The Incidence and Effect of Job Training among Japanese Women

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Using panel data of Japanese women, this paper analyzes who participates in firm-initiated training programs and the effect of this participation on wage level and wage growth. The analysis found that workers with stronger educational backgrounds are more likely to participate in firm-initiated training activities. Training participation and wage are positively correlated. Even after controlling for endogenous selection into training participation by a first-difference estimation, current training participation significantly explains current wage growth.

Introduction

The human capital theory presumes that human capital is accumulated through formal schooling or on-the-job training. According to this theory, workers with more years of education or a longer on-the-job training period accumulate more human capital and earn higher wages accordingly. Labor economists have argued that on-the-job training is more common and intense in Japan than in the United States, and this is the reason why Japanese workers' wage-experience profiles are steeper than those of U.S. workers. In addition, Germany and Japan are typically known to have

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economies with high labor market friction[1] and this fact implies that firm-sponsored training widely prevails in those economies.

Despite the international interest in Japanese workers' training, the direct empirical examination of training participation and its effect on wage is scarce mainly due to data limitations. Two recent, exceptional works directly examined the determinants of training participation and its effect on wage. Kurosawa (2001) surveyed firms in Kitakyushu city and found that more educated and unionized workers are more likely to participate in training. She also found that informal training increases subsequent wage growth, but neither formal classroom, off-the-job training, nor self-development activity boosts wage growth. Okui (2002) analyzed self-development activity using the same data set as the present study: the Japan Panel Survey of Consumers (JPSC). She found that workers with strong educational backgrounds are no more likely to participate in self-development activities than their less-educated counterparts. She found that participation in correspondence study programs increases the workers' wage level.

The purpose of this paper is to examine the determinants of workers' participation in firm-initiated training and the effect of training participation on wages, using national, representative, panel data of Japanese women. The data contain information on training participation, labor market outcomes, and demographic characteristics. First, I examined which workers are likely to participate in firm-sponsored training. Second, I examined whether participation in firm-sponsored training increases workers' wages. This paper's contribution relative to that of previous studies on the Japanese labor market is mainly due to the better data used in this study. Newly developed panel data enabled me to directly examine the relationship between training participation and wage, which was impossible in earlier studies because the previous data did not record workers' training participation. Moreover, I can work around a possible bias due to self-selection into training participation by exploiting the data's panel feature. The analysis sample is limited to women due to data limitations. At first glance, this may seem to be a critical limitation because so-called Japanese employment practices, characterized by long-term employment relationships and continuous on-the-job training, are said to be a male phenomena; however, Ogawa and Clark (1995) report that women's tenure earnings profiles are steeper than men's. Thus it is still worth investigating the source of wage growth over job tenure among women.

[1] Hart and Kawasaki (1999) found that the median enterprise tenure in Japan was 10.1 years, whereas the median was 9.5 in Germany and 3.5 in the United States, based on 1990 Organisation for Economic Cooperation and Development (OECD) statistics. They also calculated that the recruitment cost per worker was 10.46 percent of the annual earnings of a new worker in Japan in 1991.

By estimating the probit model of firm-sponsored training participation, I found that educated, full-time workers are more likely to participate in firm-sponsored training, and those who participate in the training tend to do so repeatedly over the years. In addition, ordinary least squares (OLS) estimates indicate a positive impact of firm-sponsored-training participation on wage. First-difference estimates that allow for self-selection into training participation based on unobserved characteristics indicate a smaller impact of training on wage. However, once an appropriate lagged effect of training participation on wage growth is incorporated, current training participation increases current wage growth.

The rest of this paper is organized as follows. The Data section describes the data used in this study. The Incidence of Training section lays out the empirical model for training participation and introduces the estimation results. The Effect of Training Participation on Wage section explains the empirical model to examine the causal effect of training participation on wage and reports the estimation results. The last section concludes.

Data

This study uses the JPSC collected by the Institute of Household Economics (*Kakei Keizai Kenkyusho*). The survey is based on a national representative sample of women who were between the ages of 25 and 35 in 1993, the year in which the survey began.[2] The survey included 1,500 women at the beginning, and 500 women were added in 1997, implemented in October of every year. Beginning in 1994, the survey included questions on training participation in a consistent way; thus I used the survey for five years between 1994 and 1998. For those women who work, question 14 in section 3 of the JPSC asked, "Did your company send you to a workshop, training session, or somewhere else to acquire knowledge or skill in the past year?"[3] Using those working individuals between 1994 and 1998 as the analysis sample, I analyzed who participated in workplace training.

To evaluate the effect of firm-initiated training activity on earnings, I used hourly rate of pay for all workers. question 6 in section 3 asked, "About how much do you earn from this job (pre-tax salary including overtime payment but excluding bonus payment)?" for monthly and weekly paid workers. The same

[2] Information on the respondents' family members also was collected, but this did not include training participation.

[3] For those answering "yes" to this question, the survey also asked how many days the worker participated, who organized the workshop, whether it took place during work hours, whether it was useful, and whether the worker wanted to participate in the workshop again.

question asked, "How much is the daily rate of pay?" for daily paid workers, and "How much is the hourly rate of pay?" for hourly paid workers. For the weekly hours of work, I used section 15, which asks for (i) daily time allocation that includes hours of work for weekdays and holidays and (ii) the number of holidays in a week. I assumed that there are 4.33 (= 52/12) weeks per month and I imputed an hourly rate of pay from this information for monthly paid workers. For daily paid workers, the daily rate of pay was divided by the hours of work during weekdays to obtain the hourly rate of pay.

Table 1 presents the descriptive statistics. Panel A column 1 presents statistics of the full 3,109 working sample between 1994 and 1998. Column 2 covers the subsample of 2,109 workers who did not participate in the firm-initiated training in the last year of the survey. Column 3 presents the statistics for 1,000 firm-initiated training participants. Because the data are panel data, the same individual may appear in the sample more than once. A comparison of columns 2 and 3 reveals that firm-initiated training participants were more educated and had longer firm tenure. Among workers who participated in training in the last year, the average number of times they had participated since 1994 is 2.146, while this number for the nonparticipants is 0.270. These numbers imply that training participants repeatedly take part in the training over the years. Panel B includes observations for whom the hourly rate of pay is available. A comparison of columns 2 and 3 reveals that firm-initiated training participants earned about 25 percent (= 100 × (1245 – 990)/990) more than nonparticipants.

Incidence of Training

The first analysis examines the characteristics of the workers who were sent to formal training, using working women as the analysis sample. Let T be the dummy variable that takes 1 if the worker is sent to a workshop, training session, or somewhere else by her company to acquire knowledge or skills to implement her job. The conditional expectation of T is assumed to be as follows:

$$E(T \mid x) = P(T \mid x) = \Phi(x\beta), \tag{1}$$

where x is the worker's attributes, including the worker's marital status, how many children she has, her educational background, her age and its square, and the dummy variable indicating whether the person is a full-time worker.

Table 2 reports the results of the estimation. The results in column 1 show that female workers with higher education were more likely to be sent to workshops, training sessions, or similar courses by their firms. Compared

TABLE 1

DESCRIPTIVE STATISTICS; SAMPLE: 1994–1998

Participation in employer-initiated training	(1) Total	SD	(2) Nonparticipants	SD	(3) Participants	SD
Panel A: Working Sample						
High school graduate	0.429	—	0.495	—	0.291	—
Vo. tech. college (*Senmon Gakko*)	0.204	—	0.196	—	0.221	—
Junior or tech. college (*Kosen*)	0.201	—	0.177	—	0.251	—
Four-year college	0.145	—	0.108	—	0.223	—
Graduate school	0.003	—	<0.000	—	0.007	—
Miscellaneous schools	0.005	—	0.006	—	0.003	—
Age	31.677	3.698	31.747	3.649	31.530	3.798
Experience	9.744	4.074	9.650	4.047	9.944	4.124
Experience missing	0.002	—	0.002	—	0	—
Tenure	4.384	4.684	3.763	4.459	5.693	4.895
Tenure missing	0.230	—	0.279	—	0.125	—
Married	0.578	—	0.590	—	0.552	—
Number of children	1.009	1.107	1.046	1.104	0.931	1.110
Full-time employment	0.589	—	0.491	—	0.797	—
Cumulative number of training participation	0.873	1.239	0.270	0.638	2.146	1.235
No. of Observations	3109		2109		1000	
Panel B: wage information available						
Hourly wage (yen)	1071	1457	990	462	1245	2489
No. of observations	2952		2015		937	

with high school graduates, four-year college graduates were about 25 percentage points (t = 5.75), junior or technical college graduates (*Tandai* or *Kosen*) were about 20 percentage points (t = 4.95), and vocational technical college (*Senmon*) graduates were about 13 percentage points (t = 3.21) more likely to be sent to training programs than those with no higher education. The differences in the propensity for training participation are very precisely estimated. The result that workers with stronger educational backgrounds are more likely to participate in training is consistent with previous findings by Kurosawa (2001). The worker's marital status and the number of children did not affect training participation, although it is often pointed out that household responsibilities hamper women's career advancement. This may be because those who work, regardless of household responsibilities, have a high, unobserved ability in market work, and as a result, the error term of the training participation equation and the marital status or the number of children are positively correlated after the sample is restricted to working people.

TABLE 2

PARTICIPATION IN EMPLOYER-INITIATED TRAINING PROGRAMS; SAMPLE: 1994–1998

	(1)	(2)	(3)	(4)
Dependent variable	Training incidence	log(wage)	Δlog(wage)	Δlog(wage)
Model	Probit	OLS	First difference	First difference
Training participation (Accumulated)	—	0.030	—	—
		(0.009)		
Training participation (between t and $t-1$)	—	—	0.018	0.046
			(0.012)	(0.018)
Training participation (between $t-1$ and $t-2$)	—	—	—	−0.024
				(0.019)
Junior high	−0.110	−0.074	—	—
	(0.092)	(0.052)		
Vo. tech. college (*Senmon*)	0.125	0.099	—	—
	(0.039)	(0.029)		
Junior/tech. college (*Tandai, Kosen*)	0.203	0.147	—	—
	(0.041)	(0.025)		
Four-year college	0.253	0.271	—	—
	(0.044)	(0.032)		
Graduate school	0.553	0.415	—	—
	(0.127)	(0.037)		
Misccellaneous school	−0.051	−0.090	—	—
	(0.084)	(0.310)		
Age	–0.039	−0.001	0.026	0.000
	(0.051)	(0.010)	(0.082)	(0.000)
Age^2	0.001	0.000	−0.001	−0.003
	(0.001)	(0.000)	(0.001)	(0.001)
Experience	—	0.127	0.018	0.026
		(0.038)	(0.054)	(0.059)
Emperience^2	—	−0.002	0.001	0.002
		(0.001)	(0.001)	(0.001)
Tenure	—	0.000	0.008	0.011
		(0.007)	(0.010)	(0.012)
Tenure^2	—	0.001	−0.001	−0.001
		(0.000)	(0.001)	(0.001)
Tenure missing	—	−0.034	−0.102	−0.120
		(0.028)	(0.047)	(0.048)
Married	0.049	0.015	−0.033	−0.045
	(0.033)	(0.025)	(0.024)	(0.024)
Number of children	0.019	−0.020	0.065	0.062
	(0.017)	(0.013)	(0.032)	(0.036)
Full-time	0.271	0.015	−0.002	0.024
	(0.026)	(0.025)	(0.032)	(0.033)
Constant	—	4.644	—	—
		(0.587)		
Log likelihood/R^2	−1730.93	0.28	0.02	0.03
No. of observations	3109	2952	2425	1892

NOTE: The coefficients for the probit estimation are the marginal effects evaluated at the sample mean. Panel clustering robust standard errors are in parentheses. Standard errors for the marginal effects are calculated so that t-statistics for the probit coefficients are preserved. The entire specification includes urban/rural dummy variables and year dummy variables, but the coefficients are suppressed.

The Effect of Training Participation on Wage

The next step is to analyze the effect of training participation on workers' earnings. The effect of training participation on earnings is specified as:

$$\ln w_{it} = \gamma\left(\sum_{k=1994}^{t} T_{ik}\right) + x_{it}\beta + c_i + u_{it}, \tag{2}$$

where $\ln w_{it}$ is the log of hourly wage. The treatment variable T_{it} is the dummy variable that indicates participation in firm-initiated training that took place between years t and $t-1$. This specification allows that the past participation in training affect the current level of the log wage without the depreciation of skills accumulated through the worker's training participation. I assumed that no one participated in the training prior to 1994. The vector x_{it} contains actual work experience[4] and its square and job tenure and its square, in addition to the variables included in the training participation equation; c_i is time-constant, unobserved heterogeneity and u_{it} is the idiosyncratic error term.

The OLS estimator is consistent if $E(u_{it} \mid T_{i1994}, \ldots T_{it}, x_{it}, c_i) = 0$ and $E(c_i \mid T_{i1994}, \ldots T_{it}, x_{it}) = 0$ hold. The second assumption, in particular, is a strong assumption that precludes the correlation between unobserved heterogeneity, such as motivation or ability, and training participations. If firms send more eligible workers to trainings and if the workers' eligibility is not captured by x_{it}, those workers who are sent to training programs are more likely to have higher c_i and make $\sum_{k=1994}^{t} T_{ik}$ in (2) endogenous. To deal with this possible endogeneity, I implemented a first-difference estimation that renders a consistent estimator only under the strict exogeneity of u_{it} (i.e. $E(\mathrm{u}_{it} \mid T_i, x_i,)$ where $x_i = [x_{i1}, \ldots, x_{iT}]$). The first-difference model becomes:

$$\Delta \ln w_{it} = \gamma T_{it} + \Delta x_{it}\beta + \Delta u_{it}. \tag{3}$$

The results of the estimation of (2) and (3) using working persons with wage information as a sample appear in Table 2. Column (2) tabulates the results of the OLS estimation. The estimated result indicates that an additional, firm-initiated training increases the workers' wage by 3 percent ($t = 3.33$). Interpreting this OLS result straightforwardly, we can say that such training boosts workers' earnings.

[4] The 1993 survey asked years and months of job experience after graduating from the last school they attended. Combining this information and employment status in each year's survey, I constructed actual years and months of workers' job experience after graduating from the last school.

However, the results obtained from the first-difference estimation that is reported in column (3) draw a different picture from those drawn by the OLS estimation. Participation in firm-initiated training does not increase workers' wages, as indicated by statistically insignificant coefficients for the firm-training dummy variable in this specification. In addition to the statistical insignificance, the size of the coefficient becomes 0.018 from the OLS estimate of 0.030. The change of the estimated coefficient implies a positive correlation between the unobserved heterogeneity in earnings determination and training participation. This result suggests that employers may send eligible workers to training based on unobservable characteristics.

Before concluding that the positive training effect found in the OLS estimation is spurious, I estimated the following FD specification that includes the lagged training participation:

$$\Delta \ln w_{it} = \gamma T_{it} + \theta T_{it-1} + \Delta x_{it}\beta + \Delta u_{it}. \quad (4)$$

This specification allows for the positive impact of training participation between $t - 2$ and $t - 1$ on the wage at $t - 1$. If lagged training participation increases the lagged wage, T_{it-1} decreases $\Delta w_{it} = w_{it} - w_{it-1}$ (i.e. $\theta < 0$). Because T_{it} and T_{it-1} are serially correlated due to repeated participation in the training (the correlation coefficient is 0.55 in the sample), the OLS estimator of γ without including T_{it-1} will be negatively biased. The result of the estimation that is reported in column (4) of Table 2 confirms this speculation. The estimated y is 0.046 with a standard error of 0.018, which is economically and statistically significant. This increase of the coefficient from the previous results in column (3) is explained by the negative $\hat{\theta}$, which is –0.024 with a standard error of 0.019. Although this coefficient is not statistically significant, the omission of T_{it-1} significantly biases the coefficient for T_{it} due to omitted variable bias. That the first-difference estimate (0.046) is larger than the OLS estimate (0.030) may seem surprising at first, but we must notice that those who participated in the training in the last year were likely to participate two years ago. Once we add the coefficients for current training participation and lagged training participation, the sum of the coefficients becomes 0.022 (= 0.046 – 0.024), which is reasonable in comparison with the OLS estimate.

To summarize the results obtained so far, workers' participation in firm-initiated training increases workers' wages in a causal sense, and its effect on wage increase is in the range of 2–3 percent. The results are consistent with standard human capital theory. Also, the results suggest the importance of including lagged training participation in the first-difference estimation when training participation is serially correlated. To the best of my knowledge, previous studies have not articulated this point, and this argument can be applied to studies using data from other countries.

Conclusion

This paper examined the characteristics of training participants and the effect of training on the wages of Japanese women. The analysis of training participation revealed that firms are more likely to send full-time workers with stronger educational backgrounds to training. Participation in firm-offered training is positively correlated with wage level. Even after controlling for the correlated, individual, unobserved heterogeneity by the first difference with an appropriate lag structure, the participation in firm-offered training increases participants' wage in a causal sense.

The above findings imply that government subsidies for employer-provided training mainly subsidize firms with more educated workers and some of the benefit of training program goes to those educated workers through wage gain. Policy makers should recognize these implicit policy beneficiaries in the process of policy making.

References

Hart, Robert, and Seiichi Kawasaki. 1999. *Work and Pay in Japan*. Cambridge, UK: Cambridge University Press.

Kurosawa, Masako. 2001. "The Extent and Impact of Enterprise Training: The Case of Kitakyushu City." *Japanese Economic Review* 52(2):224–241.

Ogawa, Naohiro, and Robert Clark. 1995. "Earnings Patterns of Japanese Women: 1976–1988." *Economic Development and Cultural Change* 43(2):293–313.

Okui, Megumi. 2002. "Empirical Analysis of Self Development: Evidence from Young Female Workers (in Japanese)." *Research Report on the Perspective of Structural Change of Labor Market in the New Century*, Kansai Institute of Social and Economic Research, 2002.