Chapter 7
Human Capital

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- People bring into the labor market a unique set of abilities and acquired skills known as human capital
- Workers add to their stock of human capital throughout their lives, especially via education (pre labor market) and work related experience and job training (post-school training).
  - Pre labor market
    (i) What is the optimal education investment?
      - An individual faces the trade-off between lower earnings today and higher earnings later.
        For example, students postpone entry into the workforce and the immediate benefit of a full-time wage for the reward of the relatively higher future earnings associated with a college education.
    (ii) Do increased educational investments increase worker productivity or education system is just as a means of finding out who is productive, not enhancing worker productivity?
      - The signaling model
    (iii) Is education a good investment?
      - How does the rate of return to schooling compare with the rate of return on other investments?
      - The rate of return to schooling plays an important role in many policy discussions.
        For instance, it is often argued that subsidizing investments to education and other learning activities is the surest way of improving the economic well-being of low-income and disadvantaged workers.
  - Post-school training
    (i) Who pays for the job training?
      - General training vs. specific training
    (ii) How do workers choose a particular path for their post-school investments?
    (iii) How these choices influence the evolution of earnings over the life cycle and determine the earning distributions in the economy?
I. The Schooling Model

Present value of age-earnings profiles

- An individual acquires the education level that maximizes the present value of lifetime earnings.
- There is no on-the-job training and that the skills learned in the school do not depreciate over time, which implies this individual’s productivity does not change over time so that real earnings are constant over the life cycle.
- High school graduates earn \( w_{HS} \) dollars annually until retirement age.
- If the person chooses to attend college, he gives up \( w_{HS} \) dollars in labor earnings and incurs direct costs of \( H \) dollars to cover tuition, books and fee, and earns \( w_{COL} \) dollars annually until retirement (see Figure 7-1).
- The present value of earnings stream if the worker gets only a high school education

\[
PV_{HS} = \sum_{t=0}^{46} \frac{w_{HS}}{(1 + r)^t}, \text{ where } r \text{ is the discount rate}
\]

- The present value of earnings stream if the worker gets a college diploma

\[
PV_{COL} = -\sum_{t=0}^{3} \frac{H}{(1 + r)^t} + \sum_{t=4}^{46} \frac{w_{COL}}{(1 + r)^t}
\]

- If \( PV_{COL} > PV_{HS} \), go to college; otherwise, get only a high school diploma
- The rate of discount \( r \) is important in determining whether a person goes to school or not
  1. The higher the discount rate, the less likely someone will invest in education (since they are less future oriented)
  2. The discount rate depends on:
     - The market rate of interest
     - “Time preferences” (how a person feels about giving up today’s consumption in return for future rewards)

There is a different way of formulating the schooling decision, which is useful because it also suggests a way for estimating the rate of return to education.
The wage-schooling locus
• The wage-schooling locus is what salary will firms be willing to pay workers for given levels of schooling. Three properties: (see Figure 7-2)
  - The wage-schooling locus is upward sloping
  - The slope of the wage-schooling locus indicates the increase in earnings associated with an additional year of education
  - The wage-schooling locus in concave

• Figure 7-2 The wage-schooling locus
  • The slope of the wage-schooling locus ($\Delta w / \Delta s$): How much earnings increase resulting from one more year of schooling.
  • The marginal rate of return ($MRR$): The percentage change in earnings resulting from one more year of school.

The marginal rate of return to schooling
• The $MRR$ schedule gives the marginal rate of return to schooling (or the percentage increase in earnings) resulting from an additional year of school.

• Figure 7-3 The schooling decision
  • The stopping rule: A worker maximizes the present value of lifetime earnings by going to school until the marginal rate of return to schooling equals the rate of discount.
  • A worker with discount rate $r$ goes to school for $s^*$ years.
**Education and earnings**
- Schooling and earnings when workers have different rates of discount (Figure 7-4)

- Schooling and earnings when workers have different abilities (Figure 7-5)

**Estimating the rate of return to schooling**
- The typical study estimates a regression of the form

\[ \log w = bs + \text{other variables} \]

- Observed data on earnings and schooling does not allow us to estimate returns to schooling
- In theory, a more able person gets more from an additional year of education
- Ability bias — the extent to which unobserved ability differences exist effects on returns to schooling (since the ability difference may be the true source of the wage differential)
II. The Signaling Model

Education as a signal
• Information that is used to allocate a workers in the labor market is called a signal
• Education reveals a level of attainment which signals a worker’s qualifications to potential employers
  - Two types of workers, one with productivity 1, the other with productivity 2
  - Employers can not distinguish the types
  - Schooling does not change productivity

Figure 1 The benefits to workers of educational signaling

![Figure 1](image1.png)

Figure 2 The lifetimes benefits and costs of educational signaling

![Figure 2](image2.png)
Figure 3 Requiring a greater signal may have costs without benefits

- There could be a “separating equilibrium”
  - Low-productivity workers choose not to obtain \( e^* \) years of education, voluntarily signaling their low productivity
  - High-productivity workers choose to get at least \( e^* \) years of schooling and separate themselves from the pack

Questions:
• If education is only a signal, why do employers in the competitive market not notice?

• If education increases human capital, but not a signal, then why does “sheepskin effect” (the effect of a diploma) exist?
Private and social rates of return to schooling

• Private rate of return to schooling: the increase in a worker’s earnings resulting from an additional year of schooling
• Social rate of return to schooling: the increase in national income resulting from the same year of education
• Education is more than a signal, it alters the stock of human capital
• Social return to schooling (percentage increase in national income) is likely to be positive even if a particular worker’s human capital is not increased

III. Post-School Human Capital Investments

• Three important properties of age-earnings profiles: (Figure 7-8)
  - Highly educated workers earn more than less educated workers
  - Earnings rise over time at a decreasing rate
  - The age-earnings profiles of different education cohorts diverge over time (they “fan outwards”), earnings increase faster for more educated workers

On-the-Job training

• Most workers augment their human capital stock through on-the-job training (OJT) after completing education investments
• Two types of OJT:
  - General: training that is useful at all firms once it is acquired
  - Specific: training that is useful only at the firm where it is acquired
• The profit-maximizing condition giving the optimal level of employment for the firm over the two periods:

$$TC_1 + \frac{TC_2}{1 + r} = VMP_1 + \frac{VMP_2}{1 + r}$$

• Assuming OJT occurs only in the first period; $H$ is the cost to put a worker through the training; $w_1$ is the wage paid to the worker during the training period

$$w_1 + H + \frac{w_2}{1 + r} = VMP_1 + \frac{VMP_2}{1 + r}$$
• Who pays for general training?
  - Firm will pay \( w_2 = VMP_2 \) in the last period; \( w_1 = VMP_1 - H \) in the first period (lowering wage during the training period)

• Who pays for specific training?

• Implications
  - Firms only provide general training if they do not pay the costs
  - If the firm and the worker share the returns to specific training the possibility of separation in the post-training period is eliminated

OJT and Age-Earnings profiles
• The acquisition of human capital over the life cycle (Figure 7-9)
• The age-earnings profile implied by human capital theory (Figure 7-10)
• Human capital investments are more profitable the earlier they are taken