Analysis on Educational Level Using Multi-state Life Table Techniques: The Case of Korea[1]

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1   Introduction

The level of educational attainment, both individually and socially, has an important socio-economic and demographic impact. For example, it affects the quality of labor force, which in turn plays a decisive role in developing new technology, leading to economic growth, etc. The level of educational attainment also affects the demographic behaviors such as marriage, fertility, mortality and migration through change in socio-economic status and values, which results in change in both population size and population structure

The level of educational attainment, as a kind of static indicator, is usually measured in one point of time, mostly from the population census. We can also make time-series analysis using several years of population censuses. However, the results derived from such data can reveal only the status of education in a certain time, for example the reference time of population census, for different cohorts. If we can measure the level of educational attainment throughout life course for a cohort, such data may be very useful for socio-economic and demographic polices.

This paper aimed at making attempts to analyze the level of educational attainment using multi-state life table technique, which is based on Markov chain transition probabilities matrix.

2   Method and Data

The multi-state life table is a demographic technique to apply increments and/or decrements of more than two states to life tables, taking into considerations entry and separation from one state to another with simultaneity. In the education multi-state life table, the transitional probabilities from one educational state for another among entrance, dropout and graduation were calculated using Markov transition

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probabilities matrix and were applied to education life tables. We applied both life table technique and Markov chain transition probabilities matrix to 2010 data. The basic life table functions are as follows;

$$m_x = \frac{D_x}{P_x}, \qquad q_x = \frac{2m_x}{2+m_x}, \qquad d_x = l_x - l_{x+1}$$

$$T_x = \sum_{v=x}^{v=w} L_v, \qquad e_x = \frac{T_x}{l_x}$$

Markov chain transition probabilities matrix is denoted as follows;

$$M(x) = \begin{bmatrix} \sum_{j \neq i}^{5} {}_1M_x^{1j} & -{}_1M_x^{21} & -{}_1M_x^{31} & -{}_1M_x^{41} & 0 \\ -{}_1M_x^{12} & \sum_{j \neq i}^{5} {}_1M_x^{2j} & -{}_1M_x^{32} & -{}_1M_x^{42} & 0 \\ -{}_1M_x^{13} & -{}_1M_x^{23} & \sum_{j \neq i}^{5} {}_1M_x^{3j} & -{}_1M_x^{43} & 0 \\ -{}_1M_x^{14} & -{}_1M_x^{24} & -{}_1M_x^{34} & \sum_{j \neq i}^{5} {}_1M_x^{4j} & 0 \\ -{}_1M_x^{15} & -{}_1M_x^{25} & -{}_1M_x^{35} & -{}_1M_x^{45} & 0 \end{bmatrix}$$

The data used for the analysis include population census, vital statistics such as marriage, divorce and death, the basic education statistics survey. Some irregularities of each data were eliminated by demographic techniques and/or models.

3   Results

The probability of transiting from entry to graduation in a specific grade of school for males appears to decrease with increase in grade of school, reaching the lowest level at the junior college; however, it soars up at the university with decrease, more or less, in graduate schools. A similar pattern can be also seen for females.
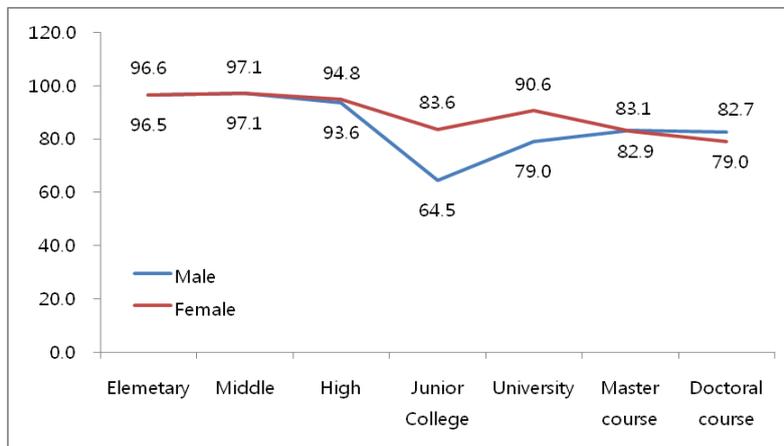
Fig.1. Probabilities of Transiting from Entry to Graduation at Each Grade of School

The probability of transiting from one grade of school to a higher grade of school for males appears to rapidly decrease with increase in grade of school, although the probability of transiting from master course to doctoral course would slightly increase. A similar pattern can be also seen for females.
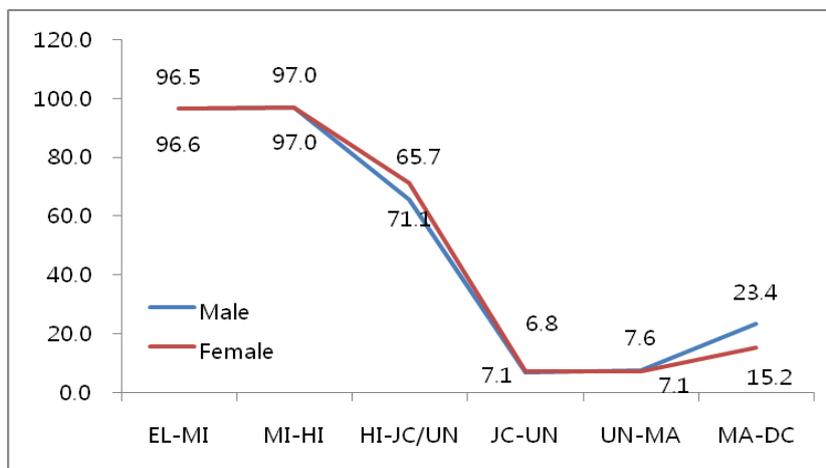

Fig. 2. Probability of Transiting from One Grade of School to a Higher Grade of School

Note: El-Elementary school, MI-Middle school, HI-High school, JC-Junior College, UN-University, MA-Master course of graduation school, DC-Doctoral course of graduation school

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