Part I: Introduction to Economics

1. The Principles and Practice of Economics
2. Economic Methods and Economic Questions
3. Optimization: Doing the Best You Can
4. Demand, Supply, and Equilibrium
Chapter 2
Economic Methods and Economic Questions

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Chapter 2
Economic Methods and Economic Questions

Outline

1. The Scientific Method
2. Causation and Correlation
3. Economic Questions and Answers
4. Appendix: Constructing and Interpreting Graphs
A model is a simplified description of reality.

Economists use data to evaluate the accuracy of models and understand how the world works.

Correlation does not imply causality.
• **Experiments** help economists to measure cause and effect.

• Economic **research** focuses on questions that are **important to society** and can be answered with models and data.
Question: Is college worth it?
The scientific method (also referred to as empiricism) is composed of two steps:

1. **Developing** models that explain some part of the world.
2. **Testing** those models using data to see how closely the model matches what we actually observe.
Models and Data

What is this?
Does it look like anyone you know?
• A **Model** is a simplified description, or representation, of the world.

Is this an airplane?
Chapter 2
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Causation and Correlation
Economic Questions and Answers
Appendix: Constructing and Interpreting Graphs
What’s the shortest distance between two points?

Exhibit 2-1 Flying from New York to Tokyo Requires More Than a Flat Map
An Economic Model

Returns to education: (教育的報酬)

- Assumption— one more year of education results in a 10% increase in future earnings.
- If you would earn $15 per hour with 12 years of education, with one more year of education (your first year of college) you would earn:

\[ 15 \times 1.10 = 16.50 \]
If you would earn $16.50 with 13 years of education, with one more year of education (2nd year of college), you would earn:

$16.50 \times 1.10 = $18.15

The third year: $18.15 \times 1.1 = $19.97

The fourth year: $19.97 \times 1.1 = $21.97
Hypothesis:

- Getting a college degree (years 13-16) increases wages from $15 to $21.97, or 46.5%

\[
\frac{21.97 - 15}{15} = .4647
\]
Two important features of models:

- They are **not exact**. **Not everyone** will see his or her wages increase by 10% with every additional year of education.
- They generate predictions that can be **tested** with data.
- Hypothesis: Each additional year of education increases wages by 10%.
- True or False?
Q: How much more do workers with a college education earn?

Exhibit 2-3 Average Annual Earnings of 30-Year-Old Americans by Education Level (2013 data)
How much higher is the wage for college graduates than for high school graduates?

- College = $51,780
- High School = $32,941
- College results in a wage that is 57% higher.

$$\frac{51,780}{32,941} = 1.57$$

- Model predicted 46%. Is that close enough?
- If college graduates earn, on average, $51,780/year, does that mean that all college graduates earn that much?
Argument by Anecdote

- How does Bill Gates’ level of education affect his income?
Exhibit 2-4 Annual Earnings of Two 30-Year-Old Americans by Education Level
2.2 Causation and Correlation

The Red Ad Campaign Blues

- Sales go up 25% during campaign with lots of images at Walmart.
- Does red ad *cause* sales increase?
- The red-themed campaigns were mostly concentrated during the Christmas season.
Causation versus Correlation

• **Causation** occurs when one thing directly affects another.
  • Example: pulling an all-nighter will make you tired.

• **Correlation** means that there is a mutual relationship between two things.
  • Positive correlation— they both change in the same direction
  • Negative correlation— they change in opposite directions
  • Example: shorter skirt lengths are associated with good economic conditions
Why isn’t correlation the same thing as causality?

1. Omitted variables
If we ignore something that contributes to cause and effect, then that something is an omitted variable. A correlation might not make sense until the omitted variable is added.

Exhibit 2.5 An Example of an Omitted Variable

The amount of red content in Walmart’s ads is positively correlated with the growth of Walmart’s revenue. In other words, when ads are red-themed, Walmart’s month-over-month sales revenue tends to grow the fastest. However, the redness does not cause Walmart’s revenue to rise. The Christmas season causes Walmart’s ads to be red and the Christmas season also causes Walmart’s sales revenue to rise. The Christmas season is the omitted variable that explains the positive correlation between red ads and revenue growth.
2. Reverse causality
Reverse causality is when there is cause and effect, but it goes in the opposite direction as what we thought.
Example: gambling and healthier older people
Experimental Economics and Natural Experiment

How can we tell the difference between causality and correlation? Experiments

1. Controlled = subjects are randomly put into treatment (something happens) and control (nothing happens) groups by the researcher.
   - Problem: difficult to do with economics studies

2. Natural = subjects end up in treatment or control groups due to something that is not purposefully determined by the researcher.
Q: How much do wages increase when an individual is compelled by law to get an extra year of schooling

In 1947, the U.K. raised the minimum drop-out age from 14 to 15. (An natural experiment)

- Those students reaching age 14 before 1947 = control group
- Those students reaching age 14 in 1947 or after = treatment group
2.3 Economic Questions and Answers

Two properties of a good economic question:

- Relevant and important
  Economic research contributes to social welfare.
- Can be answered
  Economic questions can be answered empirically.
Appendix: Constructing and Interpreting Graphs

- A well-designed graph summarizes information with a simple visual display.
- The old adage “a picture is worth a thousand words”.
A Study About Incentives

- Would you study harder for this economics class if we paid you $50 for earning an A? What if we raised the stakes to $500?
- Sally Sadoff, Steven Levitt, and John List carried out an experiment at two high schools in the suburbs of Chicago over the past several years in which they used incentives to change students’ behavior.
- How an increase in a financial reward affects student test scores.
Experimental Design

- There are two high schools in Chicago Heights, and both have a problem with student dropouts.

- Each student was randomly placed into one of the following three groups:
  - **Control Group**: No students received financial compensation for meeting special standards established by experimenters (which are explained below).
  - **Treatment Group with Student Incentives**: Students would receive $50 for each month the standards were met.
  - **Treatment Group with Parent Incentives**: Students’ parents would receive $50 for each month the standards were met.
A student was deemed to have met the monthly standards if he or she:

1. did not have a D or F in any classes during that month,
2. had no more than one unexcused absence during that month,
3. had no suspensions during that month.
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Describing Variables

Pie Charts

Exhibit 2A.1 Chicago Heights Experiment Participants by Race
Bar Charts

Exhibit 2A.2 Proportion of Students Meeting Academic Standards by Experimental Group
Time Series Graphs

Exhibit 2A.3 Participants Meeting All Standards by Month
Scatter Charts

Exhibit 2A.4 Relationship Between Education and Earnings (New Jersey 2013)
Cause and Effect

- Paying money for the students’ performance causes them to improve their academic performance because Chicago Heights Experiment was implemented using the principle of randomization.

- The experimenters split students into groups randomly, so each experimental group had an equal representation of students and their attributes.

- Any difference between the groups’ academic performance at the end of the experiment was due to the difference the experimental treatment imposed, such as differences in financial incentives.
Correlation Does Not Imply Causality

Exhibit 2A.6 Ice Cream Cone Sales and Drownings