Reappraising the Job-Training Effect on Labor Market Outputs of Korean Women

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Abstract

Theoretical considerations of job training have been suggesting enough reasons why job training is important in labor market. It would be more crucial for female, because of the situation that female face in labor market. Job training of female would be one of the implements compromise or moderate labor market that tends to be in favor of male. In order to support this proposition, it would be the first step where providing accurate measure of effect of current job training. In this paper, I investigate the effect of job training for Korean female on wage. With using rich data set (KLIPS) from Korea Labor Institute, I could evaluate the effect of job training of Korean female during 1999-2005 with several econometric specifications, mainly RE model with controlling a group difference. Empirical analysis shows that Job training of Korean female has a positive and statistically significant effect (4.2% per year) on wage rate. And job training that conducted in work place (OJT) seems to have a strong effect on female wage rate. On the contrary, public job training does not seem to work very well.

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I. Introduction

In studying on experience-earning profile or understanding of structure of labor market, human capital accumulation has become a key word in labor economics. Since the education system has been equalized for most of people, role of experience after formal schooling in horizon of lifetime has taken more attentions. According to human capital accumulation theory, after the formal schooling, people can achieve the human capital through working experience. This working experience can be defined two components, general knowledge through mature process (aging) and specific job training. Among these two different working experiences, job training has kept our attentions because job training might provide various and strong effects directly and indirectly on wage *per se*. It is not only important for employee, but also employers have paid attention of job training, because job training could reduce the cost of turnover.

Several decades back, Investigating on effect of job training has spread out its interest in studying female on labor outcomes. Since female labor is likely associated with child care and other house works, the characteristics of female labor is quite different from male. It implies the role and effect of job training on labor market might be unlike in case of male. Different role and different functioning with complicity of female labors require different methodologies that enable to handle this subject. Nowadays it became one of the most challenging topics in economics.

National wide Job Training program in Korea has been established right after Financial Crisis in 1997. And primarily it focused to overcome enormous problems of unemployment and labor instability. Even though the program does not attain full growth due to its short history, it is no doubt that it has affected Korean labor market so far. However, there have been not enough investigations of effect on female labor and female labor market regarding with job training programs in Korea. With substantial change in economic environment as well as in labor market structure after Financial Crisis, understanding of female labor and female labor market is crucially important. In this sense it would be worthy to take a look carefully the cause and effect of female job training programs.

In this paper, I investigate the effect of job training for Korean female on wage. With using rich data set (KLIPS) from Korea Labor Institute, I could evaluate the effect of job training of Korean female during 1999-2005 with several econometric specifications. Before starting the empirical estimation, first I will scrutinize the theoretical considerations of job training and job training of female labor with conventional as well as alternative point of views, and I will explain the background of Job Training Program in Korea. Then I will take a look at empirical results from previous literatures. After that I propose the econometric methodologies that I will use for

empirical analysis in this paper. Those are mainly modified Random Effect model with using various covariates. The third part, I will show the main results from different econometric model specifications. Lastly, I will conclude and discuss about future works.

II. Job Trainings for Female labors : Theoretical & Empirical Considerations

General overview of Job training

Labor force attachment of female has been increased along the improving attendance of female in formal education system. However, many current the labor market outputs, earnings and occupational choices, still show the significant difference between male and female. Many studies of the earnings of female claim that the key feature of this difference is associated with house-works, for instance child care and care of other family members in results in smaller investment of human capital along the horizon of female's life.

In general, as I mentioned before, post human capital accumulation can be accomplished via job training and via maturation process (aging). However, job training plays more important role in labor market, because it is directly related with specific skills in labor market favor. Job training programs, general form as well as firm specific form, could be crucial for female. It is not difficult to see that often time female in Korea have to decide to quite their jobs regardless their willingness and reenter the labor market. And, this discontinuity of working experience influences their working profiles and it ends up with poor occupational opportunities. In this circumstance, Job training, as a one of tools of post human capital accumulation could help them to catch up their lost labor experience and make the barrier of labor market easily remove.

In this sense, Sen's capability approach has shaded light on job training of female as well. Although his argument is focusing on female's economic activity in general[2], it is not difficult to extend his theory to emphasize the role of job training for female. More precisely, job training could support lack of opportunity of economic activities for female. This is important not only

[2] He claimed in his various papers that "the relative respect and regard for women's well-being is strongly influenced by such variables as women's ability to earn an independent income, to find employment outside the home, to have ownership rights and to have literacy and be educated participants in decisions with and outside the family" (Sen, A. (1999), Development as Freedom, p 191). That is, women's "voice and agency" would be realized through their independence and empowerment such as women's earning power, economic role outside the family, literacy and education, property right and so forth. And, of course, this argument is going well beyond women's empowerment itself, it can affect on those of children as well as influence the nature of the public discussion on a variety of social subjects, poverty, environmental priorities, human right in general.

the raising their earnings but also it helps them recognize their identification and develop their empowerment *per se* through the economic role in outside of family.

According to theory of human capital accumulation, implication of effect of job training would be straight forward. Through the theoretical relationship between investment of job training and experience-earnings profiles, the hypothesis of human capital accumulation for job-training could be tested with using various data sets and by different methodologies. Ashenfelter's paper (1978) is known as the first empirical study for job-training in U.S., and he found the positive wage effect on participants in CETA (the Comprehensive Employment and Training Act). Lynch(1992), Levine (1993), and Lowewnstein & Spletzer (1997 & 1998) also have tried directly to measure the effect of job-training with supported by a rich data set such as Panel Study of Income Dynamics (PSID), National longitudinal Survey of Youth (NLSY), and Current Population Survey (CPS). And these empirical studies based on theory of human capital accumulation also showed a positive effect of female job training on wage profile.

Job training of female has been noticed crucial functioning of the labor market. However, if job training itself is dominated by the role of labor market in favor of male, the effect of job training of female might not be clear or even could be worse to female. Intuitively, Employer's prior expectations of female labor or female labor's lower expectation of their own lifetime labor force attachment associated with their commitment of child care affects not only the opportunity of job training but also their choices of period & types of job training[3]. Obviously it leads female labor to lower quality of job as well as lower experience compared to those that male would take. Apparently these lower quality of jobs and lower experience provoke lower earning profiles with female labor.

It seems clear that both of theories, human capital accumulation and Sen's capability approach, tell us an important role of job training of female in labor market outcomes. However, in the real world the effect of job training would be not crystal clear as much as theory instructs us. Hence it would important to understand deeply the structure of female labor market and characteristics of female. In other words it would be essential to investigate female labor in terms of their special life cycle as well as role of society in the analysis of female labor market and labor outcomes.

In empirical analysis, obviously the most important issue in analysis of job training is how to measure "True Effect": the difference between two outcomes, one is from participant on job-training and the other one is from participant if they are not participants the job-training

[3] Barron, John M., Dan A. Black, and Mark A Loewenstein, 1989, " Job Matching and On the job training." *Journal of labor Economics* 8 (1), 1:19.

(potential participants). But apparently we cannot observe same person who participate the job-training at the same time does not. This impossibility of observable counterfactual is a potential problem of measuring of true effect of any of social programs. Practically, counterfactual could be estimated by using information from treatment groups and comparison groups with assuming that "treat" should be distributed randomly. That is, treatment groups and comparison groups divided by randomly, therefore the expectations of various characteristics, observable and unobservable, are same in both of groups by principle of probability. Hence given this assumption, we can make sure that there is no selection bias taking place. In other words, if we use experimental data, we could derive true effect of job training program. But most of time experimental data is not available to analyze job training program (including social/public program), in that case we have to face potential sample bias problems due to non random selection of graining participants influenced seriously on measurement of true effect of job-training.

Various econometric literatures have been pointing out this problem and try to solve with different econometric methodology. The most prevailed methodology is using panel data. With using panel data we could control the individual characteristics that might possible related with selection process. In general the selection problem is raised because decision of participating in training programs is made by participants themselves. Therefore, this nature of panel data, obtaining various information of same person in different year, gives us great chance to control this selection process that possibly involving personal characteristics. Recently other econometric literatures focused on the controlling the probability of participation of Program, and use it for controlling the characteristics of two groups. It is called Propensity Score Matching (PSM). Dehejia, R.H. and Wahba, S. (1999) revaluated the Lalonde (1986) data by using nonparametric techniques, Propensity Score Matching, so that they came to far more positive conclusions about the potential quality of observation data than Lalonde did. Lechner Michael (1999) also used the same approach with German data. Although many people appraised Propensity Score matching method would be best way to deal with selection problem, it still depends on observable variable so that couldn't solve the problem completely[4].

Practically, as I pointed out, measuring of true effect of job training of "*female*" on labor market outcomes is even more complicated. Because it is common that in many empirical applications, female labor market participants are not only randomly drawn but also observations

[4] Even Lechner, Michael (1999), claimed that "the results of evaluation of effect are highly sensitive to the different stochastic assumptions made about the selection process" in their paper, Earnings and Employment Effects of Continuous Off-the-Job Training in East Germany After Unification. p74

of female labor participants are often time limited in available data set. In that case, it is hard to clarify the selection process itself, therefore it is extremely difficult to identify the effect of job training on their actual wages. Technically speaking, we have to deal with dual selection problems and these are likely entangled with other factors that we could not observe in data set.

Overview of Job Training of female and empirical studies in Korea

Most of job-Trainings in Korea are conducted by Organization of Insurance of Employment and Public Job Training Institutes. The Organization of Insurance of Employment (OIE) has been launched right after Financial Crisis in 1997 in order to solve the problem of unemployment and labor instability. Their main projects are focusing on job stability & vocational training, insurance of unemployed & partial supporting of temporary rest for child care. The vocational Training is consisted of job training for employed and unemployed. In the case of job training for the employed (i.e. On the Job Training, OJT), the OIE supports both of employer and employee or supports partial wage (150% of minimum wage) for only employees. It also supports cash for employees who wish to get job training and it cover 80% of cost of job training. Generally OJT takes short time period, and usually workers can finish the OJT in 1-3 months in average. On the other hand, job training for the unemployed, there are two different supports. First one is for the unemployed who were insured in unemployment insurance and put their name on searching job in certain institutions. Second one is for the people who want to have specific jobs, and this job training is mostly for young people, less than 25 year old.

The general public job training for unemployed has high proportion of female trainees. In general, it takes 6 -12 months for completing training but it has become to take longer time, more than 1 year. Some of public job training conducted by public job training institutes[5]. These institutes focus on training of manufacture and communication & informational industry. By law, government support all cost of training and expense that related with trainee's living. Mostly job trainings in these institutes take 1 or 2 years and most of trainees are young people. The participation rate of female in this special public job training is very low, less than 20%. And also the type of job training are very specified in the certain types, applied fine art, design, tourism or office management.

As I described the current situation of job training in Korea, even though investing of effect of job training has long trace in many developed countries theoretically and empirically, study of Job training in Korea had been negligible, because national wide Job training has been

[5] College of Korean Poly-tech. (vocational college), Human Resource Development in Korean

established just aftermath of Financial Crisis in 1997, therefore many studies of job training have been developed in Korea just recently. Kang and Lee (1999), Kang, Lee, and Kim (2000), and Kang and Roh (2001) analyzed the effect of job-training on economic wage and unemployment with using simple treatment effect approach[6]. But they did not control individual characteristics which are likely correlated with training itself. Therefore it is hard to say that their models were enough to obtain relevant results. Kim (2002) has criticized the limitation of the model using cross session data. He pointed out that the reason why the effect on wage was not significant was because of lack of control of individual characteristics. He utilized two years panel data with controlling the individual characteristics. In his analysis, however, the model he used was not accurate enough to get adequate results (it does not include year dummy[7] and also he did use years of schooling instead of using schooling dummy). Recently Lee, M.J. and Lee, S.J. (2005) use different data, combining two sub-data files[8], and apply Weibull MLE for estimating unemployment duration. Although they applied semi-parametric model, because it still stood on cross session data set, it would not be free from above problems. Besides, Lee, S.W. (2003) is one of the paper that applied PSM method with KLIPS (1998-2000, 3 years), and showed the positive result of effect on wage. Lee, M.J & Tae (2003) showed quite interesting results. They have coped with dynamic process of job training of female more seriously. They pointed out once a women makes the choice of working (versus non-working), the simple fact that her works now will increase the likelihood that she works in future, with the other things held constant[9]. That is, present working lead likely to another work in next period. Their work is not precisely deal with female's experience-earning profile, however it has given us important headstone of analysis for the function of job training in Korean female.

In sum, it is clear that theoretically accumulating human capital through the job training might be more crucial than through the formal education in labor market. It is the job training for female that could play vital role in their attachment in labor market as well as their earning. Furthermore, the effect would be beyond their possible labor activity, and we would expect that it would be one the way to develop herself as a respectable human being in our society. And it is convincible because the function of job training would work through not only the complicated

[6] Even if all of them used KLIPS, but since they didn't have enough data as a panel, their analysis were as same as cross session data analysis.

[7] Year dummy is important, especially Korean data, because the data extracted just after Financial crisis, it would affect seriously in many labor market outcomes. It would be crucial factor for taking into account the effect of job-training in Korea.

[8] One is from the Center for Employment Information in the Department of Labor in South Korea, the other one is the unemployment-insurance file.

[9] Lee & Tae, (2003), Dynamic Labor-Participation Behavior of Korean Women. P 2. This effect is called "state dependence" or "hooked on effect". This effect much more well known in advertising effect on sale.

and unbalanced female labor market but also affect society *per se*. Ironically, this perplexed states of female makes hard to evaluate true effect of job training for female. Practically bringing up the selection process of job training and selection process of decision of work would be main subjects in this matter. As we went over in previous part, there are many papers investigated in Korean female job training. But none of them clearly showed the effects of female job training on the labor market so far. In this paper, I try to manage these two problems through panel data so that try to clarify the effect. Following section, I describe the detail econometrical methodology for that.

III. Empirical Methodology

III-1. Fixed Effect & Random Effect Model

Selection issues

As mentioned before, the crucial point over this paper is how to control the selection bias in the model. In this paper, we are concerning two selection issues. In general selection issues are raised by non-random samples. This non-random sampling could be happened because of design of sampling itself, but often time it is because of the behavior of the units being sampled (i.e. being treated). In our context, being treated group and controlled group might not be randomly distributed, that is it might be related with individual ability or other structural component. Unfortunately, those variables are unobserved, therefore we can not control those variables with using our data set. That is one of the possible selection biases, and it is from existence of unobserved variables related with individual characteristics.

The other sample selection is from due to incidental truncation leads to missing data on the explanatory variables. More precisely, wage information would be dependant variable in our wage equation but wage information is not always observable for everyone in the population because wage information is observable only for people who work. It is important especially female wage equation, because labor participation rate of female is most likely lower than one of male, in that case estimating wage equation with only using sub-sample who has wage information would lead to be biased result of coefficient that we are interested to find. First, we will bring up the selection issue of unobservable variable. We will come back to the other issue, truncated data, later on.

Using panel data gives us advantage of controlling of individual heterogeneity that are most unlikely observed in plausible data set. Fixed effect (FE) and Random effect (RE) model with using panel data provide a nice frame in this analysis for avoiding the first selection problem from above.

The basic panel model could be written,

$$y_{it} = x_{it}\beta + c_i + u_{it} \quad (1)$$

$$E(y_{it} \mid x_{i1}, x_{i2}, ..., x_{iT}, c_i) = E(y_{it} \mid x_{it}, c_i) = x_{it}\beta \quad (2)$$

where x_{it} is observable variables that changed across t and i, c_i is unobservable individual component and it doesn't change across t, and u_{it} is error component and it change across t as well as i.

Assumption RE

(a) $E(u_{it} \mid x_{it}, c_i) = 0, \quad t = 1, ..., T$

(b) $E(c_i \mid x_i) = E(c_i) = 0 \qquad where\ x_i \equiv (x_{i1}, x_{i2}, ..., x_{iT})$

Assumption RE a) states the strict exogeneity assumption in panel model. It implies that once x_{it} and c_i are controlled for, x_{it} has no partial effect on y_{it} for $s \neq t$. In other words, naturally x_{it} is likely partially correlated with c_i, but given the strictly exogenous conditional on the unobserved effect c_i, controlling c_i, x_{is} has no effect on y_{it}. Given Assumption (a) we can write the expected y_{it} in following way.

$$E(y_{it} \mid x_{i1}, x_{i2}, ..., x_{iT}, c_i) = E(y_{it} \mid x_{it}, c_i) = x_{it}\beta + E(c_i \mid x_{i1}, x_{i2}, ..., x_{iT}) \quad (3)$$

In order to get (2), we need another assumption for this panel model, Assumption (2). Assumption (2) states the orthogonality between c_i and each x_{it}. In other words c_i is independent of x_i, that is c_i is correlated with the x_{it} arbitrarily. Along the satisfaction of these two assumptions, we can reach consistent estimation with Random effect model.

On the contrary, FE model relaxes the second assumption of RE, that is it allows to control the effect of time invariants x_i, from the unobservable time invariants, c_i. In this sense, FE model is more robust than RE model. There, however, are two draw backs that need to be noticed. The first one is that once we use fixed effect model, we cannot use the time invariant variable, for

instance sex or gender, in the model. The second one is even if FE eliminates heterogeneity bias, it could exacerbate measurement error bias due to processing of FE transformation.

Measurement Error

As mentioned before, FE model could give us the most robust estimates in our model. But exploiting panel data to control the effects of unobserved individual characteristics using FE may result in even more biased estimates than simple least-squared estimator using cross-session data alone. That is, if the serial correlation of the measurement error is less than the serial correlation of the true *x*, FE increases the noise-to-signal ratio for the measured explanatory variable[10]. In fact, this draw back of FE model might support the using RE model rather than FE even if losing the opportunity of controlling of unobservable individual component in our panel model setting.

Taking advantage of using panel data with concerning of measurement error, the RE model will be the model that mainly used in this paper. In order to avoid the unrealistic assumption of RE, independence between x_{it} and c_i, we modify the conventional RE model in this analysis. That is, instead of eliminating the individual characteristics, we include a group dummy variable in RE model and it helps to control the group effect that distinguished true job training effect per year. After all we will show estimated results from this RE model, however we will also show the results from FE model as well. Following is the final version of RE model in this paper.

$$y_{it} = a + g_j\delta + d_{it}\delta' + x_{it}\beta + c_i + u_{it} \qquad (4)$$

where g_j is group dummy variable (j=1 : treated group; j=0: controlled group), d_{it} is dummy variable for individual job training in each year.

Next part, I will explain detail data source for this analysis.

III-2. Data & Descriptive Statistics

DATA

In this analysis I utilize Korean Labor Income Panel Study (KLIPS) in 1998-2005. KLIPS is a longitudinal survey of household and individuals mainly residing in urban areas in Korea. It

[10] Ashenfelter, Deaton, and Solon(1984); Griliches and Hausman(1986) showed that FE of the data to induce different and deducible changes in the biases in th estimated parameters with using panel data, and also identified the importance of measurement errors and the way to recover the "True" parameters.

contains economic information of labor market and income activities as well as comprehensive individual information. Since 1998, Korea labor Institute (KLI) has been collecting the survey and generating data set every year. In principle, it has been keeping about 5000 households and 11,000 individual in each year. So far the rate of maintaining original household in this data set is average 79% each year. With comparing with panel data set in other countries, it seems that KLIPS is reasonably reliable as a panel data. Because of the dropouts, the data set is unbalanced in each year. But it keeps observation in average N=4000 for only women of age 15-66 in each year.

KLIPS is extensive and general social & labor market outcome survey data set. In other words, KLIPS is not a specially designed data set for a specific job training program. Therefore, job training itself is just one of any other components, not a key variable in this data set. It, however, has detailed information of various labor activities as well individual & household information, hence we can take advantage of utilizing useful information in order to control other influences that around job training.

In addition, job training itself is not a main variable in this data set, it provides detail enough source of job training program. For instance, except 3rd year (2000), every year survey has job-training variable as well as other information which related to detailed job-training, such as training's types, period, main supporters, objective, subjective of cost etc. Therefore, it is reasonable to insist that KLIPS is quite relevant in analyzing the possible impacts of job-trainings on labor market and labor market outcomes.

Descriptive Statistics

[Table 1] shows the variables and definition of variable that I use in wage equation. In addition to these variables, I also use several interaction terms in wage equation in order to help us to control and interpret the relationships between job training and industry or occupational variables.

In this paper, I will analyze effect on wage rate as well as labor force. Hence there are two dependent variables in this analysis, lnwagerate (=natural log in wage rate) and labor force.

[Table 1: Dependent & Independent Variables and Definitions]

Variable	Definition
lnWAGERATE	Natural logarithm of the hourly wage rate (won) in 1998 & 2005
Labor_force	Dummy variable, =1 if one is in labor force; =0 otherwise
JT_Ever	Dummy variable,=1 if one has ever had jobtraining since 1999;

	=0 otherwise
JT_Current	Dummy variable,=1 if one took jobtraining in certain year
JT_OJT	Dummy variable, =1 if Jobtraining is conducted in working place/ supported by employer ; =0 otherwise
JT_PBC	Dummy variable, =1 if Jobtraining is conducted in public training center/supported by Government ; =0 otherwise
JT_priod_m	Amount of months one took for job training since it has started
T	Time variable, t= 1998, 1999,…, 2005
T_sq	Squared of T
Age	Age in years as of 1998 & 2005 survey date
Age_sq/100	Squared of Age/100
EDU_prim	Dummy variable, =1 if one completed primary school; =0 otherwise.
EDU_sec	Dummy variable, =1 if one completed secondary school; =0 otherwise.
EDU_coll	Dummy variable, =1 if one completed college school (2 or 4 years); =0 otherwise.
EDU_upcoll	Dummy variable, =1 if one completed post college school; =0 otherwise.
Marriage1	Dummy variable, =1 if one is not married; =0 otherwise.
Marriage2	Dummy variable, =1 if one is married; =0 otherwise.
Marriage3	Dummy variable, =1 if one is married and living without a spouse; =0 otherwise
N_fm	Number of family members
ch3	Dummy variable,= 1 if one has a child(children) under age 4; =0 otherwise.
ch7	Dummy variable,= 1 if one has a child(children) under age 8; =0 otherwise.
ch17	Dummy variable,= 1 if one has a child(children) under age17;=0 otherwise.
Employ Type	Dummy variable, =1 if current job is a irregular job; =0 otherwise
WEXP	Number of months of being employed since she started to work
Union_firm	Dummy variable, =1 if a firm is unionized ; =0 otherwise.
IND1	Dummy variable, =1 if Industry is Agriculture; =0 otherwise.
IND2	Dummy variable, =1 if Industry is Manufacture; =0 otherwise.
IND3	Dummy variable, =1 if Industry is Construction; =0 otherwise.
IND4	Dummy variable, =1 if Industry is Transportation; =0 otherwise.
IND5	Dummy variable, =1 if Industry is Finance; =0 otherwise.
IND6	Dummy variable, =1 if Industry is Service; =0 otherwise.
OCC1	Dummy variable, =1 if occupation is a Professional job; =0 otherwise.
OCC2	Dummy variable, =1 if occupation is a Technician; =0 otherwise.
OCC3	Dummy variable, =1 if occupation is an Officer ; =0 otherwise.
OCC4	Dummy variable, =1 if occupation is a Service job; =0 otherwise.
OCC5	Dummy variable, =1 if occupation is a Producer ; =0 otherwise.
OCC6	Dummy variable, =1 if occupation is a Simple work; =0 otherwise.
Region1	Dummy variable,= 1 if Seoul Metropolis; =0 otherwise
Region2	Dummy variable,= 1 if Busan Metropolis; =0 otherwise
Region3	Dummy variable,= 1 if Daegu Metropolis; =0 otherwise
Region4	Dummy variable,= 1 if Daejun Metropolis; =0 otherwise
Region5	Dummy variable,= 1 if Incheun Metropolis; =0 otherwise
Region6	Dummy variable,= 1 if Gwangju Metropolis; =0 otherwise
Region7	Dummy variable,= 1 if Ulsan Metropolis; =0 otherwise
Region8	Dummy variable,= 1 if Gyunggi-do; =0 otherwise
Region_m	Dummy variable,= 1 if middle area; =0 otherwise
Region_sw	Dummy variable, =1 if South West area; =0 otherwise
Region_se	Dummy variable,=1 if South East area; =0 otherwise
Region_o	Dummy variable,=1 if Cheju Island; =0 otherwise

As we can see, there are five different type of measurement of job training in this wage equation. JT_Ever is dummy variable that measures whether one ever has done job training during 1999-2005. As you can imagine it just captures the differences between two groups, the treated group and control group. The second one is JT_Current that could pick up the effect of general average effect of yearly job training program. In addition, I created two other variables, JT_OJT and JT_PBC. The reason is that unfortunately our main variable JT_Current captures only the general effect of Job training of female. As we went through in the previous chapter, however, there are two different type of Job trainings have been done during the years, and the distribution of those two types of job training seems to be related with same characteristics of female in Korea. Therefore it would be meaningful to include those variables separately in the wage equation so that they could capture the effect of different type of Job training. Lastly JT_period measures the amount of months that one took for job training. As you can see, it would show how the effect of length of job training works in this model. In the table for estimated results, we will discuss with first four variables mainly, and then we will get back to effect of length of Job training program separately.

There are several covariates in wage equation. First I include time variables, T & T_sq. Since our dependent variable, lnwagerate, is based on nominal monthly wage, time variable can take off trend of wage rate so that it helps to see real effect of job training in wage equation. Different levels of Education are also included as covariates. As a determinant of wage rate, education level is the most important factor. In order to have an accurate measurement of job training, it is necessary to add different levels of education. As many other papers already showed, however, education levels would be highly correlated with Job training itself. In this matter, I will narrow down the effect of job training with different level of education. This will be discussed later on as a robust check. Marriage status and having different age of child should be taken account in wage equation especially for female wage equation. In general, Marriage status has been discussed in labor economics as a marriage premium; married labor has higher wage rate compare to unmarried with holding other things equal. However, marriage status of female is a fundamentally different issue from male case, because not only it is related with female life cycle itself but also it is difficult to separate with social norms in a certain society. Raising different aged child is also considered in this line. That is whether she is married or not, or how old is the child she is raising affect implicitly as well as explicitly on her decision of labor force. And it might influence wage rate with various paths in labor market. As same as education issues, I will discuss about marriage status separately in later chapter.

In addition, I include employment type, working experience for controlling other individual characteristics. Union_firm, Industry, and Occupation are also controlled in wage equation in order to keep on separating the change in wage rate due to different industries or occupations from change in wage rate due to job training. It, however, is possible that probability of being in job training program is correlated with certain occupations. To avoid this problem, I add interaction terms with occupations and job training so that I try to clarify the possible relationship between occupations and job training.

Lastly, I also control the different regions in Korea. First seven regions mostly refer to reasonably large enough cities in Korea, and others refer to different areas in Korea; middle, southwest, and southeast.

[Table 2] & [Table 3] show the descriptive statistics for dependent and independent variables in treat group as well as controlled group in years that I consider in this analysis. There are several facts needed to mention from these tables. First, average age in treated group is younger than one in controlled group. As other analysis of job training program showed, this implies age an important fact that affects decision of attending the job training. The second, over all the education levels in treated group is higher than controlled group. More precisely, distribution of female who completed secondary school is not much different between being treated and controlled. However, one who completed college is most likely in treated group, and this pattern is same in upper college level. It implies that probability of attending job training is higher when she finished high level of education, graduate college or upper college. Obviously we could see that the effect of job training program in wage equation could be mixed with returns of school, therefore, if it is true then, the effect of job training should be separated from returns of school.

About the marriage status, as you can see if one is not married, she highly possible to attend in job training program. It does make sense to us that unmarried women would have more time to invest skill for her currier rather than spending more time to other family members. Proportion of raising different age of child lightly shows that if child is younger then she likes to attend job training program, but percentage of female having old child is just similar between two groups. It seems that raising different aged of child does not matter in being attending job train or not. We will see the effects that how those factors play a role in our regression of wage equation later on more precise.

Lastly one how has more working experience and working in unionizing firm is more likely in treated group than in controlled group, but employment type is equally distributed in two groups. Those factors also might affect wage profile of female. Hence I will need to control those factors in wage equation in order to get separate the true effect of job training from others.

[Table 2] Descriptive Statistics of Treated group and Controlled group in 1998-2005

	Treated group					Controlled group				
Variable	**Obs.**	**Mean**	**Std. Dev.**	**Min**	**Max**	**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**
lnWAGERATE	2250	-0.47	0.59	-2.77	2.30	7271	-0.93	0.57	-4.52	3.62
WAGERATE	2250	0.75	0.55	0.06	10.00	7271	0.48	0.60	0.01	37.50
JT_ever	4482	1.00	0.00	1	1	27172	0.00	0.00	0	0
JT_current	4482	0.49	0.50	0	1	27172	0.00	0.00	0	0
JT_PBC	4482	0.10	0.30	0	1	27172	0.00	0.00	0	0
JT_OJT	4482	0.09	0.29	0	1	27172	0.00	0.00	0	0
T	4482	4.53	2.32	1	8	27172	4.43	2.34	1	8
T_sq	4482	25.89	21.40	1	64	27172	25.16	21.46	1	64
Age	4482	33.31	10.48	15	66	27172	42.13	13.11	15	66
Age_sq/100	4482	12.19	7.69	2.25	43.56	27172	19.47	11.20	2.25	43.56
EDU_prim	4482	0.03	0.16	0	1	27172	0.19	0.40	0	1
EDU_sec	4482	0.48	0.50	0	1	27172	0.55	0.50	0	1
EDU_coll	4482	0.47	0.50	0	1	27172	0.19	0.40	0	1
EDU_upcol	4482	0.02	0.13	0	1	27172	0.01	0.10	0	1
N_fm	4482	3.92	1.14	1	8	27172	3.80	1.26	1	10
Ch3	4482	0.13	0.33	0	1	27172	0.10	0.30	0	1
Ch7	4482	0.14	0.34	0	1	27172	0.12	0.32	0	1
Ch17	4482	0.44	0.50	0	1	27172	0.43	0.49	0	1
Marriage1	4482	0.38	0.49	0	1	27172	0.17	0.37	0	1
Marriage2	4482	0.57	0.49	0	1	27172	0.72	0.45	0	1
Marriage3	4482	0.05	0.21	0	1	27172	0.10	0.30	0	1
WExperience	4377	79.50	76.66	0	591	24611	75.37	98.59	0	934
Employ_Type	4482	0.11	0.31	0	1	27172	0.11	0.32	0	1
Union_firm	4393	0.15	0.35	0	1	26856	0.03	0.16	0	1

[Table 3] Descriptive Statistics of Treated group and Controlled group in 1998-2005 (continue)

	Treated group					Controlled group				
Variable	**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**	**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**
Ind1	4482	0.01	0.09	0	1	27172	0.04	0.19	0	1
Ind2	4482	0.06	0.24	0	1	27172	0.09	0.29	0	1
Ind3	4482	0.01	0.08	0	1	27172	0.01	0.09	0	1
Ind4	4482	0.18	0.39	0	1	27172	0.15	0.36	0	1
Ind5	4482	0.07	0.26	0	1	27172	0.02	0.12	0	1
Ind6	4482	0.29	0.45	0	1	27172	0.12	0.32	0	1
Occ1	4482	0.13	0.34	0	1	27172	0.03	0.17	0	1
Occ2	4482	0.10	0.31	0	1	27172	0.03	0.18	0	1
Occ3	4482	0.15	0.36	0	1	27172	0.06	0.23	0	1
Occ4	4482	0.18	0.39	0	1	27172	0.15	0.35	0	1
Occ5	4482	0.04	0.19	0	1	27172	0.11	0.31	0	1
Occ6	4482	0.01	0.11	0	1	27172	0.05	0.22	0	1
Region1	4482	0.20	0.40	0	1	27172	0.25	0.43	0	1
Region2	4482	0.13	0.33	0	1	27172	0.10	0.30	0	1
Region3	4482	0.05	0.22	0	1	27172	0.06	0.25	0	1
Region4	4482	0.03	0.18	0	1	27172	0.03	0.18	0	1
Region5	4482	0.05	0.21	0	1	27172	0.07	0.25	0	1
Region6	4482	0.05	0.21	0	1	27172	0.03	0.17	0	1
Region7	4482	0.04	0.20	0	1	27172	0.03	0.16	0	1
Region8	4482	0.17	0.37	0	1	27172	0.18	0.39	0	1
Region_ws	4482	0.10	0.30	0	1	27172	0.06	0.24	0	1
Region_es	4482	0.12	0.32	0	1	27172	0.12	0.33	0	1
Region_o	4482	0.01	0.11	0	1	27172	0.02	0.15	0	1
Region_m	4482	0.05	0.21	0	1	27172	0.05	0.21	0	1

On the other hand, if we look at the distribution of job training through various industries, it is easy to say one in the finance or service industry likely attends job training program compare to other industries. This pattern does consist with distribution with occupation. Professional job, technician, officer are likely to have job training program. But one has a simple work or simple producer then it is unlikely in treated group in our sample.

Distribution of job training seems to well distributed different regions in Korea, except two special area, Region6 (Gwang-ju Metropolis) & Region7 (Ulsan Metropolis). It does make sense that those two areas are specially developed as a industrialized city in Korea. It is possible that people live in those cities are likely have chance to attend job training rather than people from other areas. Thus I control this in wage equation, too.

[Table 4] shows the change in the distribution of job training in different years. As we can see the number of female job trainee is quite small especially 1999 and 2000. However, the

[Table 4] Changes in Distribution of Trainees in each year

	No. of Participants				
Year	**Total**		**Public Job Training**	**On the Job Training**	**Total Sample Size**
	Number	%[1)]	Number	Number	Number
1999	71	1.79	64	7	3965
2000	67	1.77	38	19	3776
2001	136	3.61	67	68	3766
2002	148	3.98	83	68	3718
2003	149	3.87	80	69	3854
2004	179	4.59	76	98	3903
2005	144	3.52	57	86	4086

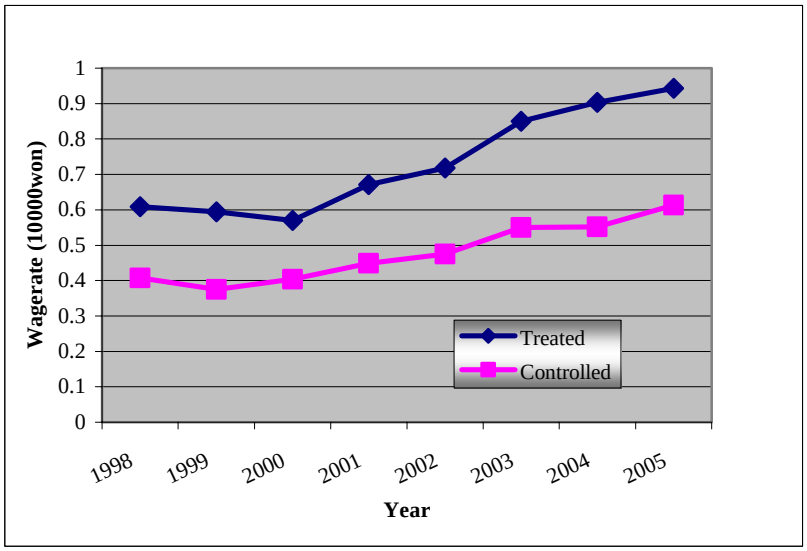
Note: 1) Percentage of numbers out of total observations (Total sample size in each year).

percentage has been increased year by year, and the proportions of female job trainees are consistent with 4-5% of total sample size in each year[11]. From this table we can also see the proportion of On The Job training and public job training in each year. From the first parts of the years that we consider in this analysis, more people was in public job training rather than on the job training, however the this pattern has been changed slightly from 2004. That is, data shows from 2004, the proportion of On the Job Training program is higher than Public Job Training program. Those patterns demonstrate of the patterns of job training in Korea. Job training has started from 1998 right after the Finance crisis at 1997, and at that time most of job trainings were established and driven by local Government or public labor institute. Therefore most of chances

[11] In male case, the percentage of job trainee is about 6-8% of sample size in each year.

to have job trainings were from Public Job Training center/institutes rather than the work place. However, after that government has change the policy of job training in a way that local government not only has supported the public job training program but also it has encouraged the firm to have their own job training program on the working place. For instance, local governments like to subsidize the firms if they want to offer job training to their employee. Those change has been affect the distribution of job trainings over the years.

[Graph 1] Change in Wage rate in each year, 1998-2005.



[Graph1] gives us an important motivation of our analysis here. As you can see from the graph, the changes in wage rate in being treated (taking job training program) is much higher than in being controlled (not taking job training program). This difference is about 0.2 and it is not trivial figure as we can notice. Not only that, this difference in wage rate between two groups is getting increased over the years. That is, we might think that the effect of job training would be positive and the rate of growth of this effect would increase over the year. However, as we all know there are various factors that might go along with job training and those factors might make this change and growth of wage rate. Next chapter we will clarify those effects and purify of job training effect from those mixtures of other effects. Various model specification could help to work it out.

IV. Finding Results of Estimates

IV-1. Fixed Effect & Random Effect model

Our empirical analysis here is based on the model we consider in previous chapter. First three columns show three different models, Pooled OLS, FE model, and RE model, with simple covariates. As you can see, the estimated coefficients over the pooled OLS are higher than ones from FE & RE. In order to make sure whether it is proper to use Panel Analysis with data that I use here, I take the LM test for each different specifications. Most of specifications indicate that a null hypothesis, $H_0 : \sigma_c = 0$, fail to accept. Now we can be sure that it is appropriate to use panel analysis in this paper. If we compare results between FE & RE, we could see that the sign of all coefficients of variables related with job trainings are same. That is current job training and job training of on the job training (OJT) show positive effect on wage rate. Thus without other covariates, FE and RE model shows job training of Korean female has positive effect on wage rate. However, the magnitudes of estimated coefficients are lower in FE model comparing to RE model. There are two things that we might want to argue with this result. First, technically FE controls more accurately control the individual effect, because it could eliminate c_i in the wage equation. It might make the estimated coefficient more robust in our analysis. However, as I pointed out before, it is also possibly true that FE could lead the coefficients to be biased downward due to enlargement of measurement error. Hence these two factors makes FE coefficients smaller than one in RE model.

Practically, I have to accept that given my data it is hard to insist to use FE model. It is because some of variables that supposed to be time variants are moving over time. Due to facing limitation of data source, I decide to use RE model after all other analysis in this paper. Even if I have to give up the opportunity of eliminating unobservable individual characteristics, RE model could avoid the problems of measurement error. Without losing consistency of result from FE and controlling of group effects, RE model would be good enough to measure of true effect of job training in this analysis.

Columns from 2 to 10 show the results with various covariates that controlled other individual as well as other factors that might affect on wage rate. Adding education dummy variables does affect on all estimated coefficients of JT_ever, JT_OJT, and JT_PBC. That is, even the estimated coefficient of current job training is still positive and statistically significant, but once I add education dummy variables, the magnitude drops by about 50%. It implies that the half of effect from general job training was mixed with effects of schooling. Surprisingly including

marriage status and raising a different aged child does not change that much. More precisely, marriage variable is positively correlated with wage rate but it is not statistically significant. In addition, raising child seems not to be crucial factor as determinant of wage rate in this model. In column 5, I add type of employment and working experience. And in this specification, effect of public job training is getting worse. Even it is not significant we can see that a negative effect of public job training is getting stronger once we control working experience.

Column 6 control Union as well, and with controlling Union, general average effect of job training reduced 0.1 point, but it still positive and significant. Through column 7 we can see that controlling industries changes the difference of wage rate in two groups. It implies that treated group might be related with certain industries and those industries are positively related with high wage rate. This pattern is same as adding occupation variable in wage equation. Column 8 has occupation dummy variables and it shows that controlling occupations reduces the differences of wage rate in two groups as well as general average job training effect. But it does increase the magnitude of a positive effect of job training from OJT and negative effect from Public Training Program (PBC). From these result we might suspect the correlation between industry and occupation with job training program. We will discuss about this more precisely with interaction terms in wage equation.

Interactions with some covariates

As we saw the descriptive statistics, it could be possible that a certain industry or a certain occupation is correlated with job training itself. In that case, wage equation without additional controls might lead us biased results. Avoiding this problem, I add several interaction terms in wage equation.

Interestingly, adding interaction terms in wage equation increase magnitude of estimated coefficient of job training but it became insignificant. On the contrary, estimated coefficient of OJT became stronger when wage equation have additional interaction term.

[Table 5] The results of Fixed Effect and Random Effect Models

	Pooled OLS	Fixed Effect Model	Random Effect Model									
			1	2	3	4	5	6	7	8	9	10
lnWAGERATE												
	Coef.		Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
JT_ever	0.367**	(dropped)	0.316**	0.222**	0.220**	0.236**	0.212**	0.202**	0.157**	0.169**	0.134**	0.147**
(SE)	(0.019)[1)]		(0.027)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.024)	(0.024)	(0.023)	(0.023)
JT_current	0.083**	0.077**	0.081**	0.048**	0.052**	0.049**	0.047**	0.038**	0.034**	0.041**	0.035**	0.042**
	(0.028)	(0.024)	(0.023)	(0.022)	(0.022)	(0.022)	(0.022)	(0.023)	(0.022)	(0.022)	(0.022)	(0.022)
JT_OJT	0.059*	0.044*	0.051*	0.059**	0.057**	0.063**	0.060**	0.061**	0.054**	0.053**	0.060**	0.057**
	(0.036)	(0.027)	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)	(0.025)
JT_PBC	0.185**	-0.051*	-0.027	-0.023	-0.024	-0.019	-0.023	-0.028	-0.016	-0.009	-0.024	-0.016
	(0.044)	(0.033)	(0.032)	(0.032)	(0.032)	(0.032)	(0.032)	(0.032)	(0.032)	(0.031)	(0.031)	(0.031)
T	0.009	0.039**	0.033**	0.029**	0.028**	0.029**	-0.006	-0.005	-0.002	-0.003	0.001	0.001
	(0.012)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
T_sq	0.006**	0.005**	0.005**	0.004**	0.004**	0.004**	0.007**	0.007**	0.006**	0.007**	0.006**	0.006**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Age				0.056**	0.057**	0.055**	0.046**	0.045**	0.044**	0.044**	0.047**	0.047**
				(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Age_sq/100				-0.069**	-0.071**	-0.068**	-0.058**	-0.057**	-0.057**	-0.057**	-0.058**	-0.058**
				(0.005)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
EDU_sec				0.107**	0.113**	0.091**	0.081**	0.081**	0.060**	0.059**	0.045**	0.044**
				(0.030)	(0.030)	(0.030)	(0.029)	(0.029)	(0.028)	(0.028)	(0.027)	(0.027)
EDU_coll				0.460**	0.462**	0.436**	0.414**	0.418**	0.373**	0.371**	0.268**	0.272**
				(0.035)	(0.035)	(0.035)	(0.034)	(0.034)	(0.033)	(0.033)	(0.033)	(0.033)
EDU_upcol				0.815**	0.808**	0.768**	0.758**	0.746**	0.720**	0.738**	0.569**	0.594**
				(0.058)	(0.058)	(0.058)	(0.057)	(0.057)	(0.056)	(0.055)	(0.056)	(0.055)
Marriage2					0.018	0.018	0.024**	0.025**	0.031**	0.032**	0.032**	0.032**
					(0.019)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
N_fm					-0.022**	-0.019**	-0.017**	-0.014**	-0.013	-0.016**	-0.012**	-0.015**
					(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Ch3					0.038	0.035	0.032	0.033	0.030	0.028	0.028	0.027

					(0.022)	(0.022)	(0.021)	(0.022)	(0.021)	(0.021)	(0.021)	(0.021)
Ch7					0.015	0.014	0.020	0.025	0.022	0.017	0.016	0.013
					(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Ch17					-0.030**	-0.029**	-0.022*	-0.022*	-0.020*	-0.020*	-0.016	-0.016
					(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.015)
Region_j					N	Y	Y	Y	Y	Y	Y	Y
lnWExperience					N	N	0.086**	0.091**	0.091**	0.087**	0.083**	0.080**
							(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Employ_Type					N	N	-0.104**	-0.100**	-0.109**	-0.111**	-0.086**	-0.088**
							(0.012	(0.012)	(0.012)	(0.011)	(0.012)	(0.011)
Industry_k					N	N	N	N	Y	Y	Y	Y
Union_firm					N	N	N	0.107**	0.106**	N	0.099**	N
								(0.015)	(0.015)		(0.015)	
Occupation_h					N	N	N	N	N	N	Y	Y
Constant	-1.135**	-1.139**	-1.229**	-2.435**	-2.357**	-2.382**	-2.407**	-2.459**	-2.514**	-2.446**	-2.615**	-2.547**
	(0.024)	(0.017)	(0.020)	(0.087)	(0.100)	(0.116)	(0.115)	(0.116)	(0.115)	(0.115)	(0.114)	(0.113)
No. of Obs.	9521	9521	9521	9521	9521	9521	9446	9061	9061	9226	9061	9446
No. of Groups.		2473	2473	2473	2473	2473	2459	2459	2459	2459	2459	2459
R_sq	0.174	0.222	0.168	0.307	0.312	0.326	0.364	0.377	0.424	0.411	0.4536	0.441

Note: 1) Standard Error is in a parenthesis.

IV-2. The labor Participation: Probit Model with Panel data

The effect of job training on labor force might be critically important. Because the decision of participation of labor force has to be made first, consideration of effect on labor force would give us important intuition for better understanding of effect on wage rate as well. In this part, we analyze the effect of job training on female labor force with using Probit Model. The result of estimates is following.

[Table 6] Results from Probit model of Labor force with random effect

		Probit Model with Random Effect						
Labor_force								
		1	2	3	4	5	6	7
JT_ever	Coef.	0.635**	0.643**	0.569**	0.574**	0.562**	0.562**	0.591**
	Std. Err.	(0.062)[1)]	(0.062)	(0.062)	(0.062)	(0.062)	(0.062)	(0.062)
JT_currenet		0.434**	0.671**	0.628**	0.625**	0.883**	0.883**	0.623**
		(0.064)	(0.021)	(0.103)	(0.076)	(0.094)	(0.094)	(0.105)
JT_priod_m			-0.064**	-0.074**	-0.087**	-0.096**	-0.096**	-0.083**
			(0.021)	(0.021)	(0.021)	(0.019)	(0.019)	(0.021)
JT_PBC		-0.178**	-0.140	-0.129	-0.129	-0.319	-0.320	-0.131
		(0.088)	(0.159)	(0.159)	(0.159)	(0.156)	(0.156)	(0.160)
JT_Pri*PBC			0.009	-0.001	-0.001	0.006	0.005	0.004
			(0.029)	(0.029)	(0.029)	(0.029)	(0.029)	(0.029)
T		0.039**	0.038**	0.038**	0.040**	0.025*	0.026*	0.023*
		(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
T_sq		0.003**	0.004**	0.004**	0.004	0.005	0.005	0.005**
		(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Age				0.107**	0.113**	0.274**	0.274**	0.251**
				(0.008)	(0.008)	(0.010)	(0.010)	(0.010)
Age_sq/100				-0.142**	-0.154**	-0.316**	-0.317**	-0.302**
				(0.009)	(0.009)	(0.011)	(0.011)	(0.011)
Edu_sec					-0.301	-0.203	-0.200	-0.212
					(0.057)	(0.056)	(0.057)	(0.057)
Edu_coll					-0.193	-0.304	-0.307	-0.281
					(0.070)	(0.070)	(0.070)	(0.070)
Edu_upcol					-0.053	-0.204	-0.211	-0.171
					(0.144)	(0.145)	(0.146)	(0.146)
Marriage1						1.582	1.578	1.151
						(0.058)	(0.058)	(0.070)
Marriage3						0.486	0.489	0.468
						(0.055)	(0.055)	(0.057)
N_fm								-0.017
								(0.013)
Ch3								-0.506
								(0.042)
Ch7								-0.123
								(0.035)

Ch17							-0.123
							(0.037)
Region_i	N	N	N	N	N	Y	Y
Constant	-0.499	-0.499	-2.226	-2.052	-5.996	-5.961	-5.004
	(0.037)	(0.037)	(0.157)	(0.167)	(0.219)	(0.245)	(0.253)
No. of Obs.	31,239	31,239	31,227	31,227	31,227	31,227	31,227
No. of groups	4469	4469	4469	4469	4469	4469	4469

Notice: 1) Standard Error is in a parenthesis.

As similar with other analysis, [Table 6] shows the results with different specifications. Over all specifications, average effect of job training has very strong and statistically significant effect on labor force of Korean female. According to the results on the table, we can say that the probability of participating labor force would be 62% when one female took job training in average. Interestingly period of job training does not help to force female to labor market. It has a negative effect on participating in labor market. It also shows that Public Job training program does not help to increase female labor force attachment. Not surprisingly, having many family members and having kids affect negatively on labor force attachment in Korean female. About the marriage status, previously we saw that marriage status does not seem to matter for wage rate in Korean female labor market, however it does matter in labor participation. Column 5 indicates that estimated coefficient of Unmarried dummy variable is positive and statistically significant, and from this result we could argue that marriage status is a formidable barrier to enter the labor market, but once she enters, it does not play a role as a wage determinant.

IV-4. The length of training program in Random Effect model

JT_current can only capture general and average effect of job training on wage rate. Therefore in order to see this intensity of job training program on our wage equation, we need to know the length of job training program. Fortunately our data provides the information of the amount of days that one has been spending for job training during each year. With this variable we could pick up the effect of length of job training on wage rate.

[Table 7] shows the results of estimates from various specifications with length of job training. Surprisingly through over all of different specifications, adding JT_period does not seem to have significant effect on wage rate. Intuitively if one spends more time for job training and job training has positively related with wage rate, period of job training has to have a positive effect on wage rate too. However, it seems that this is not a case on job training of female in Korea. That is, period of job training might be related with specific job training that has negative

effect on wage rate. If it is true, then it could be possible to say that long-term job training brings lower wage but short-term job training does higher wage. We can fine the evidence of this hypothesis from column 2.

Compare with previous analysis (without JT_priod (refer to [Table 5])), the wage equation including training period does not change in difference of wage rate in two groups and coefficients from JT in OJT, however, it affect OJT in PBC Training, and those effect are declined a little bit. Not only that, although when I have only an interaction term with Public job training and period of JT (JT_pri*pbc) in wage equation, it has a negative coefficient, but once I add other covariate with this interaction term in wage equation, it changes the direction of coefficient from negative to positive. It implies that with controlling other covariates long term job training and public training are positively related each other. In other words, if public training has a poor effect on wage rate then period job training does have poor effect on wage rate as well. Even if those estimated coefficients are not statistically significant, but it is hard ignore the direction of estimates.

[Table 7] Estimated result with Length of Job Training

	Pooled OLS	Fixed Effect	Random Effect						
lnWAGERATE									
			1	2	3	4	5	6	7[1)]
JT_ever	0.367**	Dropped	0.315**	0.314**	0.218**	0.218**	0.134**	0.146**	0.134**
(SE)	(0.019)[2)]		(0.027)	(0.027)	(0.025)	(0.025)	(0.023)	(0.023)	(0.023)
JT_currenet	-0.006	0.068**	0.061**	0.059**	0.038*	0.038*	0.023	0.024*	0.035*
	(0.035)	(0.030)	(0.028)	(0.030)	(0.028)	(0.029)	(0.027)	(0.028)	(0.022)
JT_priod_m	0.025**	0.003**	0.006	0.007	0.004	0.004	0.004	0.004	
	(0.006)	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)	(0.005)	(0.005)	
JT_OJT	0.076*	0.045*	0.054*	0.054*	0.059*	0.059*	0.061**	0.061**	0.060**
	(0.036)	(0.027)	(0.026)	(0.026)	(0.026)	(0.026)	(0.025)	(0.027)	(0.026)
JT_PBC	0.148**	-0.053*	-0.031	-0.018	-0.027	-0.028	-0.030	-0.032	-0.024
	(0.045)	(0.033)	(0.032)	(0.059)	(0.032)	(0.058)	(0.031)	(0.057)	(0.031)
JT_Pri*PBC				-0.003		0.000		0.003	
				(0.010)		(0.010)		(0.010)	
T	0.010	0.039**	0.033**	0.033**	0.028**	0.028**	0.001	0.001	0.001
	(0.012)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)	(0.009)	(0.009)
T_sq	0.006	0.005**	0.005**	0.005**	0.004**	0.004**	0.006**	0.006**	0.006**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Age					0.057**	0.057**	0.047**	0.047**	0.047**
					(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Age_sq/100					-0.071**	-0.071**	-0.058**	-0.058**	-0.058**
					(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Edu_sec					0.113**	0.113**	0.044*	0.045*	0.045*
					(0.030)	(0.030)	(0.027)	(0.027)	(0.027)

Edu_coll					0.461	0.461**	0.272**	0.268**	0.268**
					(0.035)	(0.035)	(0.033)	(0.033)	(0.033)
Edu_upcol					0.807**	0.807**	0.593**	0.568**	0.569**
					(0.058)	(0.058)	(0.055)	(0.056)	(0.056)
Marriage2					0.018	0.018	0.032**	0.032**	0.032**
					(0.019)	(0.019)	(0.018)	(0.018)	(0.018)
N_fm					-0.022**	-0.022**	-0.015**	-0.012**	-0.012**
					(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Ch3					0.038*	0.038*	0.028	0.028	0.028
					(0.022)	(0.022)	(0.021)	(0.021)	(0.021)
Ch7					0.015	0.015	0.012	0.016	0.016
					(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Ch17					-0.030**	-0.030**	-0.016	-0.016	-0.016
					(0.016)	(0.016)	(0.015)	(0.016)	(0.016)
lnWExperienc							0.080	0.084	0.083**
							(0.010)	(0.010)	(0.010)
Employ_Type							-0.088	-0.086	-0.086**
							(0.011)	(0.012)	(0.012)
Region_j	N	N	N	N	N	N	Y	Y	Y
Ind_k	N	N	N	N	N	N	Y	Y	Y
Occ_h	N	N	N	N	N	N	Y	Y	Y
Union_firm_n	N	N	N	N	N	N	Y	Y	Y
Constant	-1.136**	-1.139**	-1.228**	-1.228**	-2.356**	-2.356**	-2.546**	-2.614**	-2.615**
	(0.024)	(0.017)	(0.020)	(0.020)	(0.100)	(0.100)	(0.113)	(0.114)	(0.114)
No of Obs	9521	9521	9521	9521	9521	9521	9060	9060	9446
No of Group		2473	2473	2473	2473	2473	2429	2429	2429
R_sq	0.175	0.221	0.169	0.312	0.312	0.312	0.454	0.454	0.441

Note: 1) 7 is the model of random effect without length of Job-Training.
2) Standard Error is in a parenthesis

IV-4. Sensitivity Analysis.

As I pointed out, previous results of estimation shows the evidence of possible correlation between Education level & job training, and marriage status & job training. Therefore without considering of those relationships, it would lead us to biased effect of job training in our analysis. In this part we will try to narrow down those issues.

Different Education levels : Secondary school vs. College graduates.

[Table 8] shows distribution of job trainees between secondary school graduates and college graduates. As we can see more college graduates attend job training in general, about 2-3% is higher in college graduates in both types of job training during years. However, secondary graduates are more likely to attend OJT rather than Public training, and this pattern is opposite

within college graduates. That is college graduates are more likely to participate in public Training.

[Table 8] Distribution of Type of Job Training among Secondary vs. College Education

	On the Job Training		Public Job Training		
	Numbers	%	Numbers	%	
Secondary Education	195	8.43	178	7.70	2312
College Education	206	9.73	267	12.61	2118

Given this information, I separate those two groups and try to get separate effects of job training from the secondary graduates and college graduates. [Table 9] shows different effect of job training between secondary school graduates and college graduates. Surprisingly general average effect of job training is higher in secondary school graduates than one of college graduates. According to [Table 9], if one who graduated secondary school and takes job training, she might have about 9% increasing of wage rate over years. However, the length of job training does not have positive effect. That is, amount of time for job training seems to have a negative effect on wage rate among secondary school graduates. About the different type of job training, secondary graduates in OJT could have 8% increase of wage rate compare to one who does not have job training at all. However one who secondary school does not have strong effect from public training. On the contrary, college graduates do not have a strong effect of job training in general. From this result, we might be conclude that even though more college graduates have participated in Jot training program during the years, the effect of job training within college graduates seems to be weak on wage rate or even ambiguous for some parts.

[Table 9] Results of Estimated of Random Effect Model
: Secondary school graduates vs. College graduates

	Secondary school graduate		College graduate	
lnWAGERATE	Coef.	Std. Err.	Coef.	Std. Err.
JT_ever	0.168**	0.030	0.157**	0.033
JT_current	0.086**	0.046	0.007	0.036
JT_priod	-0.025**	0.010	0.007	0.007
JT_OJT	0.080**	0.041	0.015	0.031
JT_PBC	-0.340*	0.201	0.035	0.059
JT_Pri* PBC	0.049	0.038	-0.007	0.010
T	0.021**	0.013	-0.019	0.015
T_sq	0.004**	0.001	0.009**	0.001

Age	0.042**	0.008	0.030**	0.013
Age_sq_2	-0.053**	0.009	-0.024*	0.017
N_fm	-0.007	0.008	-0.023**	0.008
Marriage2	-0.030	0.040	0.038	0.035
Marriage3	-0.049	0.050	-0.105*	0.092
Ch3	-0.020	0.032	0.062*	0.032
Ch7	-0.014	0.022	0.064**	0.029
Ch17	-0.017	0.021	-0.003	0.039
lnWExperience	0.091**	0.013	0.081**	0.017
Employ_Type	-0.125**	0.015	-0.058**	0.021
Region_i	Y		Y	
Ind_j	Y		Y	
Occ_k	Y		Y	
Constant	-2.402**	0.166	-2.042**	0.244
No. of Obs.	4932		2879	
No. of Groups	1318		809	

Marriage status : Married women vs. Unmarried women

[Table 10] shows the distribution of Unmarried and Married women in data set.

As we can see from [Table 10], total number of treated group in Married women is much higher than total number of treated group in unmarried women, but the percentage of trainee out of total population of Married women is lower than percentage in case of unmarried women. As I did before, I separate the wage equations for Unmarried and Married women in order to see different effects of job training.

[Table 10] Distribution of Unmarried & Married Women in the wage equation

	Unmarried		Married	
	Numbers	%	Numbers	%
Treated	898	31.7	1234	22.0
Controlled	1939	68.3	4376	78.0
Total Obs[1)].	2837	100.0	5610	100.0

Note: 1) Total Observation in the wage equation model. (Observation that restricted with having wage information)

[Table 11] shows the result of estimation. Both of Married & Unmarried women do not have significant effect of job training on wage rate. However, married women have strong effect of OJT on wage rate. For both of unmarried and married women the public job training do not have strong effect on wage rate at all. Surprisingly having child doesn't matter in wage rate for married women. Only number of family members has negatively related in wage rate.

[Table 11] Results of Random Effect Model: Different Marriage Status

	Unmarried		Married			
lnWAGERATE	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
JT_ever	0.102**	0.030	0.177**	0.033	0.176**	0.033
JT_currenet	0.018	0.045	0.001	0.037	0.003	0.037
JT_priod	-0.012**	0.008	0.014**	0.007	0.014**	0.007
JT_pri*PBC	0.005	0.014	0.002	0.014	0.002	0.014
JT_OJT	0.049	0.040	0.063**	0.033	0.063**	0.033
JT_PBC	-0.031	0.081	-0.013	0.079	-0.015	0.079
T	-0.012	0.015	0.008	0.012	0.007	0.012
T_sq	0.008**	0.002	0.005**	0.001	0.005**	0.001
Age	0.066**	0.015	0.051**	0.008	0.056**	0.009
Age_sq/100	-0.074**	0.024	-0.061**	0.009	-0.067**	0.010
Edu_sec	-0.235	0.255	0.032	0.032	0.033	0.032
Edu_coll	-0.114	0.256	0.332**	0.045	0.331**	0.045
Edu_upcol	0.213	0.261	0.615**	0.076	0.612**	0.076
lnWExperience	0.037**	0.016	0.089**	0.013	0.089**	0.013
Employ_Type	-0.060**	0.021	-0.099**	0.015	-0.100**	0.015
N_fm					-0.011**	0.009
Ch3					0.006	0.024
Ch7					0.019	0.018
Ch17					-0.010	0.019
Region_i	Y		Y		Y	
Ind_j	Y		Y		Y	
Occ_k	Y		Y		Y	
Constant	-2.080**	0.332	-2.837**	0.191	-2.899**	0.200
No. of Obs.	2837		5610		5610	
No. of Groups	848		1563		1563	
R_sq	0.391		0.493		0.494	

V. Conclusive Remarks & Future works

Theoretical considerations of job training have been suggesting enough reasons why job training is important in labor market. It would be more crucial for female, because female used to be in weaker position in labor market and job training of female would be one of the implements compromise or moderate labor market that tend to be in favor of male. In order to support this proposition, it would be the first step where providing accurate measure of effect of current job training.

In this paper I estimated job training effect of Korean female, using modified Random Effect model with 8 years of panel data. Implementing of LM test for panel data, I could be sure

that using panel data is a quite proper way to analyze the effect of job training of female labor in Korea. In fact, it is well known that using Fixed Effect model would provide more robust result with panel data analysis. However, given nature of data set that I have, it does not allow us to use FE with other covariates. Thus I use Random Effect model rather than Fixed Effect model through entire analysis. Even if we use RE model, I control the difference of wage rate between two groups regardless of nature of job training in RE model. And from this I could modify RE model in a better way.

Through Random Effect model with various specifications I found several important facts. The first, Job training of Korean female has a positive and statistically significant effect on wage rate. In other words, having job training could increase female wage rate about 4.2% per year comparing to female who didn't attend the job training. The second, job training that conducted in work place (OJT) seems to have a strong effect on female wage rate. On the contrary, public job training does not seem to work very well. Third, job training also improves female labor force attachment. That is, job training help female to get into labor market at average 62% higher probability per year. However, again public job training does not have much effect on improving labor force attachment of female. Fourth, long-term of job trainings do not increase female wage rate. Adding interaction term with Public job training gives us reasonable explanations of this fact. In other words, long-term job training committed with public job training programs, therefore it does brings a negative signal of quality of female labor in the labor market rather than showing increasing skills that market expects female labor to have.

With suspect of correlation of job training program with education and marriage status, I separated the wage equations for different groups. In doing so, I found several interesting facts. The first, even if more college graduate participated in job training program, their effect on wage rate is smaller than one from secondary school graduates. Here we could argue that the reason would be related with the type of job training they choose to take. That is, college graduates likely to decided public program but secondary school graduates likely take OJT program. And the distribution of job trainee between secondary school graduates and college graduates support this argument quite sufficiently. About the marriage status, effect of job training within married women is weaker than one within unmarried women. Both of married and unmarried women do not have a strong effect of the general job training. But only married women has positive effect of OJT case on wage rate. On the other hands, raising different aged child does not matter in wage rate of married women in our analysis.

Even I separated the group effects from true effect of job training in the model specifications, it is true that I was not able to discuss about selection process deeply in this paper.

Furthermore, having strong assumption of RE model might drive us to biased results. Therefore it is necessary to check possible selection biases in the model. And if it does have one, then I need to find the way for eliminating selection problems. In additional, even I have nice advantage to have dynamic analysis with using panel data set, we couldn't investigate dynamic effect of job training in this paper. With dynamic analysis, I could find the change in slope of wage rate in different years, in doing so I could come up with the dynamic process of job training program. Even though I couldn't do much about those two works here, it should be done in future works to be complete this analysis.

Reference

Ashenfelter, Orley, (1978) Estimating the Effect of Training Programs on Earnings, *The Review of Economics and Statistics*, Vol.60.

Alkire, Sabina, (2002), Valuing Freedom: Sen's Capability Approach and Poverty Reduction, *Oxford University Press.*

Barron, John M., Berger Mark C.,Black, Dan A.,(1997), How Well Do We Measure Training?, *Journal of Labor Economics* Vol.15, No. 3

Bayard, Kimberly, Hellerstein, Juith, Neumark, David, and Troske, Kenneth, (2003), New Evidence on Sex Segregation and Sex Differences in Wages from Matched Employee-Employer Data, *Journal of Labor Economics*, Vol. 21

Bloom, Howard S. (1984), Estimating the Effect of Job-Training Programs, Using Longitudinal Data: Ashenfelter's Findings Reconsidered, *The Journal of Human Resources*, Vol.19

Constantine, Jill M. and Neumark, David, (1994), Training and the Growth of Wage Inequality, NBER Working Paper Series No. 4729

Dehejia, R. H., and S. Wahba, (1999), "Causal Effects in Non-Experimental Studies: Evaluating the Evaluation of Training Programs," *Journal of the American Statistical Association* Vol. 94

Heckman, James J., Ichimura, Hidehiko, Smith, Jeffery, and Todd, Petra, (1996), Source of Selection Bias in Evaluating Social Programs:An Interprtation of Conventional Measures and Evidence on the Effectiveness of Matching as a Program Evaluation Method, *Proceeding of the National Academy of Sceineces of the United States of America*, Vol. 93, No.23.

Hsiao, Cheng, Analysis of Panel Data, (2003)

Kang, S.H. and Roh, H.S.,(2001), Job-training Effect on Employment and Wage, *Labor Economics Theory*, Vol. 23, No.2

_____ and Lee, Byung-Hee, (2000), Evaluating the Training for the Unemployed in Korea, International Conference on Economic Crisis and labor Market Reform: The Case of Korea, *KLI and World Bank.*

Kim, An-Kuk. (2002), Economic effect of Job-training: on the wage workers, *Labor Economics Theory*, Vol. 25, No.1

Kim, CH., Young Nah and Sang Lee, (2006), "The Proposal for Reducing the Gender Gap of Job Training", *Working Paper series* in KRIVET.

Kim, Yoo-Sun, (2004), Analysis of determinant for Employment of informal jobs: with KLIPS, *Economy and Society*, Vol.61

Korean Labor Institute, 1998-2005, Korean Labor & Income Panel Study, Each Year.

Korenman, Sanders and Neumark, David, (1991), Does Marriage Really Make Men More Productive?, *The Journal of Human Resources*, Vol. 26.

Kuklys, Wiebke and Robeyns Ingrid, (2004), Sen's Capability Approach to Welfare Eocnomics, *Cambridge Working Papers* (CWPE) 0415.

Lalonde, Robert J., (1986), Evaluating the Eonometric Evaluation of Training Programs with Experimental Data, *American Economic Review*, Vol. 76

Lechner, Michael, (1999), Earnings and Employment Effects of Continuous Off-the-Job Training in East Germany after Unification, *Journal of Business & Economic Statistics*, Vol.17, No. 1

Lee, Sang-jun and Lee, Myung-jae, (2005), Analysis of job-training effects on Korean women, *Journal of Applied Econometircs*, Vol.20.

Lee, Suk-Won, (2003), Evaluation of job-training effect on the unemployed by Propensity Score Matching Method, *The Korea Administrative Gazette*, Vol. 37, No 3

Lee, Sang-Ho, (2005), Opportunity of Job-training and Effect on labor market, *Research of Panel*, Vol 61, Korea Labor Institute.

Loewenstein, Mark A. and Spletzer, James R., (1999), General and Specific Training: Evidence and Implications, *Journal of Human Resources* Vol.34. No.4.

Lynch, Lisa M. (1991), The Role of Off-the Job vs. On-the-Job Training for the Mobility of Women Workers, *The American Economic Review*, Vol. 81

Neumark, David and Wascher, William, (1992), Employment Effects of Minimum and Subminimum Wages:Panel Data on State Minimum Wage Laws, *Industrial and Labor Relations Review*, Vol. 46.

Rosenbaum, P. R., and D. B. Rubin (1983), " the Central Role of the Propensity Score in Observational Studies for Causal Effects," *Biometrika* 70.

Sen, Amartya, (1999), Development as Freedom, Random House, Inc., New York.

_____, (1985), Commodities and Capabilities, Oxford University.

_____, (1997), Choice, Welfare and Measurement, Harvard University Press.

Wooldridge, Jeffery M.,(2005), Fixed-effects and Related Estimators for Correlated Random-Coefficient and Treatment-Effect Panel Data Models, *Review of Economics and Stati*stics, Vol.87.

_____, (1995), Selection corrections for panel data models under conditional mean independence assumptions, *Journal of Econometrics 68*.

_____, (2002), Econometric Analysis of Cross section and Panel Data, The MIT Press.