

## Lecture 6. Post-school Investment

### 1. Types of training

#### (1) General training (training in general skill)

Human capital acquired can be readily employed in a range of firms with the same resulting effect on output.

#### (2) Firm-specific training (training in firm-specific skill)

Pure specific training increases the worker's productivity only in the firm which provides the training.

### 2. Theories on training

#### (1) Becker's theory

- a. General training: in a competitive labor market, employers will not pay for general skill training due to the “holdup” or “poaching externality” problem.

The problem can be seen in a simple two-period model. In period 1, a worker is hired and the firm/worker decides whether or not to offer/receive general training,  $g$ . In period 2, the worker decides whether or not to stay in the same firm or take an outside offer. For simplicity, assume the discount rate is 0. Suppose a worker's pre-training marginal productivity and wage is  $w_0$ . After receiving an amount of general training,  $g$ , with a cost of  $c(g)$  ( $>0$ ), his/her marginal productivity increases to  $w+f(g)$ . The firm will only be willing to cover the cost of training,  $c(g)$ , if the post-training wage is  $w+f(g)-c(g)$ . However, as the worker's post training marginal productivity will be  $w+f(g)$ , he/she will only stay in the same firm if he or she is paid  $w+f(g)$ .

Is there a market failure? Or can a worker pay his/her own general training (through borrowing or accepting a low trainee wage)? The answer depends on the following two factors:

- Workers cannot typically borrow against future stock of human capital (except from government)
- Wages cannot go low enough (e.g., negative) to cover the training expenses.

How relevant is this model?

- College education is paid for by individuals/families
- Professional schools do not generally subsidize tuition: law, accounting, medicine, etc.

b. Specific training: the decision for firm-specific training is more complicated and depends on who bears the costs and who reaps the benefits of the worker's higher productivity in the future.

(2) Beyond Becker

Employers are commonly seen to be willing to cover some general training costs. For example:

- BLS 1994 study of employer training found that employers spent \$3.4 billion in 1994 on direct reimbursements and outside training funds.
- The British WiB survey showed that nearly 47% of the employees have received general training provided or paid for by their employers in the past two years.

Firms may be willing to provide general training if there are:

- Search costs
- Monopsony
- Asymmetry information
- Adverse selection
- Signaling

3. Who provides and who receives training?

Empirical findings: HK & US

Who provides:

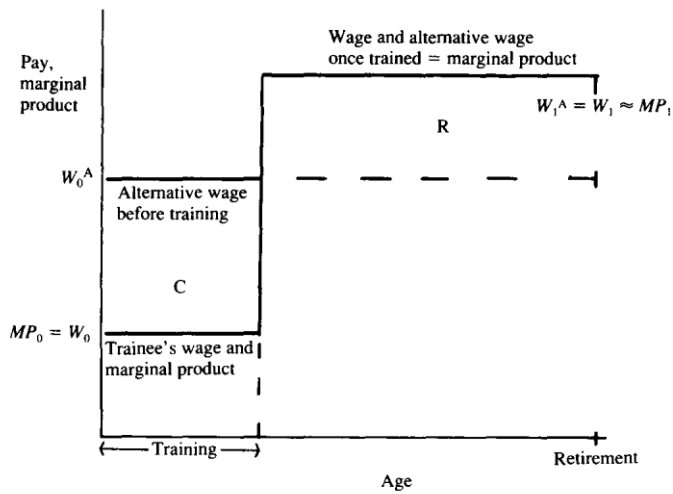
- Firm size
- Technology
- Institutional factors: union etc.
- Human resource management style

Who receives:

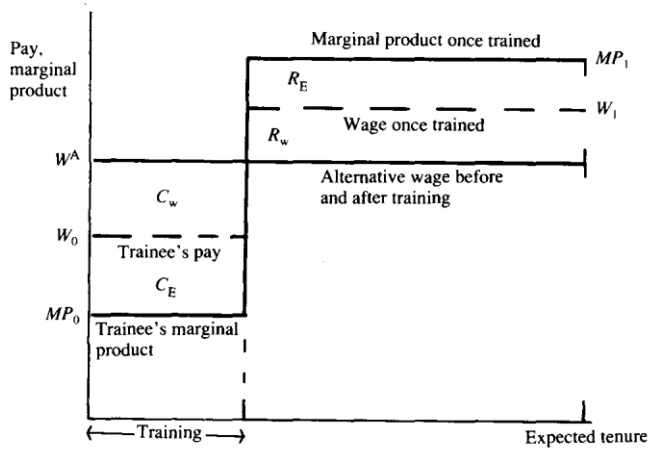
- Education
- Age
- Gender

#### 4. The benefit of training

- Training increases worker productivity
- Training increases worker adaptability
- Training increases job satisfaction
- Training reduces worker turnover



General Training



Specific Training

Regression results from a study done by Ho Lok-Sang and Wei Xiangding using a survey of Hong Kong employees:

Binomial Probit Model

Variables	Coefficient	t-ratio	Mean of X
Constant	0.25971	1.017	
AGE1	0.27451	2.172	0.14621
AGE3	-0.38072E-02	0.1161	0.30475
AGE4	-0.39320E-01	-0.219	0.15978
AGE5	-0.26409	-1.033	0.48118E-01
APRO	-0.18163	-1.454	0.39358
WORKER	-0.91620E-01	-0.660	0.31832
LABOUR	-0.33090	-2.002	0.15299
ED2	0.20470	1.458	0.18569
ED3	0.58734	4.285	0.46391
ED4	0.62086	3.551	0.10549
ED5	0.97188	4.972	0.84516E-01
MALE	-0.16927	-2.081	0.60703
MARRIED	0.81355E-02	0.089	0.63171
EXPE	-0.15586E-02	-0.237	20.173
TENURE	0.84203E-03	1.511	70.824
SIZE1	-1.0560	-9.728	0.21407
SIZE2	-0.57306	-7.324	0.39790
PFIRM	-0.71359	-6.376	0.82295

9 Industry dummies included

Frequencies of actual & predicted outcomes

Predicted outcome has maximum probability.

		Predicted		TOTAL
Actual	0	1		
0	925	159		1084
1	283	254		537
TOTAL	1208	413		1621

Empirical results from a study: Frazis, H, Gittleman, M. and Mary Joyce (1998).  
 “Determinants of Training: An Analysis Using Both Employer and Employee  
 Characteristics,” *Working Paper*, Bureau of Labor Statistics.

Table 5  
 Determinants of the Intensity of Formal Training: Hours, Employer Survey  
 Two-Part Model, Unweighted

Dependent variable	Any formal training (Derivatives)		Ln(hours of formal training per employee)		Marginal impact on hours of formal training per employee	
	All		Hours of formal training per employee >0			
Sample	Estimate	Standard Error	Estimate	Standard Error	Estimate	Standard Error
<b>Employer Characteristics</b>						
Ln(Employment)	0.135***	0.018	-0.140**	0.055	0.036	0.050
Ln(Estab. Wage)	-0.002	0.039	0.037	0.141	0.028	0.125
Ln(EIN size)	0.005	0.009	0.043	0.031	0.042	0.028
% Part-time	-0.174*	0.103	-0.558	0.389	-0.660*	0.342
Union present	-0.157***	0.038	-0.064	0.120	-0.230**	0.109
Contract workers used	0.016	0.035	0.170	0.110	0.033	0.101
Turnover rate	0.031	0.042	0.072	0.113	0.094	0.105
Growth rate	0.124	0.084	-0.051	0.300	0.097	0.267
Number of benefits	0.042***	0.010	0.070**	0.031	0.106***	0.028
# of workplace practices	0.025**	0.008	0.072***	0.026	0.089***	0.023
Mining	0.071	0.077	0.483**	0.214	0.482**	0.199
Construction	0.029	0.067	-0.356	0.235	-0.263	0.211
Nondurable manufacturing	0.004	0.067	-0.145	0.223	-0.117	0.200
Durable Manufacturing	0.004	0.070	-0.049	0.208	-0.029	0.190
T.C.P.U.	0.063	0.070	0.390*	0.221	0.396**	0.202
Wholesale trade	-0.029	0.070	-0.237	0.238	-0.230	0.213
Retail trade	0.034	0.067	-0.508*	0.279	-0.384	0.246
F.I.R.E.	0.057	0.074	0.238	0.202	0.262	0.187
Constant	-0.845**	0.029	-1.084	1.044		
Log likelihood	-467.37					
R <sup>2</sup>			0.105			
Observations	943		646			

\* Coefficient significant at 10 percent level

\*\* Coefficient significant at 5 percent level

\*\*\* Coefficient significant at 1 percent level

NOTE: Statistical significance of derivatives in column 1 does not correspond to  
 significance of coefficients.

Table 9  
Determinants of the Incidence of Formal Training, Employee Survey  
Probit Maximum-Likelihood Estimates, Unweighted

Dependent variable	Ever formal training from current employer (derivatives)		Formal training from current employer in last 12 months (derivatives)	
	Estimate	Standard Error	Estimate	Standard Error
<b>Employee Characteristics</b>				
Black	-0.014	0.018	-0.006	0.018
Hispanic	0.019	0.024	-0.013	0.020
Male	0.033**	0.012	0.078**	0.012
HS Dropout	-0.042	0.046	-0.029	0.021
GED	0.019	0.030	0.103	0.035
Some College	0.022	0.020	0.060*	0.014
Assoc. Degree	0.001	0.030	-0.023	0.022
BA	0.046**	0.021	0.058	0.020
Graduate Degree	0.061	0.073	0.147*	0.043
Married	0.001	0.008	0.001	0.007
Age	0.006	0.013	0.016**	0.012
Age Squared/100	-0.009**	0.015	-0.024**	0.014
Job tenure	0.010***	0.002	-0.008	0.003
Tenure Sq./100	-0.022*	0.007	0.019	0.009
Part-Time	0.003	0.024	-0.035	0.032
<b>Employer Characteristics</b>				
Ln (Employment)	0.000	0.004	0.010	0.007
Ln (Estab. Wage)	0.028	0.129	0.018	0.079
Ln (EIN size)	0.016***	0.005	0.015	0.002
% Part-Time	-0.039	0.119	-0.019	0.101
Union Present	-0.047**	0.022	-0.051	0.013
Contract Workers	0.040**	0.014	0.056*	0.010
Turnover Rate	-0.044*	0.053	-0.097*	0.033
Growth Rate	-0.042	0.059	-0.046	0.046
Number of Benefits	0.011**	0.003	0.023**	0.002
Number of Workplace Practices	0.015***	0.003	0.022***	0.001
Observations	1,073		1,073	

\* Coefficient significant at 10 percent level

\*\* Coefficient significant at 5 percent level

\*\*\* Coefficient significant at 1 percent level

NOTE: Statistical significance of derivatives does not correspond to significance of coefficients.

Empirical results from a study done by Simon Fan and Xiangdong Wei:

**Table 3. Ordered Probit Models for Employee Self-reported Work Effort, Loyalty and Sense of Job Security**

Independent Variables	Dependent Variables							
	Wilwkhd		Loyal		Turndown		Jsecure	
	I	II	III	IV	V	VI	VII	VIII
Train	.164*** (2.79)	.109* (1.68)	.205*** (3.56)	.157** (2.48)	.142** (2.35)	.132** (2.03)	.134** (2.15)	.157** (2.31)
Psize1	.351*** (3.72)	.319*** (3.18)	.292*** (2.91)	.300*** (2.70)	.357*** (3.53)	.395*** (3.42)	.056 (.50)	.059 (.619)
Psize2	.199** (2.06)	.151 (1.49)	.099 (.97)	.150 (1.35)	.174* (1.67)	.270** (2.28)	.032 (.28)	.091 (.74)
Psize3	.117 (1.21)	.062 (.60)	.024 (.24)	.011 (.10)	.033 (.32)	.022 (.19)	-.037 (.32)	-.027 (.22)
Psize4	.132 (1.01)	.048 (.35)	.013 (.10)	-.017 (.12)	.171 (1.37)	.117 (.85)	-.047 (.35)	-.027 (.19)
Public	-.045 (.49)	-.135 (1.34)	.028 (.33)	.023 (.22)	.112 (1.30)	.108 (1.09)	.065 (.70)	.122 (1.17)
Union	-.133* (1.90)	-.117 (1.55)	- (6.78)	-.173** (2.21)	-.148** (2.09)	-.114 (5.14)	-.051 (.70)	-.068 (.85)
Male	.040 (.61)	.009 (1.33)	.090 (1.36)	-.033 (.47)	.003 (.04)	-.005 (.07)	.075 (1.11)	.049 (.67)
Tenure	-.0002 (.44)	.0001 (.18)	-.0002 (.48)	.000002 (.01)	.001*** (3.76)	.001*** (4.12)	.001* (1.78)	.001* (1.74)
Pjob	.136 (1.33)	.126 (1.04)	.233** (2.38)	.128 (1.15)	.079 (.81)	.040 (.34)	.837*** (6.73)	.892*** (6.04)
Ptime	-.029 (.40)	-.075 (.89)	.027 (.37)	-.083 (1.01)	.151** (1.95)	.060 (.34)	-.091 (1.18)	-.130 (1.51)
Prof	.481*** (2.82)	.309 (1.51)	.391*** (2.54)	.360* (1.87)	.605*** (3.41)	.523** (2.35)	-.092 (.50)	-.191 (.91)
Iman_tech	.584*** (4.18)	.472*** (2.65)	.421*** (3.63)	.424*** (2.87)	.383*** (2.69)	.358* (1.90)	-.096 (.65)	-.173 (.98)
Sknman	.540*** (3.97)	.451*** (2.56)	.254** (2.19)	.224 (1.49)	.265* (1.85)	.135 (.71)	.004 (.02)	-.095 (.54)
Skman	.236* (1.68)	.160 (.90)	.132 (1.12)	.177 (1.20)	.128 (.87)	.142 (.75)	-.153 (1.00)	-.138 (.75)
Semi_sk	.295** (2.06)	.258 (1.41)	-.019 (.15)	.038 (.24)	.055 (.37)	.041 (.21)	-.074 (.48)	-.136 (.74)
Satpay		.093*** (3.19)		.114*** (4.07)		.195*** (6.34)		.058** (2.01)
Sathour		-.040 (1.30)		.059* (1.88)		.076*** (2.60)		-.036 (1.24)
Satfben		.121*** (4.01)		.077*** (2.66)		.117*** (3.73)		.050* (1.72)
Satrelsup		.200*** (6.66)		.251*** (8.23)		.204*** (6.55)		.129*** (4.41)
Industry dummies (13)	Included							
Pseudo R <sup>2</sup>	.022	.073	.030	.098	.028	.114	.039	.061
Sample Size	1,934	1,675	1,956	1,685	1,832	1,584	1,937	1,673

Note: Figures in the brackets are t-statistics.

\*\*\*, \*\*, \* denote 1%, 5% and 10% significant levels, respectively.

