Human Capital: Third Lecture

LABOR ECONOMICS (ECON 385)

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Introduction

To the extent schooling increases a worker's productivity, the human capital acquired in school is general in nature—not specific to a particular firm. Typically individuals pay for their schooling (unless subsidized by grants and scholarships) as opposed to having employers pay.

This is true of all general training; since the worker's productivity is increased at any firm, no single firm has an incentive to pay for general training because the employee can take his new skills anywhere he wants, depriving the original firm of the productivity it helped pay for.

General training

- Consider what happens when a worker receives <u>general training</u>. In the present, his productivity is MP_0, and if he continues working for *T* periods without training, his wage is w_0.

- If he obtains general training, he will be able to find a job willing to pay him according to his new productivity, MP_1, even if he has to go to another firm to get the new wage, w_1. During the training, assume the employee is paid a training wage, $\widetilde{w}$.

$$w_0 = MP_0 \ \forall \ \text{periods}; \ w_1 = MP_1 \ \forall \ t > 0, w_1 = \widetilde{w} \ \text{in} \ t = 0.$$

Training costs

- Training costs explicitly *H* dollars, of which the employer can choose to pay fraction, *s*. The gain (*G*) to the firm from paying for training is the present discounted sum of profit on the worker's career productivity minus $s * H$.

$$G = MP_0 - \widetilde{w} + \sum_{t=1}^{T} \frac{MP_1 - w_1}{(1+r)^t} - sH$$

- Since the training is general, the firm will not be able to "mark-up" future wages, and the term with the sum operator will equal zero. The employer will only provide general training if it can deduct its costs from the employee's present wage; this is the only way its gain is non-negative.

$$G \geq 0 \rightarrow 0 \leq MP_0 - \widetilde{w} - sH \Leftrightarrow s \leq \frac{MP_0 - \widetilde{w}}{H}$$

Employees pay for general training

- Recall that s is the *share* of training costs borne by the firm. It cannot be less than zero, so in order to get the firm to pay a strictly positive share of the training costs, the employee has to accept a lower training wage than is justified by his productivity.

$$s > 0 \rightarrow MP_0 > \widetilde{w}$$

- Either way, <u>the employee will pay for general training</u>. He either earns the value of his marginal product in each period and explicitly pays for the training or he implicitly pays for it with a lower training wage. A much more general treatment of the human capital accumulation process is found in Ben-Porath (1967).*

*Ben-Porath, Yoram. 1967. "The Production of Human Capital and the Life Cycle of Earnings." *Journal of Political Economy*: Vol. 75: 352-365.

Specific training

The training is <u>specific</u> if the <u>employee's productivity is increased exclusively at the current firm</u>. The wage he would get at any other firm would still only be w_0.

- The post-training wage could conceivable be any amount in the interval,
$$w_0 \leq w_1 \leq MP_1.$$

  - The employee will not continue working for his current firm if it pays less than the best external offer, w_0.

  - The firm will not continue employing him if he has to pay more than productivity, MP_1, justifies.

  - Consider the two extreme cases in which one party captures all the "rents" created by the training: $w_1 = w_0$ (firm captures all rents) and $w_1 = MP_1$ (employee captures all rents). Whichever party gets the gains, here, would be the one paying for the training, i.e., the employee does not have an incentive to pay if his wage does not increase, and the employer would not pay if profit could not be increased by paying below MP_1.

  - Between these two extremes lie numerous possible ways of splitting the rent created by the training.

Strategic bargaining

- Deciding on one particular solution requires an assumption about how the two parties behave strategically. If the employer doesn't concede enough of the rents, the employee can leave and take another job, but the employee would also lose this opportunity for training and higher wages. Similarly if the employee wants too much of the rents, the employer may dismiss him and seek out someone else to train.

  - A common solution technique for such problems is called Nash Bargaining. Applied to this problem, the Nash Bargaining solution requires choosing a post-training wage that maximizes the product of both parties' net benefits.

$$\max_{w_1} V = (MP_1 - w_1 - sH)(w_1 - w_0 - (1-s)H)$$

  Where the first parenthesis is the employer's net benefit, and the second is the employee's. Note that the entire size of the rents is $(MP_1 - w_0)$.

Nash bargaining solution

- The problem can be simplified if we make the assumption that each party's share of training costs will equal his share of the rents.

$$s = \frac{MP_1 - w_1}{MP_1 - w_0} \rightarrow (1 - s) = \frac{w_1 - w_0}{MP_1 - w_0}$$

The value function, V, becomes:

$$\max_{w_1} V = (MP_1 - w_1 - (\frac{MP_1 - w_1}{MP_1 - w_0})H)(w_1 - w_0 - (\frac{w_1 - w_0}{MP_1 - w_0})H)$$

$$\Leftrightarrow \max_{w_1} V = (MP_1 - w_1)\left(1 - \left(\frac{H}{MP_1 - w_0}\right)\right)(w_1 - w_0)\left(1 - \left(\frac{H}{MP_1 - w_0}\right)\right)$$

$$\Leftrightarrow \max_{w_1} V = (MP_1 - w_1)\left(\frac{MP_1 - w_0 - H}{MP_1 - w_0}\right)(w_1 - w_0)\left(\frac{MP_1 - w_0 - H}{MP_1 - w_0}\right)$$

Nash bargaining (continued)

The thing in the parentheses does not have w_1 in it, so even though it will be in the solution, an abbreviation can be used—such as θ.

$$\Leftrightarrow \max_{w_1} V = (MP_1 - w_1)(w_1 - w_0)\theta^2$$

Taking the derivative of this with respect to w_1 and setting it equal to zero (for the first order condition) gives us the solution for optimal post-training wage:

$$\frac{\delta V}{\delta w_1} = \theta^2[MP_1 - w_1 - (w_1 - w_0)] = 0$$

$$\Leftrightarrow w_1^* = \frac{1}{2}(MP_1 - w_0)$$

- Nash Bargaining gives the (fairly unsurprising) solution that the wage is half way between the employee's outside wage and the maximum wage the employer is willing to pay. This would also result in the two parties splitting the costs.
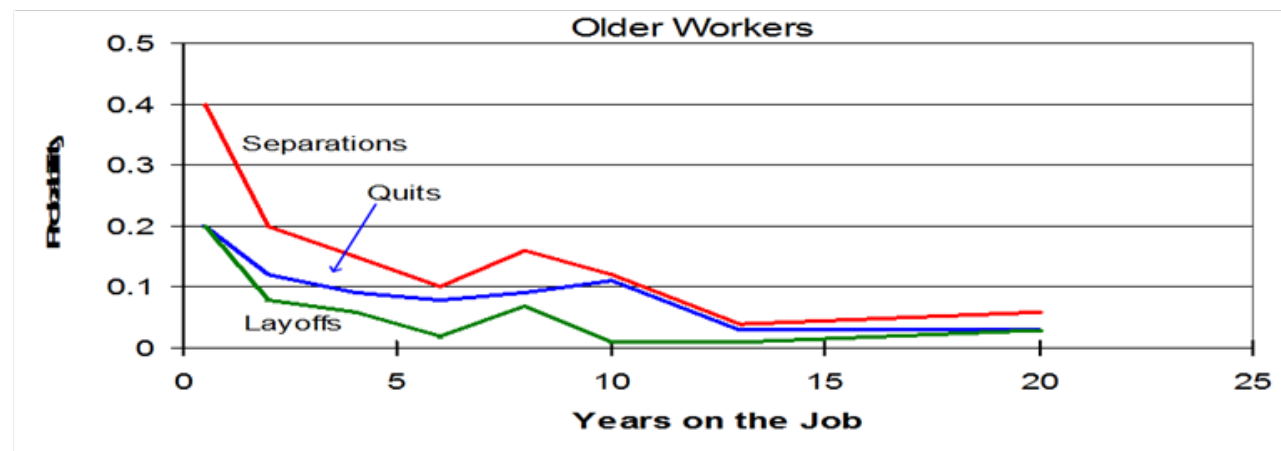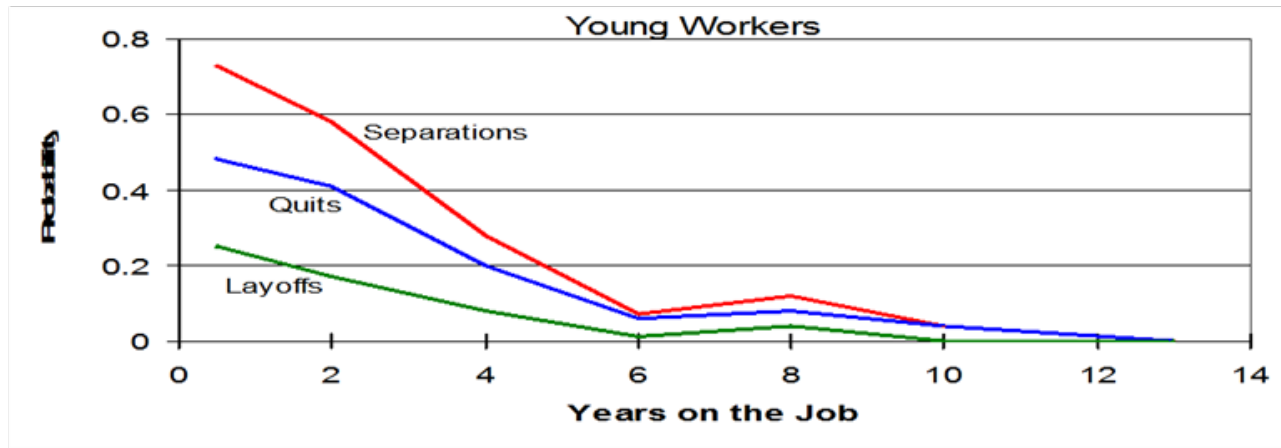
Extensions

I will only touch on a couple of the many directions this can be extended here.*

- Foremost, firm-specific human capital gives both parties an investment in keeping the employment relationship going.

- If a worker trained in this manner is temporarily laid off, he will have strong preferences about waiting until the original employer recalls him—as opposed to seeking a new job.

- It also helps explain why workers with more <u>tenure</u> at the firm are less likely to be laid off during periods of low sales. Additionally it predicts that workers that have been with the same firm longer will be paid higher wages than new hires.
  - Firm-specific human capital makes the probability of a "voluntary quit" lower because it is unlikely that another job will compensate the employee as well as the one in which he has invested in training. See the graph below from the Borjas text for descriptive evidence of this.

*One novel extension (and accessible) is Lazear, Edward. 2009. "Firm Specific Human Capital: A Skill Weights Approach." *Journal of Political Economy*: Vol. 117, No. 5: 914-940.

Separations and tenure on the job

Extensions (continued)

- On the macroeconomic side, human capital is intimately tied to innovation and growth.

- Regardless of the composition of the effects of human capital and signaling, education is a field of economics in its own right. It is more important the more important human capital is in explaining individuals' wages.
  - Education is the conduit for equalizing economic opportunity and has enormous impacts on income distributions in cross section and also over time.
  - Differences—not only in the quantity of schooling, but—in the quality of schooling is relevant at all levels.
  - Education may have externalities related to crime, fertility, governance, and health.

- Training and signaling are related to other subjects we discuss later in this class: labor mobility, unemployment, and matching.