Estimation of Work–life Expectancy for the elderly by Work–life Table in Korea

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Abstract

This study was carried out for estimating the work–life expectancy and expected retirement of the elderly in Korea by work–life tables. How long and until when do the elderly stay in the future labor market in Korea, and when will they retire completely if the condition of their second labor continues? This study aims for prediction of the work–life expectancy and expected retirement age of the elderly, and analysis of changes in the retirement age for last ten years. Furthermore, an international level of the Korean elderly’s expected retirement age and their pension-receiving period will be suggested through international comparison of the retirement age and expected pension receiving period.

> keyword : work–life tables, work–life expectancy, retirement, the elderly

1. Introduction

Korean labor force structure is highly relevant with the domestic population structure. In the workforce structure, there are three major augmentations just like the Korean population structure, which is 1st, 2nd, and 3rd baby–boom generations. Since they have a great portion in the whole labor force, they have a significant role to support the domestic labor market. Specifically, the 1st baby–boom generation who were born in 1955 to 1963, their ages are about 50 to 58 year–old, is considered as old aged in the labor market. Most of them are either already retired or planning to do it within few years, which will be supposed to impact on the society and labor market.

In this research, we focus on the old aged groups who are born in 1952 to 1966. The number of those groups is about 11,290,000; it takes up 22.7% of the total population. Among them, 8,350,000 people are currently working, which contributes 34.5% into the entire workforce. The society had concerned about the social impact of massive
retirement of the 1st baby-boom generation when their age reaches 55 that is the
general ‘official retirement age’ in Korea. However, insufficient social system for retirees
and financial burden of supporting their children allow the old aged group to delay
their ‘effective retirement ages’. For last 10 years, employment ratio of the old ages
have been augmented in Korea. In particular, late 50’s has increased drastically. These
outputs indicate that our society become more aged in that the senior groups become
more active in the market.

Based on the fact above, we are able to come up with several questions, ‘how long
the 1st baby-boom generation will be likely to stay in the labor market?’ and ‘what is
the effective retirement age of them in the current social tendency, people find another
job after their official retirements?’ In this study, we make a work–life table and
conduct analysis about how retirement ages of old–aged groups have changed during
the last ten years, and also we estimate work–life expectancy and actual retiring age of
those groups to find distinct features of current Korean labor force with comparison to
other OECD members.


2. Method

‘Life tables’ are defined as tables that show life expectancy of individuals based on
their probability of dying. According to the life tables we can estimate up to which age
each age group can live under the assumption that the current life expectancy of each
age group will remain same in the future. We can also estimate the work–life
expectancy by using these tables.
The work-life tables show the probability of entry to and exit from the labor market of each age group using the same concept of the life tables. Life expectancy of Korean people is rapidly increasing and the work force is aging fast too. The retirement age of the old aged is being delayed due to their longer life expectancy and the late graduation and marriage of their children. We make a very important assumption that 'the retirement of the old aged is being delayed' compared to past generations. It will provide very important implications in estimating the labor supply and making labor-market policies to correctly estimate the ultimate age of retirement of people in the country.

The first study about work-life tables is "Money Value of a Man" by Dublin and Lotka in 1930. During the Great Depression period from 1930 to 1950, many studies about work-life tables were published. Among other things, work-life tables for American men by S. Wolfbein and H. Wool(1940) was representative. Wolfbein & Wool estimated work-life expectancy by double decrement model after they assumed a potential level for maximum value of economically active population. However, there were other people who against Wolfbein & Wool’s theory. Probability of employment for young male population was much greater than probability of dying for them, while probability of employment for young female population was fluctuating because of 'M curve' of economically activity participation. Therefore, Schoen and Woodrow(1980) point out the limit of existing work-life tables and suggest a new work-life tables which is applied by increment-decrement model considering both an increase and decrease of death and employment.

Based on Wolfbein & Wool’s method, this research is going to create work-life tables from 2000 to 2011. Especially, we estimate work-life expectancy and the expected retirement age for older age group(45–59). The main sources are ‘complete life tables’ and ‘economically active population survey’ from 2000 to 2011. In order to make work-life tables we need the stationary population, the number of survivors and employment rates by age group. Stationary population and the number of survivors are calculated by simply using life tables and we can get employment rates from economically active population survey.

For making work-life tables, we need to understand how to make life tables first. \( n^d_x = l_x - l_{x+n} = n^d_x \cdot d l_x \)
'\( q_x \)' is the probability that people of age \( x \) die before the age \( n+x \) and that equals to the number of deaths divided by the number of survivors

\[
nq_x = \frac{d_x}{l_x} = \frac{l_x - l_{x+n}}{l_x}
\]

The number of survivors (\( l_x \)) is

\[
l_x = \frac{\sum d_x}{nq_x}
\]

Stationary population (\( nL_x \)) is the sum of the number of years of people who are expected to survive from age \( x \) to age \( x+n \) and that equals to the average number of survivors of age \( x \) and age \( x+n \) multiplied by age range \( n \)

\[
nL_x = n \cdot \left( \frac{l_x + l_{x+n}}{2} \right)
\]

The total sum of stationary population after their age-group \( T_x \) is the sum of years that people of certain age are expected to live before their deaths

\[
T_x = \sum nL_x
\]

Work life tables are made by using numbers above mentioned and the result of research on the economically active population

‘Stationary labor force (\( nLwx \))’ is calculated as ‘the stationary population (\( nLx \))’ multiplied by ‘the probability of employment of the age (\( nWx \))’

‘The probability of employment of the age (\( nWx \))’ is the total number of people employed divided by total population of the age group

‘Stationary labor force (\( nLwx \))’ is ‘stationary population (\( nLx \))’ multiplied by ‘The probability of employment of the age (\( nWx \))’

\[
nL_{wx} = nL_x \times nW_x
\]

‘The total sum of the labor stationary population after their age-group (\( Twx \))’ is
calculated by summing up stationary labor force \((nL_{wx})\) of people with the current age and above

\[
T_{wx} = \sum_{x}^{\infty} nL_{wx}
\]

Then work–life expectancy\((\varepsilon_{wx})\) is calculated as \(T_{wx}\) divided by the number of survivors\((l_x)\)

Life expectancy : 
\[
\varepsilon_x = \frac{T_x}{l_x}
\]

Work–life expectancy : 
\[
\varepsilon_{wx} = \frac{T_{wx}}{l_x}
\]

3. Results

3.1. The Characteristics of labor market for the elderly

The labor force participation rate for the elderly people in Korea is relatively higher than many other countries, especially labor force participation rate for male population. This is due to traditional male- oriented culture in Korea and the lack of social system for the elderly. The figure below is an employment rate during last 10 years (figure 2). When comparing the curves of employment rate by ages for 3 period (2001, 2006, 2011), the increasing trend of employment rate for the elderly (45–59) than any other age group is apparent. Employment rate of late 40s increased from 76.5% in 2001 to 77.0% in 2006, 78.4% in 2011, which means 1.9% growth since the last 10 years. And in same period, employment rate for early 50s and late 50s increased from 70.3%, 62.5% in 2001 to 74.7%, 67.4% in 2011 respectively (4.4%p, 4.9%p). Increasing employment rate of early and late 50’s is clearer than late 40s.

This trend is called an irony considering that early retirement trend is getting severe in reality. What is the cause of this trend? The increase of employment rate for older age group and the participation of older age labor force may have been triggered by 'population effect'. In other words, rapid growth of elderly population has affected the aging of labor force. Longer education of children generation, entry into labor market, and delay of marriage might be another reason that the employment rate for the elderly has increased.
3.2. The change of work–life expectancy and the expected retirement age

Based on the Wolfbein and Wool’s method, we draw out several implications for work–life expectancy and retirement ages of old–aged groups.

First, during the last 10 years, the work–life expectancies of all age groups have increased, and men have a distinct increasing pattern more than women. To be specific, the work life expectancy of men increased by 1.9 years for 20’s, 2.3 years for 30’s, 2.2 years for 40’s, 1.7 years for 50’s, and 0.2 for 60s respectively, which contrasts women, 1.6 years for 20’s, 0.9 years for 30’s, 0.9 years for 40’s, 0.4 years for 50’s, and 0.2 year for 60’s. From these data, we notice that 30s is the most increased group among men, and 20’s is the one for women. This is largely due to the fact that participation of female groups into the labor market has significantly increased
during the recent years, and the middle aged groups have delayed their actual retirement as well.

Second, we observe the work–life expectancy. The work–life expectancy of young people which does not fully enter the labor market shows no decrease over time because the current probability of employment is reflected in the calculation. The work–life expectancy after 20’s shows constant decrease and that of 60’s becomes very short.

Specifically, work–life expectancy (in the year 2011) of 20’s is 31.8 years, 30’s 25.3 years, 40’s 18.0 years, 50’s 10.8 years, 60’s 5.1 years. This means 40’s in 2011 will work 19.0 years more and ultimately retire from the labor market, 50’s 10.8 years, 60’s 5.1 years. By gender, the work–life expectancy of men in 20’s is 37.2 years, 30’s 30 years, 40’s 21.3 years, 50’s 13.0 years, 60’s 6.3 years and these are all longer than that of women. This is because the probability of employment of each age group is factored in and shows high participation rate in the labor market and late retirement of men.

On the other hand, looking at the difference in work–life expectancy in 2000 and 2011 the increase of work–life expectancy in 20’s is 1.7 years, 30’s 1.6 years, 40’s 1.5 years, 50’s 1.1 years, 60’s 0.6 year. By gender, men in 30’s show the highest increase of 2.3 years and female in 20’s 1.6 years. This shows late marriage and higher participation rate in the labor market of women in recent years.

<table>
<thead>
<tr>
<th></th>
<th>whole</th>
<th>male</th>
<th>female</th>
</tr>
</thead>
<tbody>
<tr>
<td>aged 20–29</td>
<td>30.1</td>
<td>35.3</td>
<td>24.7</td>
</tr>
<tr>
<td>aged 30–39</td>
<td>23.7</td>
<td>27.7</td>
<td>19.6</td>
</tr>
<tr>
<td>aged 40–49</td>
<td>16.5</td>
<td>19.1</td>
<td>13.9</td>
</tr>
<tr>
<td>aged 50–59</td>
<td>9.7</td>
<td>11.3</td>
<td>8.3</td>
</tr>
<tr>
<td>aged 60–69</td>
<td>4.5</td>
<td>5.4</td>
<td>3.8</td>
</tr>
</tbody>
</table>

Third, we can estimate the expected retirement age by adding work–life expectancy to the current age. Based the result of the year 2011, the retirement age of 30’s is 59.8 years, 40’s 62.5, 50’s 65.3, 60’s 69.6. By gender, the expected retirement age of 30’s of men is 64.5 years, 40’s 65.8, 50’s 67.5, 60’s 70.8 and
these numbers are all higher than that of females. Work life tables use the probability of employment so the entry into and exit from the labor market are considered. The older age group shows late expected retirement age due to the longer life expectancy.

The expected retirement age has been increased in recent years. Based on the result of the year 2011, the retirement age of 40’s is 62.5, 50’s 65.3 and 60’s 69.6 and increased by 1.5 years, 1.1 and 0.6 each. By gender, it clearly shows the late retirement of men in 30’~40’s(△2.3, △2.2) and women in 20’~30’s(△1.6, △0.9).

**Table 3.** The expected retirement age by ages : 2000, 2005, 2011 (unit: age)

<table>
<thead>
<tr>
<th></th>
<th>whole</th>
<th>male</th>
<th>female</th>
<th>△00-11</th>
<th>whole</th>
<th>male</th>
<th>female</th>
<th>△00-11</th>
</tr>
</thead>
<tbody>
<tr>
<td>aged 20~29</td>
<td>54.6</td>
<td>55.4</td>
<td>56.3</td>
<td>1.7</td>
<td>59.8</td>
<td>60.9</td>
<td>61.7</td>
<td>1.9</td>
</tr>
<tr>
<td>aged 30~39</td>
<td>58.2</td>
<td>58.9</td>
<td>59.8</td>
<td>1.6</td>
<td>62.2</td>
<td>63.4</td>
<td>64.5</td>
<td>2.3</td>
</tr>
<tr>
<td>aged 40~49</td>
<td>61.0</td>
<td>61.6</td>
<td>62.5</td>
<td>1.5</td>
<td>63.6</td>
<td>64.7</td>
<td>65.8</td>
<td>2.2</td>
</tr>
<tr>
<td>aged 50~59</td>
<td>64.2</td>
<td>64.6</td>
<td>65.3</td>
<td>1.1</td>
<td>65.8</td>
<td>66.6</td>
<td>67.5</td>
<td>1.7</td>
</tr>
<tr>
<td>aged 60~69</td>
<td>69.0</td>
<td>69.2</td>
<td>69.6</td>
<td>0.6</td>
<td>69.9</td>
<td>70.3</td>
<td>70.8</td>
<td>0.9</td>
</tr>
</tbody>
</table>

Forth, by referring to ‘Abridged life tables’, we also estimate an expected retirement age of each age group. The work-life expectancy of late 20s group (25 to 29 year-old) is 31.9 years and the other older age groups have a decreasing pattern such as 25.1 years for late 30s, 17.8 years for late 40s, 10.6 years for late 50s, and 5 years for late 60s. Moreover, in terms of gender difference, men generally have more work-life expectancies than women and their increasing pattern is more steeper than women in the data between 2001 and 2011. The expected retirements of middle-aged groups are 62.5 for the late 40s, 65.3 for late 50s, and 69.6 for late 60s among male, which are longer than ones of the female groups.

**Table 4.** Work-life expectancy of old-aged groups : 2001, 2006, 2011 (unit: year)

<table>
<thead>
<tr>
<th></th>
<th>whole</th>
<th>male</th>
<th>female</th>
<th>△00-11</th>
</tr>
</thead>
<tbody>
<tr>
<td>aged 45~49</td>
<td>16.5</td>
<td>17.3</td>
<td>17.8</td>
<td>1.3</td>
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<tr>
<td>aged 50~54</td>
<td>12.9</td>
<td>13.6</td>
<td>14.1</td>
<td>1.2</td>
</tr>
</tbody>
</table>
Finally, we analyze work-life expectancy of middle-aged groups. The 1962~1966 birth-cohort (late 40's group) work-life expectancy decreased by 5.8 from 23.6 in 2001 to 17.8 in 2011. At the same time, The 1957~1961 birth-cohort (early 50's group) and The 1952~1956 birth-cohort (late 50's group) drop by 5.9 and 6.8 respectively. However, although their expected work life have lowered over the last 10 years, the actual retirement ages are delayed because they add 10 years on their ages simultaneously. For example, when the late 40s add 10 years on their age over the period, their expected work-life drop only 5.8 year, which means their actual retirement was delayed by 4.2 years. In the same way, the early 50's and late 50's postponed their retirement by 4.1 years and 3.2 years as well.

<table>
<thead>
<tr>
<th>Table 5. Work-life expectancy by birth-cohort</th>
<th>(unit: year)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>aged 55-59</strong></td>
<td>23.6</td>
</tr>
<tr>
<td><strong>aged 60-64</strong></td>
<td>20.0</td>
</tr>
</tbody>
</table>

4. Comparison to OECD countries

According to the work life tables, the old aged in Korea is expected to work 7.5~17.8 years more from now on. The employment rate of the aged in Korea is relatively high and especially that of the aged man is higher compared to other OECD countries. Here I would like to mention the average retirement age and pensionable period of OECD countries with its implications.

There are three different types of retirement ages. First ‘the effective retirement age’ is the age when the work force ultimately exit from the labor market. Second ‘the official retirement age’ is the age you are supposed to retire by the law. Lastly ‘the pensionable age’ is the age from which you receive pension, this
could be same with ‘official retirement age’ in most countries but different in some other countries.

According to OECD data, the effective retirement age of Korean men is 70.3, women 69.8 and these figures are the second highest after Mexico. The effective retirement age of Mexico is 72.2 and 69.5, men and women each, Korea 70.3 and 69.8, Japan (the third highest) 69.7 and 67.3. Turkey, New Zealand, Sweden and Switzerland also show relatively late effective retirement age. There are two possible reasons behind: the lack of a welfare system for retirees and the well developed work environment for the aged. Korea and Mexico are considered to belong to the former and Switzerland and Sweden to the latter.

**figure 5.** retirement age of OECD Countries(2011): male

![Figure 5](image1)

*source: 「Pension at a Glance 2011」: OECD 2011*

**figure 6.** retirement age of OECD Countries(2011): female

![Figure 6](image2)

*source: 「Pension at a Glance 2011」: OECD 2011*

On the other hand the average retirement age of OECD countries is 63.8 for men and 62.4 for women and in most countries people retire before official
The difference between the official retirement age and the effective retirement age of men in Austria is 6.1, Canada 1.6, Germany 3.2, Luxembourg 7.7, Finland 3.2, the Netherlands 2.9 and in most OECD countries people effectively retire before their official retirement age. In women’s case, they effectively retire before the official retirement age in Austria(2.5), Belgium(5.9), Canada(2.8), Denmark(3.1), Finland(3.6), Germany(4.5) and Luxembourg(7.0). In Switzerland and Sweden men work after the official retirement age, but women retire earlier the official age. In the UK men show early retirement tendency and women late retirement. In the US, the aged remains in the labor market longer compared to European countries. On the contrary Mexico, Korea, Japan, Turkey are categorized as late retirement countries where people effectively retire after the official retirement age.

Retirement age of the aged is closely related to the pension policy. OECD forecasts pensionable period in the past and the future. The average age to receive pension for men is 63.1 and women 61.7, it’s 60 for men and women alike in Korea. We can calculate the pensionable period looking at the life expectancy and the start year of pension. For Korean men expected pensionable period is 20.2 years which is similar to that of Japan(19.8) and 1.7 years longer than the average of OECD countries. For Korean women the expected pensionable period is 25.2 years which is 1.9 years longer than the average of OECD countries(23.3) and 6.7 years longer than the average men’s(18.5). This is because they receive pension earlier and live longer than men.

![figure 7. The Pensionable years in OECD Countries](image)

<table>
<thead>
<tr>
<th></th>
<th>Korea</th>
<th>Japan</th>
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<th>France</th>
<th>OECD average</th>
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<tbody>
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<td><strong>male</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2010</td>
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<tr>
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<td>16.8</td>
<td>20.3</td>
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<tr>
<td><strong>female</strong></td>
<td></td>
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</tr>
<tr>
<td>2010</td>
<td>25.2</td>
<td>26.7</td>
<td>19.3</td>
<td>26.5</td>
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<tr>
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<td>24.5</td>
<td>27.0</td>
<td>21.9</td>
<td>29.5</td>
<td>24.6</td>
</tr>
</tbody>
</table>

Source: *Pension at a Glance 2011*, OECD 2011
5. Conclusion

Consequently, there are two general features of current labor market in Korea. One is employment of young generation get deteriorated. The other one is that the 1st baby-boom generation who is currently in old-aged groups is firmly staying in the labor market. The society had concerned about the case of massive retirement of the 1st baby-boom generation. In reality, however, their employment ratio is stable in high level; consequently, delaying 'official retirement ages of them' is a social issue currently.

This phenomenon can be explained by several reasons. One is in sufficient well-fare system for the elderly. The other one is financial burdens for their children who delay their marriages and jobs. Korea is classified as a country having 'effective retirement ages' later than 'official retirement ages' just like Japan and Mexico. Based on the outputs of this study, we expect old-aged groups will be likely to work for 10.6 to 17.8 years from now and retire at 65.3 to 68.1 year-old in Korea. This indicates that the society needs to come up with policies to make good use of the aged labor force.

reference

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URL=http://dx.doi.org/10.1787/888932315602