ANALYZING THE KOREAN LABOR MARKET OF THE ELDERLY PEOPLE USING AGENT-BASED MODELING

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ABSTRACT

The aging of population gives rise to many social problems. One of them is the saturation of the labor market of the elderly people. To stabilize the labor market of the elderly, the government should understand the market in depth and make an good policy. In this paper, using agent-based modeling, we simulate the Korean labor market of the elderly people to observe how the employment rate changes in various situations.

1   INTRODUCTION

The aging is raising the labor market problem of the elderly people. Through analyses of the economically active population survey data (Statistics Korea, https://mdis.kostat.go.kr), we figure out that a job for the elderly is usually a temporary job or a daily job and age is highly relevant to the employee preference of a company in the case of the elderly. Therefore, in our model, we assume that every job has one year contract period and the company considers age and professional skill when they hire the elderly people. Also, we can categorize jobs into three types, a simple job, a regular job and a skilled job by defining the preference function properly. Based on theses, we make the agent-based model of the Korean labor market of the elderly. We show that the employment rate by age has a different trend according to the job type and the renewal rate by implementing the model using the repast simphony (Repast Simphony Simulator, https://repast.github.io/repast_simphony.html).

2   MODELING THE KOREAN LABOR MARKET OF THE ELDERLY PEOPLE

We consider two types of agents, Person and Company. The elderly person can decide if s/he applies to the company using the logistic regression model (See Figure 1-(a)), which is derived from the real survey data (Statistics Korea 2017). The company keeps some of current employees, which is controlled by the renewal rate parameter, and hires only the top prioritized applicants based on its preference function. The preference function is defined as "preference = α age_preference + (1-α) skill_preference" By controlling

α, we can characterize jobs. In this paper, we categorize only three types of jobs by setting α to 1, 0.5, 0. The job categories are summarized in Figure 1-(b). To simulate the population dynamics, as the simulation iterates, new person agents enter the simulator and old person agents, who are over the maximum age, disappear from the simulator. Also, as the simulation iterates, age and skill are updated. Since the skill in a temporary or daily job is related to the employee's experience, we increase the skill for the current employees.

3   RESULTS AND ANALYSIS

In the case of the renewal rate 0 in a simple job, most of the hired people are #60 (aged 60 to 61). (See Figure 2-(a)). Since a simple job does not need skills, the company prefers the youngest group. However, in the case of the renewal rate 1, the result is completely different from the cases of the renewal rate 0 and 0.5 (Figure 2-(c)). The results of simulating a regular job model are shown in Figures 2-(d), (e), and (f). In a regular job, more age groups are employed compared to the case of a simple job. In all cases of the renewal rate 0, 0.5 and 1 in a skilled job, the simulation results show similar trends (See Figures 2-(g) and (h). We omit the case 0.5). This is because the company does not consider the age factor significantly for a skilled job. Even though they fluctuate, the employment rate in all age groups keeps the reasonable rate and shows a tendency to converge in Figure 2-(g) and (h).

Simulation results show that in the case of a simple job and a regular job, the youngest age group dominates the labor market of the elderly people if we do not set the renewal rate high. The government needs to control the renewal rate properly to make a stable job market for older people. Also, for a skilled job, the government does not need to control the job market because it is not affected by the age group and the renewal rate.

	Coefficient	Std. Error	z value	Pr(>|z|)	
(Intercept)	9.48E+00	6.84E-01	13.865	< 2E-16	***
factor(gender)2	-1.50E-01	1.46E-01	-1.03E+00	0.303996	
age	-1.35E-01	7.47E-03	-1.81E+01	< 2E-16	***
factor(marital_status)2	1.84E+00	4.59E-01	3.99E+00	6.49E-05	***
factor(marital_status)3	8.51E-01	4.53E-01	1.88E+00	0.060504	.
factor(marital_status)4	8.74E-01	4.70E-01	1.86E+00	0.06286	.
family_size	3.24E-02	5.74E-02	5.60E-02	0.95499	
factor(house_type)2	-6.12E-01	1.06E-01	-5.80E+00	6.63E-09	***
factor(house_type)3	-6.30E-01	1.56E-01	-4.03E+00	5.57E-05	***
factor(house_type)4	5.92E-01	3.76E-01	1.58E+00	0.115217	
house_size	-3.11E-03	1.09E-03	-2.85E+00	0.004332	**
total_asset	-5.62E-07	1.35E-06	-4.18E-01	0.676073	
estate_except_residential_house	7.42E-06	2.40E-06	3.09E+00	0.002009	**
public_transfer_income	-7.48E-04	6.31E-05	-1.19E+01	< 2E-16	***
private_transfer_income	-1.76E-03	1.77E-04	-9.94E+00	< 2E-16	***
factor(haveDebt)A0102	-3.67E-01	9.90E-02	-3.71E+00	0.000208	***

*Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*

Job Type	Parameter	Function	Description
Simple Job	1	Preference = age_preference	Usually, the company prefers younger people for a simple job.
Regular Job	0.5	Preference = 0.5*age_preference + 0.5*skill_preference	The company considers both age and skill level for a regular job.
Skilled Job	0	Preference = skill_preference	The company prefers well trained workers. The age is not important.

(a)   (b)

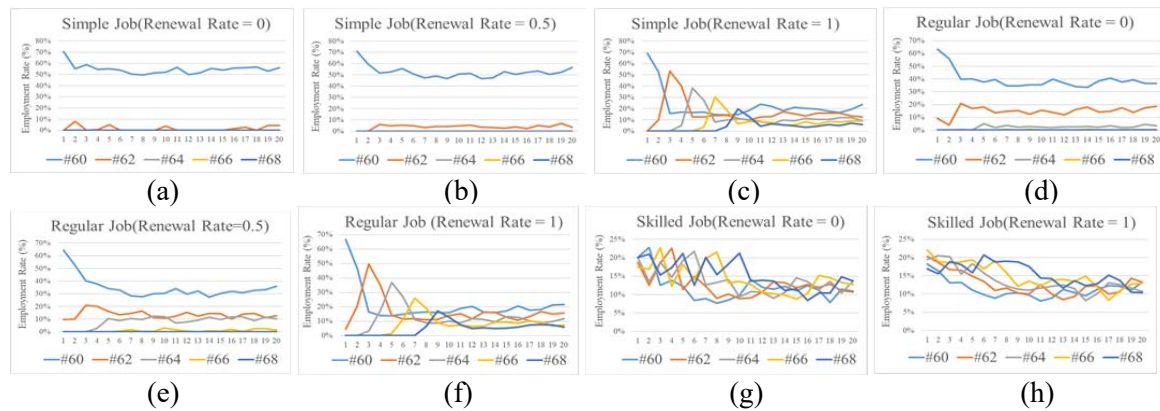Figure 1. Logistic regression and job types for Korean job market.

(a)   (b)   (c)   (d)

(e)   (f)   (g)   (h)

Figure 2: Simulation results for a simple job, a regular job and a skilled job.