What is the effect of on-the-job training on employment duration for mothers?

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Abstract:

This paper examines the determinants of employment duration of mothers with on-the-job training (OJT) by using the National Longitudinal Survey (NLS) of Mature Women. To overcome the problem associated with the censored data, the duration model is applied to estimate the effect of the OJT. After controlling personal characteristics and types of industry, the interaction effects between the OJT and motherhood were not found to be significant determinants of job stability. A possible explanation is that the job market discrimination also influences the type of training and the probability for obtaining the training; therefore, the effect of the OJT on the employment duration of mothers vanishes.

Introduction:

In the context of a economist's concern with the different processes of investment in manpower, on-the-job training (OJT) has a significant contribution on the stock of skill and experience. While unlike other human capital investment, OJT does not only raise wages after the training but also increases the job stability. As Gary Becker (1964, 1975) suggests, OJT can be classified into general OJT and specific OJT depending on whether or not the training is portable from employer to employer. For both types of OJT, a employer faces the risk that the employee leaves after training since there is

an opportunity cost for general training and a real training cost for specific training. As a result, all types of OJT increase the job stability for the workers after training. For employee, the decision to stay in the current job depends on wages, his or her own life planning and interest, lifetime wage path and job stability. OJT also has a beneficial effect on the lifetime wage path because it signals the individual's ability. It is possible that the employee tends to leave the employer after training because of the higher lifetime wage path provided by other employers. Indeed, although Lynch(1990) argues that the OJT in the United States seems to be highly firm specific, Gritz (1993) shows that OJT causes high turnover rate for males but not for females. It appears that the effect of OJT is diverse between different groups. For the groups facing discrimination in the job market, workers tend to stay in the current job after training and care more about job stability than their lifetime wage path. Therefore, the OJT seems to have a negative effect on the probability of leaving an employer for these groups. On the other hand, the effect of OJT could be insignificant for the groups of workers "favored" by the job market because of the better opportunities after training.

The purpose of this paper is to examine the determinants of job stability with on-the-job training and the motherhood. The hypothesis is that all types of OJT should have positive effect on the duration of employment for the group faces discrimination in the labor market. Most of empirical

literatures show the motherhood wage gap and suggest that there is motherhood discrimination. However, it is possible that the effect of the OJT can be insignificant if the trainings they obtained are non-professional or non-technical. It is also possible that only the mothers with the characteristics "favored" by the labor market obtained training. These characteristics may be "white", "good-looking" or "highly educated". In this paper, I want to test the hypothesis. If the effect of OJT is positive and significant on the job stability of mothers, there is no motherhood discrimination on the OJT. While if the effect is insignificant then perhaps the discrimination not only exists in the labor market but also affects the opportunity for obtaining OJT. I also include different industry categories into the model and show the variance of job duration across industries. This paper is organized as follows. Section 2 is the literature review. In section 3, I describe the econometrical model. The data together with a descriptive statistic are introduced in section 4. Section 5 is the regression results. The last section is the conclusion.

Literature review:

Many empirical studies have proven that mothers care about the benefits from jobs rather than wage or possible life wage path. Nielsen *et al.* (2004) examine the motherhood wage gap in Sweden of private sector and public sector jobs to capture the effect of family-friendly policies and the

lower pay rate in public sector jobs. The result shows that public sector workers have lower motherhood wage gap, which suggests that mothers care more about non-wage benefits when they choose jobs. Todd (2001) also find that motherhood wage gap narrows when taking nonwage benefits such as health insurance into account. Based on this point, mothers tend to stay in current jobs after training because of the job stability even when higher wages or larger possible growth of wage is available in other employment.

On the other hand, the employment stability is affected by not only worker's characteristics but also the difference between industries and other forces such as the power of labor unions. Jacoby and Sharm (1992) focus on the employment duration for different industries during the decades after WWI and show that the job duration varies across industries. Indeed, different industries face different labor supply, labor regulations and training costs. When studying the effect of OJT, the types of industries need be taken into account. Grossberg and Sicilian (2004) study on the legal minimum wage and employment duration by using the National Longitudinal Survey of Youth (NLSY). In their paper, there is strong evidence indicating that a significant and positive relationship between the legal minimum wage and drop in job turnover rate for males but it is insignificant for females. The possible explanation is that a new job tends to have less stability for females and therefore the effect of relative wage has smaller effect on the turnover rate.

Gritz (1993) studies the effect of OJT on the job duration and shows that private training program improves the employment duration of women. Also, Lynch (1991) compares the effect of on-the-job training and off-the-job training on the employment duration of the first job after graduated. The results using NLSY for both male and female and indicate that the job duration is shorter for African Americans and workers with less education and is longer for the workers obtained OJT. In this study, he also includes the number of children as the independent variable but the coefficient is insignificant. Felmlee (1982) uses the dataset from the NLS of Young Women and shows that the rate of voluntary job shifts with different employers decreases as the numbers of children above six years old increases but the result still insignificant. Lillard and Tan (1986) use the dataset from NLS of labor market experience (Young Men, Mature Men and Women) and show that NLS career women tend to receive the training that is neither professional nor technical training. Using the data from NLS Mature Women's Cohort, Hill (1995) investigates how the post-school-age training affects the women's wages and labor force participation. He shows that groups such as single women, white women and highly educated women "favored" by job market have higher probability to obtain OJT. Combined with Lillard and Tan(1986), if the most of the trainings are general and only favored groups getting the training, the effect of OJT on employment duration might be insignificant by using the NLS of Mature Women.

Empirical Models:

In the relatively few empirical studies that have attempted to examine the role of training and the probability of leaving an employer, most of them use the dataset from NLS, which has rich information about training, the general state of demand, and other personal characteristics in determining turnover. However, just like any other surveys, limited resource makes it impossible to track every individual from the beginning to the end of employment. If the individual's employment duration is longer than the survey period, that value is censored by the duration of survey so that the estimator is biased in the Least Square. To solve this problem, I apply the technique of hazard rate and duration model in this study. In this model, I assume that the employment duration is a non-negative random variable, which follows the Weibull distribution. The cumulative distribution function is denoted by F(t), then the survival function can be wrote as follows:

$$S(t) = 1 - F(t)$$

where S(t) is the probability of staying in the current job in next interview. The probability of leaving an employer is the failure rate or the hazard rate. It can be expressed as:

$$\lambda(t|\theta) = \lim_{\Delta \to 0} \frac{P(t < T < t + \Delta | T > t, \theta)}{\Delta}$$

$$= \lim_{\Delta \to 0} \frac{\frac{1}{\Delta} P[(t < T < t + \Delta) \cap (T > t, \theta)]}{P(T > t)}$$
$$= \lim_{\Delta \to 0} \frac{\frac{1}{\Delta} P(t < T < t + \Delta)}{S(t)}$$
$$= \frac{f(t)}{S(t)}$$

where Δ is the duration of survey, T denotes the time it takes to leave an employer. θ_s are the demographic characteristics that affect the employment duration. The probability of leaving a job is determined both by the supply the demand side in the labor market. Since Jacoby and Sharm (1992) indicate employment duration varies across industry, I use the four-digit SIC to capture the effect from the demand side of the labor market. For determining the supply of labor, I include personal characteristics such as age, marital status, education, race, children under one year old, experience about OJT and the interacted term of OJT and motherhood. The group "favored" by the labor market should have higher probability of leaving an employer and the group that is discriminated should have longer employment duration. The parameters can be obtained by maximizing the log-likelihood model:

$$\ell(\theta) = \log\left(\prod_{i=1}^{n} L_i(\theta)\right) = \sum_{i=1}^{n} d_i \cdot \log f(t_i, \theta) + \sum_{i=1}^{n} (1 - d_i) \cdot \log S(t_i, \theta)$$
$$= \sum_{i=1}^{n} d_i \cdot \log \lambda(t_i, \theta) + \sum_{i=1}^{n} \log S(t_i, \theta)$$
$$= \sum_{i=1}^{n} d_i \cdot \log \lambda(t_i, \theta) + \sum_{i=1}^{n} \Lambda(t_i, \theta)$$

The model gives us the effect of the characteristics in 1967 on the employment duration. Some of the factors such as industry and race are time-invariant, but others tend to be time variant. Therefore, for the motherhood and OJT, I also use the information after 1967.

The Data:

The NLS of mature women is a survey of 5038 females who are 30 to 45 years of age in 1967. The respondents have been interviewed on all the aspects of their labor market experience in the survey period from 1967 to 2003. The data also has comprehensive information on the types of training received other than government training and schooling. These trainings include company training and training obtained from an institution outside the firm. Since this paper focuses on the effect of OJT, I use the experience of company training to measure the OJT. To identify the respondents who have been obtained OJT, I use the survey question "Do you use the training program from you current job? " in each interview. Since I do not have the information about the OJT before 1967, I use only the OJT experience in 1967 and after 1967 to be the proxy. Table 1 is the descriptive statistics.

In the dataset, 40 percent of females are high school dropouts and 10 percent of observations are college graduates. Most of the respondents are white females and black are about only 27 percent of all observations. There are about 21 percent of respondents working in manufacturing, 20 percent in

professional sectors, 21 percent in wholesale, and only 6 percent in finance and business industry. Abstractly, most of the respondents are married and have children. The table also shows that 21 percent of observations have children younger than one year old. About 15 percent of the females obtained OJT in 1967 and the percentage increases to 21 percent if we account for OJT in all the survey periods.

Table1

	Percentage
Dropout	40%
College	10%
Black	27%
Finance	6%
Manufacturing	21%
Profession	20%
Wholesale	21%
Married	81%
Infant	21%
Mother	93%
OJT1967	15%
OJT	21%
Observations	5083

Table 2 shows the employment duration for mother and those who have gone through OJT. The average duration for mothers is about 20 years, and it is longer for the observations without any children. If the respondents received OJT in 1967, the average employment duration is longer than those who have no OJT experience in 1967.

Table 2

	Mean (year)	Variance
Mother	20.4	12.1
Non-Mather	22.9	12.4
OJT1967	20.9	11.6
No OJT1967	19.7	12.6
OJT	20.3	11.7
No OJT	19.7	12.7
Total duration	19.8	12.5
Observations	5083	

The results in table 2 are consistent with the theory that OJT has a positive effect on the job stability and the group discriminated by the labor market has less stability in terms of employment. However, Table 2 does not show that whether OJT helps mothers in employment duration. To test the hypotheses, I use the duration model and control for other variable in next section.

Result:

The results obtained from estimating the maximum log-likelihood function mentioned before are presented in Table 3. The first column shows that if the female is less educated then the probability of leaving an employer is higher than highly educated woman. The coefficient of college graduate is negative and insignificant, which is consistent with Lynch's (1991) results. As with blacks, disabled respondents are more likely to leave their employer

since this group is discriminated by the labor market. The positive effect of the logarithm of hourly wage shows that high-income women also have lower employment duration, which is contrary to the theory. However, the effect is insignificant and it is possible that high wages is given because of the compensation of job instability. The results also indicate that the higher the husband's income is, the higher probability of leaving an employer. Indeed, the theory of labor economics suggests that the reservation wage increases as the non-labor income increases. Also, the division of labor is more efficient if the high-income husband works in the labor maker and the wife focuses on home production. It can also explain the positive effect of marriage on the probability of leaving an employer. Once the respondent is married, the opportunity cost of having a job could be higher and she would tend to quit a job and put her labor force in housework. The coefficient of age is also positive and significant, which suggests that if the respondent is older in 1967 then her employment duration is shorter. Since the dataset contains only mature women whose age was between 30 to 45 years old, the older women are more likely to retire before younger respondents. Motherhood seems to have negative effect on the probability of leaving an employer. Just as other empirical literatures suggest (Nielsen *et al*, 2004), mothers care more about the stability of the jobs so that they tend to have longer employment duration but lower wages. The infant is a dummy variable equaling to 1 if the respondent has children less than one year old. The result shows that it has

similar effect as motherhood on the probability of leaving an employer but the effect is insignificant. The coefficient of OJT1967 shows that if the respondent obtained company training during 1967 then she is less likely to leave the employer. The result is consistent to most empirical studies (Lynch's, 1991) (Gritz, 1993), which shows that OJT has a positive effect on the employment duration.

In the second model, I include the interaction term of OJT and motherhood. The results are in the second column. It shows that the magnitudes of coefficients are almost the same, and the sign of the interaction term is positive but not significant. This result is contrary to the hypothesis that OJT increases the employment duration for mothers. The possible explanation could be that if the OJT obtained by mothers is normal and not professional, the cost of the OJT is low and it cannot influence the duration of the jobs. Indeed, Lillard and Tan (1986) show that most of company training received by mature women in the NLS is non-technical training. Also, Hill (1995) suggests that the groups favored by the labor market are more likely to obtain OJT. Combined with these arguments, the positive effect of OJT can vanish if the receiver is discriminated by the labor market. The other possible explanation is that without controlling for the types of industries, the coefficients are biased because women are more likely to work in business and finance that provides less technical training than other industries. Therefore, I include the dummy variables for the four

industries: Finance and Business, Manufacturing, Professional, and Wholesale. The results are shown in the third column.

Almost all of the coefficients are the same as in the first and second model. The finance and business jobs tend to have longer employment duration as does wholesale. The probability of leaving an employer varies between manufacturing and professional jobs but the difference is not significant. Still, the interaction term remains positive and insignificant after controlling the difference in industries. If the women tend to receive less professional training or only the respondents that favored by the labor market received training in all industries, then the effect of OJT on the employment duration of mothers can be the same even after accounting for the difference between industries.

Since the OJT1967 only shows the effect of the training that was in 1967, I replace it by the OJT dummy that equals to 1 if the respondents have ever obtained any company training at all during the entire survey period. The results are represented in the last column. It shows that the coefficients are not different to those in the previous models and suggests that the effect of OJT still vanish in the job stability of mothers.

Table 3

	(1)	(2)	(3)	(4)
Intercept	2.17***	2.18***	2.24***	2.24***
	(0.12)	(0.12)	(0.13)	(0.13)
Dropout	0.01	0.01	0.01	0.00
	(0.03)	(0.03)	(0.03)	(0.03)
College	-0.05	-0.05	-0.08	-0.07
	(0.05)	(0.05)	(0.05)	(0.05)
Black	0.10***	0.10***	0.09***	0.09***
	(0.03)	(0.03)	(0.03)	(0.03)
Wage	0.14	0.14	0.12	0.11
	(0.18)	(0.18)	(0.18)	(0.18)
Husband's income	0.07***	0.07***	0.07***	0.07***
	(0.01)	(0.01)	(0.01)	(0.01)
Age	0.02***	0.02***	0.02***	0.02***
	(0.00)	(0.00)	(0.00)	(0.00)
Finance	.	.	-0.11*	-0.11*
	.	.	(0.06)	(0.06)
Manufacturing	.	.	-0.02	-0.01
	.	.	(0.04)	(0.04)
Profession	.	.	0.01	0.01
	.	.	(0.04)	(0.04)
Wholesale	.	.	-0.10***	-0.10**
	.	.	(0.04)	(0.04)
Married	0.08**	0.08**	0.08**	0.08**
	(0.03)	(0.03)	(0.03)	(0.03)
Infant	-0.05	-0.05	-0.05	-0.05
	(0.03)	(0.03)	(0.03)	(0.03)
Mother	-0.17***	-0.19***	-0.2***	-0.2***
	(0.04)	(0.05)	(0.05)	(0.05)
OJT1967	-0.09**	-0.16*	-0.17*	.
	(0.04)	(0.10)	(0.10)	.
Mother*OJT1967	.	0.09	0.10	.
	.	(0.10)	(0.10)	.
OJT	.	.	.	-0.14
	.	.	.	(0.09)
Mother*OJT	.	.	.	0.06
	.	.	.	(0.09)
Scale	0.58	0.58	0.57	0.57
	(0.01)	(0.01)	(0.01)	(0.01)
Weibull	1.74	1.74	1.74	1.74
	(0.03)	(0.03)	(0.03)	(0.03)
Observations	5083	5083	5083	5083

*** 1% significant, **5% significant, *10% significant

Conclusion:

As a critical source of human capital accumulation, the OJT has been proven to have a beneficial effect on the wages and job stability by the previous empirical studies. While the effect on the employment duration can be influenced by the existence of discrimination toward certain groups since the job duration depends not only on the supply but also the demand side of the labor market. Furthermore, the job market discrimination affects the probability of obtaining OJT as Hill (1995) argues. In this paper, the result is consistent with Hill's and Lillard and Tan's finding, which shows that the positive effect of OJT on the job stability of mothers vanishes even after controlling other personal characteristics and the difference between industries. Since some of the characteristics such as beauty are "favored" by the labor market and hard to measure, it is possible that these unobserved factors go into the effect of the OJT if these characteristics also determine the chance of receiving the training.

To further verify this conclusion, the future research can use the NLS of Young Women to examine whether OJT obtained by young women tend to be non-professional training and whether the effect of OJT also vanish for the job stability of mothers. By comparing the results to this study, the study of the influence of job market discrimination on the effect of employment duration can be more complete.

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