Human Capital Model:
Suppose:
Adult Earnings = f(education, other stuff)

(Loosely speaking) the return to education is the derivative of the function f with respect to education, holding everything else constant (the slope of the relationship between education and earnings)
Human Capital Model Estimation Issues: Selection Bias

Example: Suppose there are 2 types of people
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<table>
<thead>
<tr>
<th></th>
<th>Type A</th>
<th>Type B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Productivity as a Doctor (if finish college &amp; med school)</td>
<td>100</td>
<td>-100</td>
</tr>
<tr>
<td>Productivity as a Mechanic (if take auto shop in high school)</td>
<td>40</td>
<td>60</td>
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Apparent return to education (if Type A become doctors & Type B become mechanics)
Human Capital Model Estimation Issues:  
*Selection Bias*

Example: Suppose there are 2 types of people

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True return to education (among people who could become doctors)
Human Capital Model Estimation Issues: *Omitted Variable Bias*

Example:

Suppose earnings actually depend on education and drive.

- $o$ represents a low-drive person
- $+$ represents a high-drive person

![Diagram showing earnings and drive relationship](image-url)
Human Capital Model Estimation Issues: Omitted Variable Bias

If the researcher can’t see “drive”, the model might be incorrectly specified due to the omitted variable.

Relationship estimated if “drive” is unobserved

\[ \begin{align*}
+ & \text{represents a high-drive person} \\
\circ & \text{represents a low-drive person}
\end{align*} \]
Human Capital Model Estimation Issues: *Omitted Variable Bias*

When the omitted variable is correlated with education *and* affects earnings, the estimated return to education will be biased.

![Graph showing the relationship between drive, education, and earnings. The graph illustrates that people with more drive have higher earnings than those with less drive for the same level of education. It is indicated that the relationship is estimated if "drive" is unobserved.](image)
Human Capital Model Estimation Issues:  
*Omitted Variable Bias*

PDV of future earnings = f(education, other stuff)

Candidates for omitted variable bias:
1) Unobserved characteristics of job-compensation package (e.g. fringe benefits, psychic benefits, actual hours worked per week)
2) Unobserved characteristics of education (e.g. teacher quality, college major)
3) Unobserved characteristics of individuals (e.g. drive, motivation, problem solving ability, people skills)
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Screening OR Signaling Model:

Students make the exactly the same choices: Invest in more education if the future benefits are high enough relative to the current costs (minus current benefits).

The difference is that education does not increase the productivity of individuals, it only tells employers who the most productive individuals are. The screening model can only work if costs are higher for the lower productivity group. (Otherwise, it pays for everyone to pretend to be in the high productivity group).
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Screening Model (Figure 9.8):

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\[ \text{PDV}(e) \]

\[ \text{BENEFITS (for all students)} \]

\[ e^* \]  

\[ \text{# Years of Education } = e \]
Screening Model (Figure 9.8):


**Screening Model:**
Students with LOWER costs of education

```
$ \text{PDV}_H \quad \text{PDV}_L

e^* \quad \text{BENEFIT}

\text{COST for Students with lower costs}

\# Years of Education
```
Screening Model:
Students with HIGHER costs of education

Screening OR Signaling Model:
The screening model can only work if costs are higher for the lower productivity group. (Otherwise, it pays for everyone to pretend to be in the high productivity group).

What if…
What if…

…suppose some people have low costs only because their families are very wealthy. What happens under the screening/signaling model?