Chapter 4

Labor Quality: Investing in Human Capital
Human Capital Model

- The decision should be made by comparing the costs and benefits (higher earnings) of college.

- Costs of attending college
  - The *direct costs* are the cost of tuition, fees, and books.
    - Room and board are not included since they are needed regardless of whether you go to college.
  - The *indirect cost* is the forgone earnings you give up while you attending college.
• The HH curve is the age-earnings profile if a person does not attend college.
• The CC curve is the cost-earnings profile if one attends college.
• The total cost of attending college is the sum of the direct costs (area 1) plus indirect costs (area 2).
• The benefit of attending college is the increase in earnings due to the college degree (area 3).
• Whether it is rational to attend college depends on whether the present value of the benefits exceeds the present value of the costs.
Present Value

- Discounting converts the value of future dollars into today’s dollars through the interest rate.

- The present value ($V_p$) of a payment received one year from now is:

  - Def: $V_p = \frac{\text{Payment 1 year from now}}{1+\text{Interest rate}}$

  - Ex: $V_p = \frac{\$110}{1.10} = \$100.00$

  where $i = 10\%$
Present Value

- The present value of a future stream of incremental earnings or costs (E):

\[ V_p = E_0 + \frac{E_1}{(1 + i)} + \frac{E_2}{(1 + i)^2} + \cdots + \frac{E_n}{(1 + i)^n} \]

- Costs are represented as negative values of E.

- A person should attend college if the net present value \((V_p)\) is greater than 0.
**Discounted Present Value**

**PV of $8,000 Investment in Webmaster Training Program**  
*(Interest Rate = 10 Percent)*

<table>
<thead>
<tr>
<th>Year (1)</th>
<th>Incremental Earnings (2)</th>
<th>Discounted Value (10 Percent Rate) (3)</th>
<th>Present Value of Earnings (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-$8,000</td>
<td>1.000</td>
<td>$-8,000</td>
</tr>
<tr>
<td>1</td>
<td>$3,000</td>
<td>0.909</td>
<td>$2,727</td>
</tr>
<tr>
<td>2</td>
<td>$4,000</td>
<td>0.826</td>
<td>$3,305</td>
</tr>
<tr>
<td>3</td>
<td>$5,000</td>
<td>0.751</td>
<td>$3,755</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>$1,787</td>
</tr>
</tbody>
</table>

• Suppose Melinda is considering taking a webmaster training program that involves direct costs of $3,000 and forgone earnings $5,000. The training program will increase Melinda’s earnings by $3,000, $4,000, and $5,000 for the 3 years she plans on working.

• Because she can borrow the funds at an interest rate of 10%, we will discount the future expected income at an 10% rate.

• What is the present value (*PV*) of this training program?

• The *PV* of the training program is positive, Melinda should take the training program.
Internal Rate of Return

- The *internal rate of return*, \( r \), is the rate of return at which \( V_p = 0 \):

\[
V_p = 0 = E_0 + \frac{E_1}{(1 + r)} + \frac{E_2}{(1 + r)^2} + \cdots + \frac{E_n}{(1 + r)^n}
\]

- A person should attend college if the rate of return (\( r \)) exceeds the market interest rate (\( i \)).
Generalizations

- Length of income stream
  - The longer the stream of positive incremental earnings, the more likely the net present value will be positive.
    - As a result, younger people are more likely to attend college

- Costs of attending college
  - The lower the cost of attending college, the more likely the net present value is positive.
    - Older people have a higher opportunity cost of attending college, less likely to attend.
Generalizations

- Earnings differential
  - The larger is the college-high school earnings differential, the more likely the net present value is greater.
  - College attendance rose in the 1980s as the college-high school premium increased.
Private vs. Social Perspective

- Education yields substantial *external* or *social benefits* that society reaps.
  - More educated workers have lower unemployment rates.
  - Education raises the amount and quality of participation in the political process.
  - Children grow up in a better home-environment if the parents are more educated.
  - The research discoveries of more educated persons yield benefits to society.
Private vs. Social Perspective

- The social rate of return is higher (lower) than the private rate of return, resources will be underallocated (overallocated) to human capital investments.
  - The private and social rate of return are quite similar.
The marginal rate of return to education declines as additional schooling is acquired.

Investment in education is subject to the law of diminishing returns. The increases in knowledge decline with each additional year of schooling.

The return also falls because the explicit cost and opportunity cost of education rises with additional schooling.
Demand for Human Capital

- Since individuals should increase schooling so that the marginal rate of return of schooling (r) is equal to the interest rate (i).
- Using the r=i rule, at interest rate i₂, the optimal level of schooling is e₂.
- At i₁ the optimal level is e₁.
- At i₃ the optimal level is e₃.
- Each equilibrium point (1,2,3) indicates the “price” and quantity demanded of human capital. In other words, the demand for human capital.
• Alfonse is low ability person. He has low mental/physical talents and/or low motivation and self-discipline. His demand for schooling is $D_A$.
• Bob is a high ability person. He has a greater demand for schooling at $D_B$ because he can better translate schooling into higher productivity and earnings.
• For a given interest rate, Bob will obtain more schooling which will compound the earnings differential between low and high ability persons.
Discrimination

• Albert is black and is discriminated against in the labor market. His demand for schooling is $D_A$ since he has low ability to convert additional schooling into higher earnings.

• Brett is white and has a greater demand for schooling at $D_B$ as he can reap the benefits of additional schooling.

• For a given interest rate, Bob will obtain more schooling which will compound the earnings differential between whites and blacks.
Cost of Funds

- Ann is from a wealthy family and faces a low cost of borrowing funds ($i_A$). Her optimal level of schooling is $e_A$.
- Betty is from a poor family and faces a high cost of borrowing funds ($i_B$). Her optimal level of schooling is $e_B$. 

Diagram:
- $S_A$ and $S_B$ are supply curves of schooling.
- $D_A = D_B$ indicates equal demand for schooling.
- $i_A$ and $i_B$ are interest rates for Ann and Betty, respectively.
- $e_A$ and $e_B$ are their optimal levels of schooling.
Interactions

- The ability, discrimination, and cost of funds factors that affect schooling levels may interact to cause even larger earnings inequality.
  - If a person faces labor market discrimination, lenders may charge a higher interest rate since they are less certain of getting repaid.
    - Discrimination will reduce both the supply and demand for schooling.
    - Anti-discrimination policies may reduce earnings inequality as a result.
Capital Market Imperfections

- The capital market is biased in favor of physical rather than human capital
  - Lenders can’t repossess human capital.
  - Young people, who are most likely to invest in human capital, don’t have established credit ratings.
- The government may have to intervene by subsidizing human capital loans in order to make the returns on physical and human capital equal.
Costs and Benefits

- Firms will invest in *on-the-job training* if the present value of the benefits of the training exceeds the present value of the costs.
- The costs to the firm include:
  - Direct costs such as classroom instruction and greater worker supervision.
  - Indirect costs such as reduced worker output during training.
- The benefit is greater worker productivity.
General and Specific Training

- **General training** is training that is usable at *all* firms and industries.
  - Word processing skills or accounting skills.

- **Specific training** is training that is usable at *only* at the firm that provides the training.
  - Assembly procedure unique to a firm’s product.

- Most training is a mixture of general and specific training.
• $W_u$ and $MRP_u$ are the wages and marginal revenue product for an untrained worker. *Marginal revenue product* is the increase in total revenue associated with the employment of an additional worker.

• Since general training is usable at other firms, workers must pay for the entire cost of the training. They receive a lower wage ($W_u > W_t$) that is equal to their diminished productivity ($MRP_t$).

• After the training period, workers receive a higher wage $W_p$ that is equal to their new higher level of productivity $MRP_p$. 

\[
\begin{align*}
W_p &= MRP_p \\
W_u &= MRP_u \\
W_t &= MRP_t
\end{align*}
\]
Specific Training

- Since specific training is not transferable to other firms, the employer must pay for the training.
- During training, the employer pays a wage greater than the worker’s productivity ($W_u > MRP_t$).
- After training, the employer gets a return on her training investment by paying a wage less than the worker’s productivity ($W_u < MRP_t$).
- The employer may pay a higher wage to decrease worker turnover and thus protect her training investment ($W_p'$).
Modifications

- Faced with a minimum wage, some firms may pay for general training.
  - The firms recoup their expenses by pay workers less than their MRP after the training is completed.
    - This is possible because workers are not perfectly mobile across jobs—there are costs to switching jobs.
- Workers with the most formal education also receive more on-the-job training.
  - They have shown they can receive training more readily and thus less cost.