduce the number of jobs for new hires, leading to a decrease in young people's core labor supply and in labor productivity. Intergenerational competition over em-

ployment is thus projected to begin to disappear after 2020 when all baby boomers finally retire and the shrinking of the young population becomes obvious (Lee et al., 2011, p. 59).

The majority of studies in Korea, however, beg to differ from Lee et al. (2011), stressing the strong intergenerational complementary effect on employment. Kim (2011), for example, argues that raising extension of the retirement age would ultimately increase jobs for young people by increasing demand for a larger labor force and lowering wage levels to an extent that would not compromise the lifetime welfare of workers (Kim, 2011, p. 394).

Using the Wage Structure Statistics Survey data spanning the years 1978 through 2007, the author first sets up three generations of workers, aged 15 to 34, 35 to 54, and 55 to 64, divided by gender, and sets up simultaneous equations of labor demand and supply functions.

Kim's analysis shows that, with the retirement age raised, lifetime income would actually increase despite lower wages, and that increasing employment of the middle-aged and older workers is unlikely to crowd young people out of the labor market. The author believes this is because there is little substitution effect, in terms of the total productivity factor, between the older generation of workers, whose employment increases with the retirement age, and the younger generation of workers about to be hired. Nevertheless, the author emphasizes

the need for labor-management consultation before xtending the retirement age because it is necessary to lower the wage levels for all generations if the higher retirement age is to generate greater labor demand (Kim, 2011, p. 420).

Ahn (2011) empirically tests various hypotheses on the intergenerational employment substitution effect, using time-series data to examine the effect of older workers' employment on the unemployment of young people. He also checks, using micro-level data, whether there is an occupational segregation or intergenerational competition between younger and older people.

First, in order to test the hypothesis of "intergenerational conflict" on the labor market, the author performs a time series analysis on the monthly EAPS data from July 1982 to October 2010, setting up an autoregressive model, with the unemployment rate of young people as the dependent variable and the employment rate of older people as one of the independent variables. The author tested the robustness of the estimates by including the employment and unemployment rate variables in the form of lagged explanatory variables. Analysis reveals that increasing the employment rate of older people by one percent lowers the unemployment rate of young people by 0.029 percent. Even after expanding upon the model of analysis, such as by replacing the employment rate with the number of workers or the unemployment rate, the intergenerational complementary effect persists (Ahn, 2011, p. 48).

Shin (2010) estimates a translog production function to determine the correlations between the production agents of labor supplied by different gender and age groups. In his time series analysis of the Wage Statistics Survey data on workplaces with five or more workers each (1993 to 2008), the author divides workers into three age groups—young workers 34 and under, middle-aged workers aged 35 to 49, and older workers aged 50 and above—and by gender, setting up six groups in total. The dependent variable is the share of each group's factor income in the gross product. The explanatory variables are the logarithms of the numbers of workers making up the six groups (Shin, 2010, p. 147).

Analysis shows young male workers are in a complementary relationship with male workers of other generations. Relations among female workers of all generations, on the other hand, are competitive. The author thus concludes that extension of the retirement age could work alongside the policy on increasing the employment of young people, but may well replace female workers (Shin, 2010, p. 152).

The mainstream consensus among Korean researchers so far is that extension of the retirement age would trigger an intergenerational complementary effect on employment and therefore not crowd young workers out of the labor market. An examination of the raw data supporting these studies, however, shows that conclusions may vary significantly depending on the

scope of time analyzed. For instance, Lee et al. (2011), which insists on an intergenerational substitution effect on the labor market, focuses on relatively recent data spanning the years 2005 through 2010. All of the studies that lean toward intergenerational complementary effects, in contrast, involve longer spans of time under analysis dating back to the early 2000s or even earlier.

Furthermore, conclusions also vary substantially depending on how age groups are defined, with Lee et al. (2011) and Oh et al. (2015) setting up only two groups (20s vs. 50s), while Shin (2010) and other studies set up three or more. Now that population aging is accelerating and all signs indicate worsening employment conditions for young people, the claim that there is no intergenerational conflict on the labor market is losing credibility. Most importantly, all these studies take micro-level and partial equilibrium approaches, failing to serve the pressing demand for empirical analysis on how increasing the employment of older workers would affect the employment of young workers in complex interaction with other socioeconomic agents.

B. Evidence from CGE Modeling

CGE models are used quite widely in South Korea across a variety of fields of analysis including, among others, public finance and environmental economics. There has not, however,

been any study to date that has employed a CGE model to analyze the effects of extending the retirement age. There are, nonetheless, a few studies that have attempted to analyze the effects of imported labor on the Korean labor market, treating the variable as an exogenous factor created by policy decisions.

Lee et al. (2007), for instance, applies a CGE model to analyze the economic ripple effects of importing unskilled labor into Korea, specifically adapting the ORANI-G model to analysis of Korea's demand for imported labor, and perform simulations assuming two, four, and six-percent increases in the share of imported labor in overall Korean labor supply. They also assume that migrant workers in Korea would remit 70 percent of their income back to their families and relatives and spend the rest in Korea. The study concludes that imported labor in Korea would increase the gross product of industry overall, with increases particularly prominent in such industries as furniture-making, textiles, primary metals, and chemicals. Imported unskilled labor, in contrast, is shown to have relatively little positive impact on services and other industries requiring skilled labor. Because unskilled migrant workers in Korea are assumed to remit significant portions of their income back to their respective countries, increasing their presence does relatively little to boost the macroeconomic conditions of Korea compared to increasing the employment of Korean consumers (Lee et al., 2007, p. 107).

Kang et al. (2016) analyzes the substitution effect between Korean and foreign workers and applies the resulting substitution elasticity estimates to the given CGE model to estimate the appropriate number of immigrants to be brought into Korea. They used second order approximation of the log transformed translog functions- and set up annual panel data on 30 industries spanning the years 2005 through 2015 to perform a regression analysis based on a fixed-effect model. Having so estimated substitution elasticity, the authors also estimate the changes in labor demand due to projected decreases in working-age population after 2017, concluding that demand for substitution of domestic labor would rise steeply to 6.2 percent on average per year until 2040. The authors estimate that 4.814 million foreign workers will be needed to offset contraction of the working-age population in Korea. They thus recommend that the work visa system in Korea be reformed in light of the diverse skill levels of foreign workers, and that an official labor shortage index be developed to identify industries and occupations with greater labor demand than the supply of Korean labor can meet, making for better management of the import of foreign workers (Kang et al., 2015, p. 142).

Cho and Kang (2014) uses a dynamic CGE model and shift their focus from migrant workers staying in Korea only for the short term onto immigrants staying in Korea permanently, with the goal of analyzing how the increasing share of immigrants in

the overall working-age population in Korea will affect aggregate supply and potential growth rate of the Korean economy. Assuming that the share of immigrants in the overall working-age population grows by two percent a year, the aggregate supply would increase by 1.1 to 2.1 percent a year and the potential economic growth rate by 0.07 percent a year. As the native working-age population shrinks and the working population relative to output also decreases over time, marginal productivity of the working-age population in Korea will grow in the long run. In order for the potential economic growth rate to grow by one percentage point, Korea would need nearly five million immigrants by 2020 (Cho and Kang, 2014, p. 61).

III

Model and Database

1. Social Accounting Matrix (SAM)
2. Database of the Model
3. CGE Model and Scenarios

III Model and Database

1. Social Accounting Matrix (SAM)

A. Macro SAM

The macro-level SAM in South Korea is based mainly on the Input-Output Tables and the National Accounts of the Bank of Korea. The Input-Output Tables usually capture the processes by which productive activities generate income, while the National Accounts provide information on how income is distributed to the suppliers of production factors, such as labor and capital.

The data required for the compilation of the SAM are National Accounts and Input-Output Table released by the Bank of Korea. For example, the compensation received by employees overseas, for output generated outside of Korea with labor input provided from Korea, falls into the "Rest of the World (ROW)" category of the "Income Distribution Account-Compensation of Employees" of the National Income Accounts by Institution. On the other hand, the compensation received by employees overseas for labor input provided from ROW form the "Overseas-Use" category in the same accounts. We can apply a simple equation to the compensation for of employees and compensation received from overseas to estimate the control totals for the wage account.

The distributed surpluses, representing the flows of surpluses generated by the capital factor into households, form the "Individual-Origins" in the "Korea-Originating Income Distribution Account – Operating Surplus." Corporate and asset income paid overseas, on the other hand, form a corresponding part of the same account and can be found in the "Individual-Use" category. Undistributed surpluses, referring to those generated by the capital factor flowing into firms, can be calculated by applying a simple deduction, as in the case of the wage account. First, the operating surpluses and the corporate and asset income received overseas, as indicated on the use table, are added together to calculate capital income. As capital income and capital expenditure must be equal, the distributed surpluses and the corporate and asset income paid overseas can be subtracted from capital income to arrive at the amount of undistributed surpluses.

In order to ensure consistency of the overall matrix, it is important to readjust the sums of the rows and columns of the SAM through a balancing process. Commonly-used balancing approaches include the RAS method (Han and Kim, 1999),[3] the cross-entropy method (Shin, 2000), and the ordinary least square (OLS) method (Nam et al., 2012). The RAS balancing method is used in this study because it allows the researcher to assign different weights to different cells.

3) Also known as bi-proportional matrix balancing.

Creating a macro-level SAM generally leads to five error terms (or inconsistencies between accounts and items). These usually represent differences between (1) corporate income and corporate expenditure, (2) foreign exchange expenditure and foreign exchange income, (3) household expenditure and household income, (4) government expenditure and government income, and (5) aggregate investment and aggregate savings.

〈Table 3-1〉 Macro SAM

	Production	Goods	Labor factor	Capital factor	Households	Firms	Government	Capital	Overseas	Total
Production		Domestic supply								Gross product
Goods	Demand for intermediate goods				Private consumption expenditure		Government consumption expenditure	Capital formation	Exports	Aggregate demand
Labor factor	Employee compensation								Employee compensation received overseas	Labor income
Capital factor	Operating surpluses								Corporate income received overseas	Capital income
Households			Wages	Distributed surpluses		Transfers	Transfers		Ordinary transfers overseas	Household income
Firms				Undistributed surpluses	Transfers		Transfers		Ordinary transfers overseas	Corporate income
Government	Other production taxes				Income taxes	Corporate income taxes			Ordinary transfers overseas	Government income
Capital	Fixed capital consumption				Household savings	Corporate savings	Government savings		Net capital transfers overseas	Savings
Overseas		Imports	Employee compensation paid overseas	Corporate income paid overseas	Current transfers overseas	Current overseas	Current overseas	Gaps in investment in overseas savings		Payments in foreign currencies
Total	Gross input	Aggregate supply	Labor expenditure	Capital expenditure	Household expenditure	Corporate expenditure	Government expenditure	Investment	Foreign currencies received	

B. Micro SAM

In order to compile a micro-level SAM, we need first to find the control totals of the macro-level SAM and expand the values making up each by row, column, and vector. As Table 3-1 shows, the control numbers for demand for intermediate goods and domestic supply are expanded along row and column, while the control numbers for employee compensation and operating surpluses are expanded by vector.

The Input-Output Tables present three price references: namely, purchasers' price, producer price, and basic price. Depending on the objective of analysis, the adjustments among these prices may be included in the SAM.

The difference between producer price and basic price captures the area in which net product tax and byproducts (scraps), which are reflected on the rows and columns of the micro-level SAM. The private and government fixed capital formations, found only as vectors, are converted into rows and columns. The 2008 System of National Accounts (SNA) has changed the way in which the Input-Output Tables are created, merging the imported goods taxes and tariffs into the imported product tax. It is necessary, for the purpose of this study, to divide this single tax category again into import taxes and tariffs.

2. Database of the Model

The development of a CGE model and analysis of policy effects based thereupon begins with the ORANI database, whose structure is shown in Figure 3-1.

A key problem with the Korean database is that the flows of intermediate input and private consumption have some negative numbers in some instances. These are mostly found in the primary metal industry, apparently because of the significant value of byproducts.[4)]

Furthermore, private consumption includes no construction expenditure, but has indirect taxes instead. As this was going to cause some issues with balancing of the database, these items had to be readjusted.

4) This is quite an important topic in processing the database for a CGE model.

[Figure 3-1] Components of Database

		Absorption Matrix					
		1	2	3	4	5	6
		Producers	Investors	Households	Exports	Public sector	Stock changes
		← I →	← I →	← 1 →	← 1 →	← 1 →	← 1 →
Basic	↑ C×S ↓	V1BAS	V2BAS	V3BAS	V4BAS	V5BAS	V6BAS
Margins	↑ C×S ↓	V1MAR	V2MAR	V3MAR	V4MAR	V5MAR	V6MAR
Indirect taxes	↑ C×S ↓	V1TAX	V2TAX	V3TAX	V4TAX	V5TAX	
Labor	↑ O ↓	V1LAB	C = types of commodities I = types of industries S = domestic and imported goods O = skilled/unskilled * Of the taxes, export (V4TAX) and government expenditure (V5TAX) taxes equal zero.				
Capital	↑ 1 ↓	V1CAP					
Production taxes	↑ 1 ↓	V1PTX					
Other costs	↑ 1 ↓	V1OCT					

	Joint production
Type	← I →
↑ C ↓	MAKE

	Tariff
Type	← 1 →
↑ C ↓	V0TAR

Source: Nam, S., S. Moon & G. Lee (2012). *Indicators of Korean Society Based on Korea Welfare Panel Data*, p. 260.

〈Table 3-2〉 Korean ORANI Database

(unit: trillion KRW)

		1	2	3	4	5	6	0
		Production	Fixed investment	Household consumption	Exports	Government consumption	Stock changes	Total
	Size	I	I	1	1	1	1	1
Basic	C×S	V1BAS	V2BAS	V3BAS	V4BAS	V5BAS	V6BAS	V0BAS
	Domestic	1,720.2	344.1	628.9	751.8	224.7	-352.9	3,658.0
	Imported	543.7	58.2	64.7	0.0	0.0	1,894.2	673.7
Indirect taxes	C×S	V1TAX	V2TAX	V3TAX	V4TAX	V5TAX	V6TAX	V0TAX
	Domestic	35.5	31.0	45.0	0.0	0.0	0.0	111.5
	Imported	10.8	2.7	6.0	0.0	0.0	0.0	19.6
Labor	O	V1LAB						
		661.4						
Capital	1	V1CAP						
		676.7						
Production taxes	1	V1PTX						
		16.7						
Other costs	1	V1OCT						
		-7.0						
Total	1	3,658.0						

	Joint production
Size	I
C	MAKE
	3,658.0

	Tariffs
Size	1
C	V0TAR
	10.2

Note: Compiled by the author with the Bank of Korea's Input-Output Tables of 2010.

3. CGE Model[5] and Scenarios

A CGE model typically combines computer programming and general equilibrium analysis to integrate the optimization behavior of economic actors according to a nonlinear equation, and uses the flows of various sectors to produce an equilibrium. As this model looks for solutions regarding the employment of economic agents of different types and the output of the industrial sector simultaneously, it provides an accurate glimpse into interactions among various variables making up a given economy. A CGE model, moreover, can also be used to analyze and predict the effects of various policy programs, such as those for employment, on macroeconomic variables, or vice versa.

In this study, we shall use the ORANI-G model developed by the Center of Policy Studies at Monash University, Australia, in the mid-1970s and modify it and the accompanying database in part to suit the objective of our research, namely, to analyze the socioeconomic effects of the extension of the retirement age.

5) The economic effects of imported labor identified in Lee et al. (2007) have been summarized again to suit the purpose of this study. The origin point of all this debate, however, can be found in the ORANI-G documentation of Horridge (2014). For more information, see www.copsmodels.com.

A. Employment Rates and Wages by Age

To start, let us suppose the baseline retirement age is 55 years old. The Act on Prohibition of Age Discrimination in Employment and Elderly Employment Promotion (APDE) defines 55 years of age as the age at which "old age" starts (with persons aged 50 to 54 defined as "near-old"). The Act requires employers to keep their respective retirement ages at 60 or older (Article 19.1). Studies with retirement ages below 60 interpret this provision as mandating a minimum retirement age at 60 (Article 19.2). Although this statute is enforced with respect to even relatively small workplaces hiring fewer than 300 workers (as of January 1, 2017), the law applied only to workplaces hiring 300 or more workers only a year ago. The amendment to the preamble in 2013[6] suggests that Korean society is now in transition to a higher retirement age. Therefore, we shall see age 55 as the cut-off point for whether the retirement age is raised or not. We shall divide the entire working-age population into three groups according to age - namely, 29 years old or younger, 30 to 54, and 55 years old or older - before proceeding with our analysis.

The Employment Tables, forming one of the annexes to the

6) Prior to amendment in 2013, the statute stated that, should they decide to fix a retirement age, employers ought to make effort to set that age at 60 years old or beyond (effective as of June 4, 2010). This wording hardly warrants the belief that the retirement age in Korea has been officially raised.

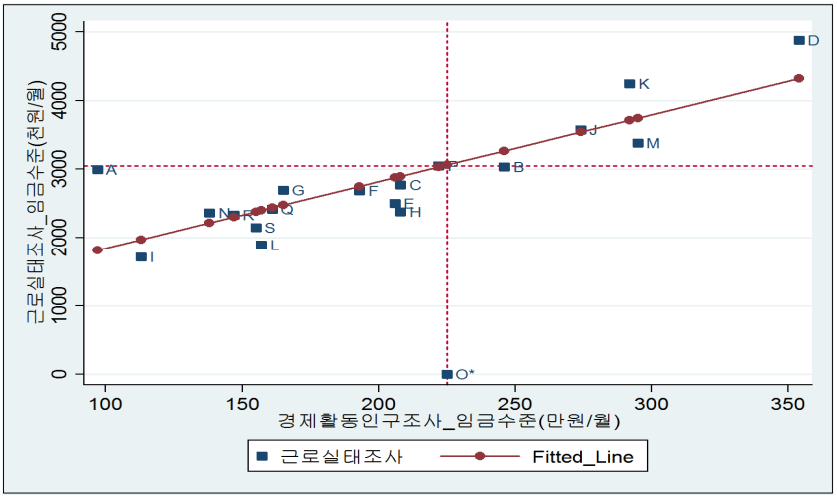
Input-Output Tables, contain information on jobseekers and employed persons by category of goods and category of industries. The Employment Tables provide estimates based on the EAPS data. Although the EAPS provides relatively more accurate and reliable data than other comparable nationwide surveys as it uses the same target population as the Population Census, it is difficult to match with the Input-Output Tables, as the former divides industries according to the Korean Standard Industrial Classification (KSIC), while the latter uses more refined manufacturing industrial categories. Moreover, micro-level EAPS data available from the Microdata Integration Service (MDIS) of Statistics Korea indicate only 21 industrial categories, as opposed to the 30 found in the Input-Output Tables.

We may turn to the Work Status Survey by Employment Type (WSS-ET, formerly known as the Wage Structure Statistics Survey) data provided by the MOEL. This survey provides detailed information on wage earners as it specifically targets workers hired by businesses, as well as providing up to 72 industrial subcategories matching those found under the KSIC and are matchable with the categories used in the Input-Output Tables.

We may estimate the number of workers in public administration and national defense that are not included in the EAPS and the WSS-ET using the OLS method. The regression equation employed to this end is as follows:

The dependent variable here is the workers included in the WSS-ET while the explanatory variable is the workers included in the EAPS. The subscript "i" represents any of the 19 main industrial categories found under the KSIC. We can use the estimates obtained from this equation to arrive at the fitted value of the dependent variable, and from there proceed to include both the estimated number of workers in public administration and national defense and their wage levels in our analysis. Figure 3-2 shows the dispersions and regression lines used to estimate the number of workers and wage levels in public administration and national defense. As both the KSIC and the Input-Output Tables use the same category for public administration and national defense, the O* estimate was entered into Industrial Category No. 027. Through this process, we may estimate the number of wage earners and wage levels by industry and age.

[Figure 3-2] Wage Levels by Source of Data[7)]



Notes: 1) Vertical axis represents wages from MOEL data, whereas horizontal axis represents wage of Statistics Korea.
2) The O* is replaced by estimates in the actual analysis.
Sources: Statistics Korea, EAPS; MOEL, WSS-ET.

B. Criteria for Distinguishing Skill Levels

Extension of the retirement age would enhance the employment security of older workers, but affect other generations differently. Of particular note is that the effect of a higher retirement age would be felt more acutely by unskilled workers than skilled ones. It is therefore important to distinguish between unskilled and skilled workers in our analysis. In theory, the labor productivity of workers converges with the wage level

7) Industrial Category O* has been omitted from analysis due to the presence of missing values in the ESS-ET, but was assigned the arbitrary value of zero for the ease of charting the graphs.

in the long run. Yet wage levels alone are inadequate as indicators of how skilled workers are in Korea as seniority-based deferred wages are quite common in the country. Moreover, skills are impossible to measure objectively and require certain arbitrary choices of standards, such as official licenses or other such criteria justified by researchers.

In this study, we shall divide workers between skilled and unskilled on the basis of their education and career experience combined. High school may be all the education a worker has received, but, if he has been in the same line of work for a decade or longer, he should be regarded as a skilled worker. Alternatively, while a degree from a four-year university is not equivalent to being skilled, a worker with such a degree may be a bit more skilled than a worker with high school education, and therefore needs only a minimum of three years' work experience to be regarded as skilled. Figure 3-3 summarizes the combinations of education and work experience that divide skilled workers from unskilled workers.

[Figure 3-3] Skill Level by Education and Work Experience

	Less than a year	1 to 2 years	2 to 3 years	3 to 5 years	5 to 10 years	10 years or longer
Middle school or less						
High school						
Vocational college						
University or higher						

■ Skilled workers □ Unskilled workers

IV Empirical Evidence

1. Macro-Level Effects
2. Micro-Level Effects

Ⅳ Empirical Evidence

1. Macro-Level Effects

In this section, we will explore the short-term effects that an exogenous shock in the form of a higher retirement age would exert on the Korean economy as a whole. In an ORANI model, macro-level aggregate variables are known as "macro" variables. Depending on the closure of the model, we can distinguish between short-term and long-term effects even in a static model. The results of an ORANI model may differ from those of an American-style GAMS model, mainly due to the different ways in which the models are given closure, and whether the models distinguish different categories of investment by industry and commoditiy. Given the same data, the same model, and the same closure, the results of the analysis should be identical. In this case, we will first apply the standard ORANI closure that has been used for over four decades.[8)]

We are faced with the task of applying the the retirement age extension to our model as an exogenous shock. The most commonly-used form of such shock in existing literature is the shock from increasing the number of older persons being employed. Professor Peter Dixon at the University of Victoria[9)]

8) An explanation of this is found in the earlier description of the model.
9) The author consulted Professor Dixon at a CGE model seminar held at the

has suggested the increase in savings by older workers and accumulation of their pension assets as alternative exogenous shocks to be tested in our CGE model.

As of August 2017, the employment rate of the entire working-age population aged 15 or older in South Korea reached 61.06 percent. With the wage peak policy and the flexible employment culture (including re-contracts) combined, the rate rises by another 1.64 percentage points (Jang et al., 2016).

Assuming that workers' capability for labor is fixed, an increase in the employment rate would increase labor supply by 0.2 to 1.64 percent in the short run. This would be equivalent to 270,000 new workers being added to the workforce. Supposing that approximately 65 percent of the total household income of workers comes from wages earned, extending the retirement age would generate up to 1.07 percent more income for households.

Increases in labor supply due to the extension of the retirement age, however, would cause the labor supply curve to move rightward, leading the equilibrium wage to fall. This drop in the equilibrium wage is a factor not discussed in the existing debate on whether to raise the retirement age. The downward pressure exerted by a higher retirement age on wage levels may reduce the financial burden of employers. Nevertheless, the actual "surpluses" that employers can expect may not amount to

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International Trade Commission in Washington DC on June 20, 2017.

much.

Before proceeding with our analysis, we shall define our policy scenarios, according to which the sizes of the exogenous shocks to be exerted to our model shall be decided. In reference to Jang et al. (2016), our scenarios should be designed so that extension of the retirement age and introducing wage peaks would increase labor supply and income for workers. Yet it would be quite unrealistic to assume that the retirement age would be raised equally across all industries. An assumption grounded more in reality would be that the higher retirement age requirement would exert different effects depending on the level of skills required by industries or occupations.

For ease of analysis, let us assume that the retirement age is raised by five years solely for industries and occupations requiring skilled workers. In our model, rightward movement of the labor supply curve following the extension of the retirement age results in the fall of equilibrium wage, thus keeping employers' financial burden more or less the same even in the absence of wage peaks.[10)]

Table 4-1 summarizes the macro effects that are likely to follow after the retirement age is raised. The table specifically compares the effects on three sectors, namely, professional services, public administration and national defense, and edu-

10) Due to the limited availability of technical resources, it was impossible to set up and test a scenario in which wage peaks would be introduced into the CGE model as a variable.

cation and health.

In general, raising the retirement age would increase labor supply and cause wages to fall. Specifically, it would increase employment by 0.248 percent and decrease real wages by 0.121 percent in professional services. In education, employment would rise by 0.139 percent while real wages fall by 0.19 percent. In public administration and national defense, however, raising the retirement age would decrease employment, albeit slightly by 0.007 percent, while also decreasing real wages by 0.093 percent. In other words, a higher retirement age is unlikely to make a substantial difference.

Wage falls would lead to overall decreases in consumer prices. Wage decreases in professional services would cut consumer prices by 0.128 percent, while those in education and health would lead to a decrease of 0.170 percent.

A higher retirement age for professional services would increase the real gross domestic product (GDP) by 0.20 percent, while for education and health it would lead to an increase of 0.039 percent. On the other hand, a higher retirement age in public administration and national defense would decrease the GDP by 0.050 percent.[11)]

Raising the retirement age for the business services industry would positively affect investment and exports. In contrast, the

11) While further research is required, this may be due to the effect of absorbing employment from and a resulting contraction of production in other industries.

same change would decrease real investment, while increasing real exports, in public administration and national defense and in education and health.

A higher retirement age would decrease compensation for labor in all three industries mainly because of the fall in wages.

〈Table 4-1〉 Macro Effects of Retirement Age Extension

(unit: %)

Variable		Professional services	Public administration/ national defense	Education/ health
Employment rate	employ_i	0.248	-0.007	0.139
GDP deflator	p0gdpexp	-0.184	-0.042	-0.199
Nominal average wage	p1lab_io	-0.249	-0.095	-0.360
Fixed investment deflator	p2tot_i	-0.142	-0.001	-0.084
CPI	p3tot	-0.128	-0.002	-0.170
Real wage	realwage	-0.121	-0.093	-0.190
Nominal GDP	w0gdpexp	0.026	-0.092	-0.160
Compensation for capital	w1cap_i	0.034	-0.093	-0.136
Compensation for labor	w1lab_io	-0.001	-0.102	-0.221
Nominal household consumption	w3tot	0.010	-0.099	-0.194
Nominal exports (LCU)	w4tot	0.169	0.002	0.102
Nominal government expenditure	w5tot	-0.150	-0.266	-0.370
Nominal stocks	w6tot	0.005	-0.085	-0.091
Real GDP	x0gdpexp	0.210	-0.050	0.039
Real household consumption	x3tot	0.170	-0.057	-0.104
Real investment	x2tot_i	0.138	-0.097	-0.024
Real exports	x4tot	0.281	0.003	0.168
Real government expenditure (exog.)	x5tot	0	0	0

Note: After an exogenous shock of a 1.6-percent increase in labor supply is applied to each industry.

2. Micro-Level Effects[12)]

In this section, we will examine, using a partial equilibrium model, how raising the retirement age would affect poverty and inequality at the micro level.

Policy researchers are often faced with the challenge of previewing the likely effects of policy change. Effects on income distribution are projected by first setting up distribution functions for pre-policy and post-policy states and then estimating the effects of a given policy from the parameters defining the two distribution functions.

The generalized beta distribution of the second kind is often rated as the most useful in analysis of income distribution effects. This encompasses most of the distribution functions found in the existing literature, including log-normal, Fisk, Lomax, and Singh-Maddala distributions (McDonald and Xu, 1995, p. 139).

In this study, maximum likelihood estimation is used, along with a nonlinear optimization algorithm, to estimate the parameters of the distribution functions. One of the benefits of this approach is that it produces a distribution that most closely approximates the given real data using four parameters. To make the most of this convenience, a GB(2) distribution func-

12) For more discussion on generalized beta distribution of the second kind, see Nam (2016, pp. 87-88) and McDonald and Xu (1995).

tion is used. Our analysis here is based on raw data for the Korea Welfare Panel Survey (KOWEPS). The following discussion is focused on the estimates of a generalized beta distribution of current income.[13] The specifics of the analysis process are summarized below, while the results of analysis are summarized in Table 4-2.

1) Using micro-level raw data, levelized income is estimated and an adjusted weight is applied to estimate parameters for the distribution function.
2) From the given parameter estimates, distribution and inequality are gauged.
3) The higher retirement age is applied to the income variable depending on the characteristics of the given household head - i.e., additional income is exogenously given to the heads of households standing to benefit from the higher retirement age to estimate their income variable again.
4) The parameters of the distribution function are estimated again with respect to the new income variable. The weight and household conditions that applied to income estimates earlier still apply.
5) Distribution and inequality indices are again calculated on the basis of the new parameters.

13) Infinite loops were generated as parameters were estimated. Accordingly, it was necessary to estimate the logarithms of parameters and convert them.

6) The poverty and inequality indices of the two sets of estimates are compared to determine the effects of raising the retirement age.

〈Table 4-2〉 Estimation Results of GB2 Distribution

	Income 2015	Retirement age extended	Difference
ln a	0.2948 (0.053)	0.2992	0.0044
ln b	11.046 (0.001)	10.8607	-0.1853
ln p	0.6030 (0.003)	0.5970	-0.006
ln q	4.5697 (0.261)	4.3280	-0.2417
Likelihood function	-58705	-58733	-28
Observations	6,674	6,674	0
Gini	0.3123	0.3128	0.0005
Poverty rate	0.1663	0.1669	0.0006
Poverty gap	0.0606	0.0508	-0.0098
Inequality among the poor	0.0642	0.0644	0.0002

Note: Figures in parentheses indicate p-values.
Source: Raw data for KOWEPS 2016 (11th wave, with current income in 2015).

Generalized beta distributions of the second kind in the existing literature capture the patterns of income distribution with relative accuracy despite their simple structure of only four parameters. These functions are therefore recognized as the best-suited to estimating measurable differences likely to result from policy change.

In our case, raising the retirement age does not appear to exert a significant impact on the income distribution function.

There are a number of reasons for this. First, our analysis assumes that highly-skilled workers in a few specific industries and occupations are the beneficiaries of the higher retirement age. These workers, however, are already earning high wage levels. Additional income given to them would therefore worsen the income distribution only ever so slightly. In fact, our analysis shows that raising the retirement age for these workers would increase the Gini coefficient by 0.16 percent and the poverty rate (i.e., the percentage of the population below 50 percent of median income) by 0.0006 points. Although inequality among the poor would also increase by 0.0002 points, the poverty gap would narrow.

In other words, simply raising the retirement age would not dramatically reduce the poverty or inequality because the higher retirement age would mostly benefit workers already at the higher end of the given income distribution.

These results, however, should not lead us to conclude that raising the retirement age has no merit. The literature is rich with analyses confirming the abrupt fall in earned income for retirees in Korea, rendering them vulnerable to poverty in old age. Individuals who retire before they are old enough to claim pension benefits often find it nearly impossible to find decent jobs on the labor market after retirement. Raising the retirement age would enable at least some of these individuals to continue to work and earn steady incomes until they can claim

their pensions and therefore help them avoid poverty after retirement.

The dramatic recent increase in minimum wage has the potential to backfire against the original intent of enabling workers to enjoy greater income security by giving them additional income. Should employers decide to respond to the increased minimum wage by reducing their workforces, workers would be entirely deprived of the income on which they have relied so far. Although workers lucky enough to retain employment will earn higher wages and enjoy greater compensation than they did prior to the minimum wage increase, the overall unemployment rate will rise across Korean society, requiring appropriate policy intervention and prevention.

V

Conclusion and Implications

1. Summary of Findings and Implications
2. Limitations of This Study

V Conclusion and Implications

1. Summary of Findings and Implications

The policy of raising the retirement age is expected to apply to only a few select industries and occupations—those requiring skilled workers—rather than to all industries across the board. The most likely candidates are the professional/scientific/technical services, business support services, public administration, education services, and health and social work. The selective application of a higher retirement age to these few industries is unlikely to transform the labor market in a profound way.

In this study, a CGE model is applied to analyze the possible effects of raising the retirement age in professional services, public administration and national defense, and education and health. The increased retirement age is applied to the model in the form of higher employment rates. The model shows that increases in labor supply from older workers with a higher retirement age would lead to falls in wages and increases in total employment overall.

The employment-increasing effect of a higher retirement age would vary by industry depending on the skill levels required. The higher the level required, such as in professional services, the greater the probability of raising the retirement age and al-

so the greater the anticipated effects thereof. However, precision machinery emerges as the industry whose added value would increase by the greatest margin when the retirement age is raised, followed by electronics and machinery. As for industries dominated by unskilled workers, on the other hand, it is difficult to raise the retirement age. Neither would a higher retirement age produce as much effect as anticipated in these industries.

Our micro-level analysis shows that raising the retirement age is unlikely to reduce the poverty rate or mitigate inequality in the short run. This is mainly because the benefits of a higher retirement age would be concentrated in workers already at the top of the earned income distribution. This, however, should not lead us to dismiss the raising of the retirement age altogether. Korean retirees tend to experience abrupt falls in their earned income and face significant risks of falling into poverty. Persons who are compelled to retire before they reach the age of eligibility for pension benefits are also unlikely to return to the labor market with decent jobs. Raising the retirement age would therefore enable at least some of these individuals to continue to work and earn income until they can claim their pensions, thereby mitigating the risk of falling into poverty in their old age.

2. Limitations of This Study

It is important to find ways to have skills directly accounted for within the CGE model. Taking skills into account could well change the results of our analysis. Including skills as a variable into the model may render the model's structure more complex, but may also allow for a more refined analysis and interpretation. In analyzing the effects of retirement age extension, it is important to fix the reference age to 55, which is shortly before people begin to retire. The working-age population under analysis should be divided into at least three groups - the young, middle-aged, and older workers - and the effects of increasing the employment of older workers on the employment prospects of young workers should be considered.

Some may point out that imported labor is another important variable that ought to be analyzed in the literature on delayed retirement. There have been attempts to analyze the substitution effect of domestic and imported labor using partial equilibrium models. With the labor market already divided by generation, however, it is quite difficult to analyze both the domestic labor market and the labor market of imported labor. Due to the shortage of detailed information on migrant workers in Korea and the shortcomings of the chosen method, the impact of imported labor has been left out of the scope of this study.[14)]

Another important topic that was not discussed herein is the effect that a higher retirement age would have on non-regular and unskilled workers in all industries. Analysis of this subject matter requires the characteristics and wage structures of workers in all industries be included as variables in the model. The sheer scale of additional work implied in this task prevented it from being included in this study. Nevertheless, this subject should be prioritized in future research as it will play a central role in analyzing the overall effects of a higher retirement age on the entire labor market.

14) The author is planning new research on this point in the future, insofar as some of the constraints are removed.

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