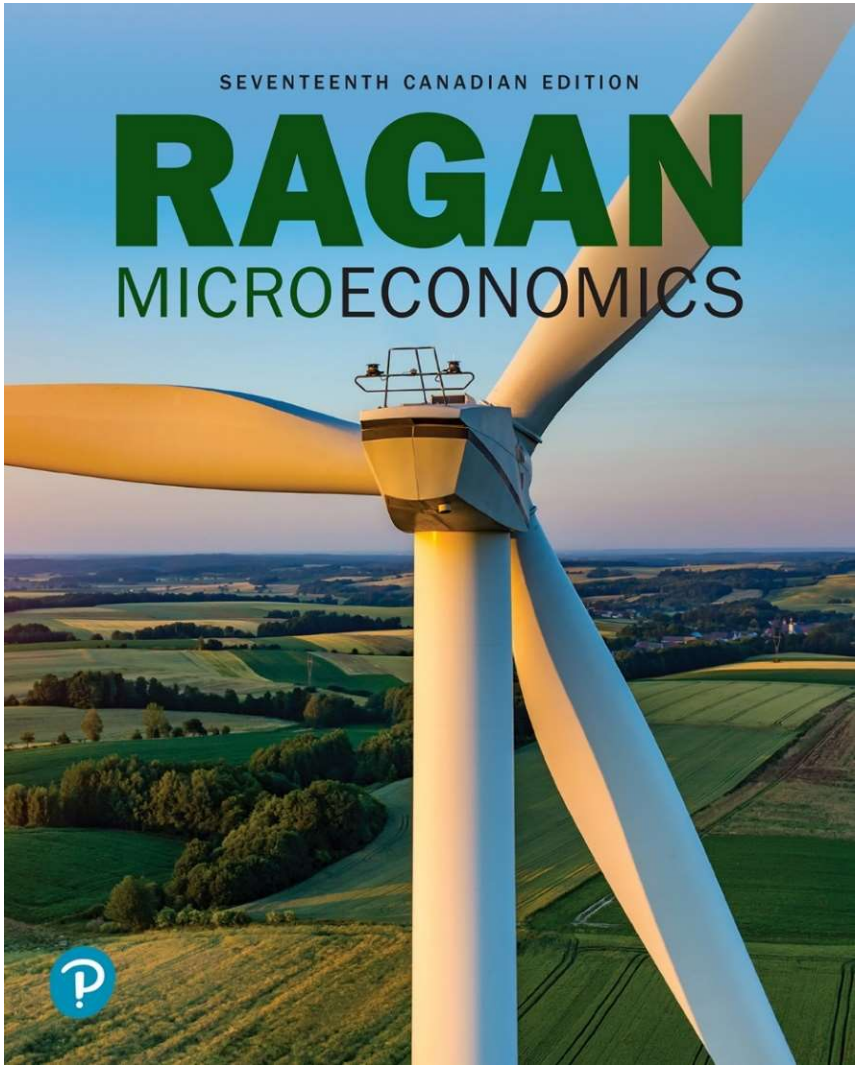
Ragan: Microeconomics

Seventeenth Canadian Edition



Chapter 2

Economic Theories, Data, and Graphs

Chapter Outline/Learning Objectives

Section	Learning Objectives
	After studying this chapter, you will be able to
2.1 – Positive and Normative Statements	1. distinguish between positive and normative statements.
2.2 – Building and Testing Economic Theories	2. explain why and how economists use theories to help them understand the economy. 3. understand the interaction between economic theories and empirical observation.
2.3 – Economic Data	4. identify several types of economic data, including index numbers, time-series and cross-sectional data, and scatter diagrams.
2.4 – Graphing Economic Theories	5. recognize the slope of a line on a graph relating two variables as the “marginal response” of one variable to a change in the other.

2.1 Positive and Normative Statements

- **Normative statements** depend on **value judgements** and cannot be evaluated solely by a recourse to facts.
  - A normative statement is about what ought to be.
- **Positive statements** do not involve value judgments. They are statements about matters of **fact**.
  - A positive statement is about what actually is, was, or will be.

Disagreements Among Economists

- Economists often disagree with each other in public discussions.
- Many public disagreements are based on the positive/normative distinction.
- A responsible economist states clearly which part of proffered advice is normative and what part is positive.

Applying Economic Concepts 2-1

- **Where Economists Work**
  - The skills of economists are demanded in many parts of the economy by:
    - Governments
    - private businesses
    - crown corporations
    - non-profit organizations
    - post-secondary schools
  - Economists design methods to analyze and evaluate government policies, examine global economic risks to economic growth, etc.

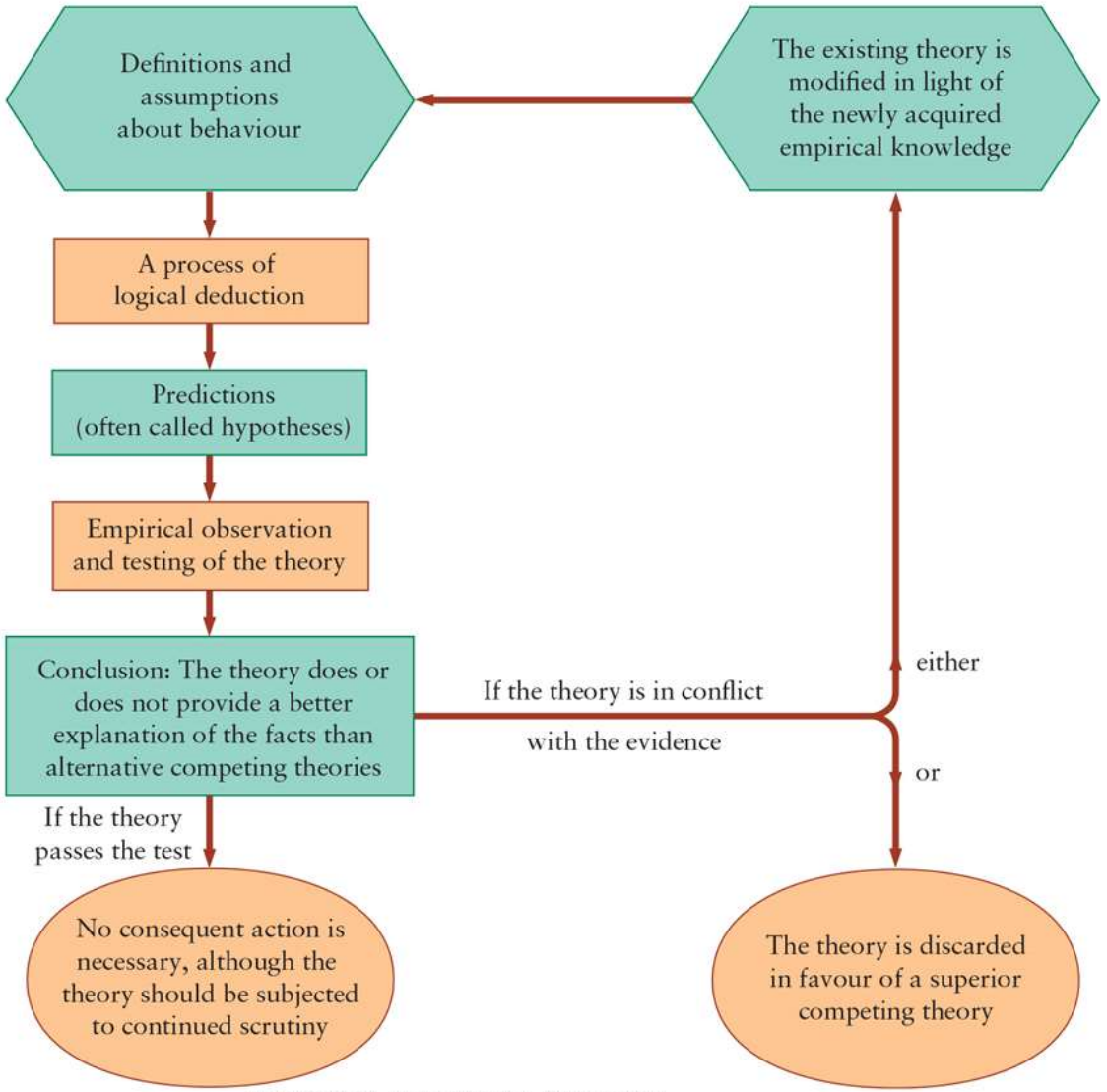
2.2 Building and Testing Economic Theories

- **What Are Theories?**
  - A theory is an abstraction from reality.
  - A theory consists of:
    - Variables – can take on various specific values
      - *Endogenous* or *dependent* variables can be explained within a theory
      - *Exogenous* or *independent* variables are outside the theory.
    - Assumptions
    - Predictions

Testing Theories

- A theory is tested by confronting its predictions with **evidence**.
- If a theory is in conflict with facts, it will usually be amended to make it consistent with those facts, or it will be discarded to be replaced by a superior theory.
- The **scientific approach** is central to the study of economics.

Figure 2-1 The Interaction Between Theory and Empirical Observation



Statistical Analysis

- Used to test a hypothesis such as “if X occurs, then Y will also happen.”
- Economists must use millions of “uncontrolled” experiments going on every day in the marketplace.
- The variables that interest economists are generally influenced by many forces that vary simultaneously.
- The analysis of such data requires the use of appropriate—and complex—statistical techniques.

Correlation versus Causation

- **Positive correlation** means only that X and Y move together, in the **same direction**.
- **Negative correlation** means that X and Y move in **opposite directions**.
  - A finding that X and Y are correlated is not direct evidence of a causal relationship.
  - Most economic predictions involve causality. Establishing causality usually requires advanced statistical techniques.

Applying Economic Concepts 2-2

Can Economists Design Controlled Experiments to Test Their Theories?

- Economists are usually interested in causal relationships in data.
- Economists generally lack the ability to set up controlled experiments necessary to find cause.
- In recent years some economists have begun adopting techniques that have been used in medical field – *randomized controlled trials* (RCT)
- RCT approach helps determine underlying causality among economic variables.

2.3 Economic Data

- **Index Numbers**
  - An index number is a measure of some variable, conventionally expressed relative to a **base** period, which is assigned the value 100.
  - The most common index number is the *Consumer Price Index* (CPI) – the price of the average price paid by consumers for typical "basket" of goods and services.

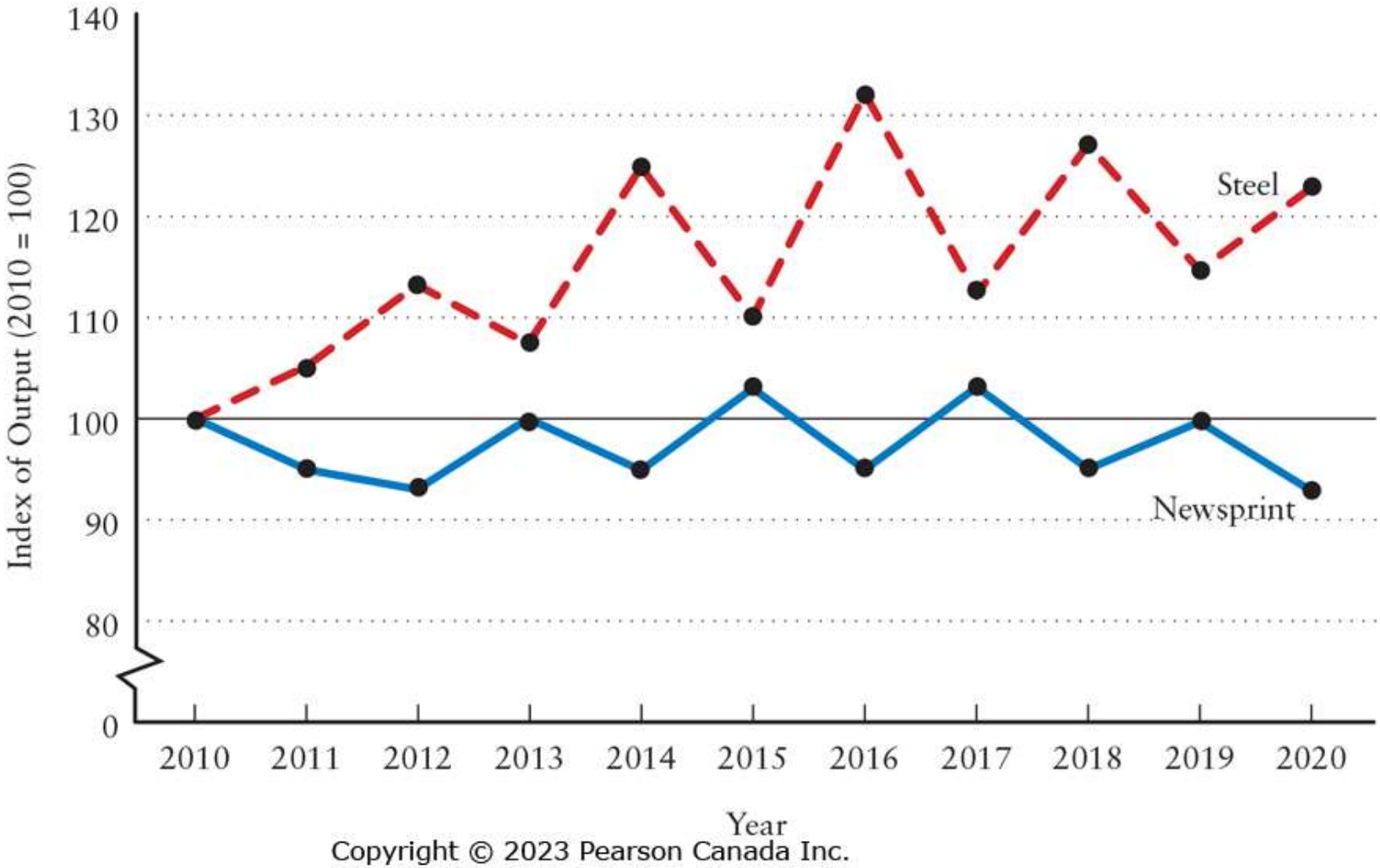
$$\text{Value of index in given period} = \frac{\text{Absolute value in given period}}{\text{Absolute value in base period}} \times 100$$

Table 2-3 Constructing Index Numbers

	Steel			Newsprint		
Year	Procedure		Index	Procedure		Index
2010	(200/200) × 100	=	100.0	(3200/3200) × 100	=	100.0
2011	(210/200) × 100	=	105.0	(3100/3200) × 100	=	96.9
2012	(225/200) × 100	=	112.5	(3000/3200) × 100	=	93.8
2013	(215/200) × 100	=	107.5	(3200/3200) × 100	=	100.0
2014	(250/200) × 100	=	125.0	(3100/3200) × 100	=	96.9
2015	(220/200) × 100	=	110.0	(3300/3200) × 100	=	103.1
2016	(265/200) × 100	=	132.5	(3100/3200) × 100	=	96.9
2017	(225/200) × 100	=	112.5	(3300/3200) × 100	=	103.1
2018	(255/200) × 100	=	127.5	(3100/3200) × 100	=	96.9
2019	(230/200) × 100	=	115.0	(3200/3200) × 100	=	100.0
2020	(245/200) × 100	=	122.5	(3000/3200) × 100	=	93.8

Index numbers are calculated by dividing the value in the given year by the value in the base year and multiplying the result by 100. The base period is chosen to be 2010. The 2020 index number for steel tells us that steel output in 2020 was 22.5 percent greater than in the base year. The 2020 index number for newsprint tells us that newsprint output in 2020 was 93.8 percent of the output in the base year, 2010.

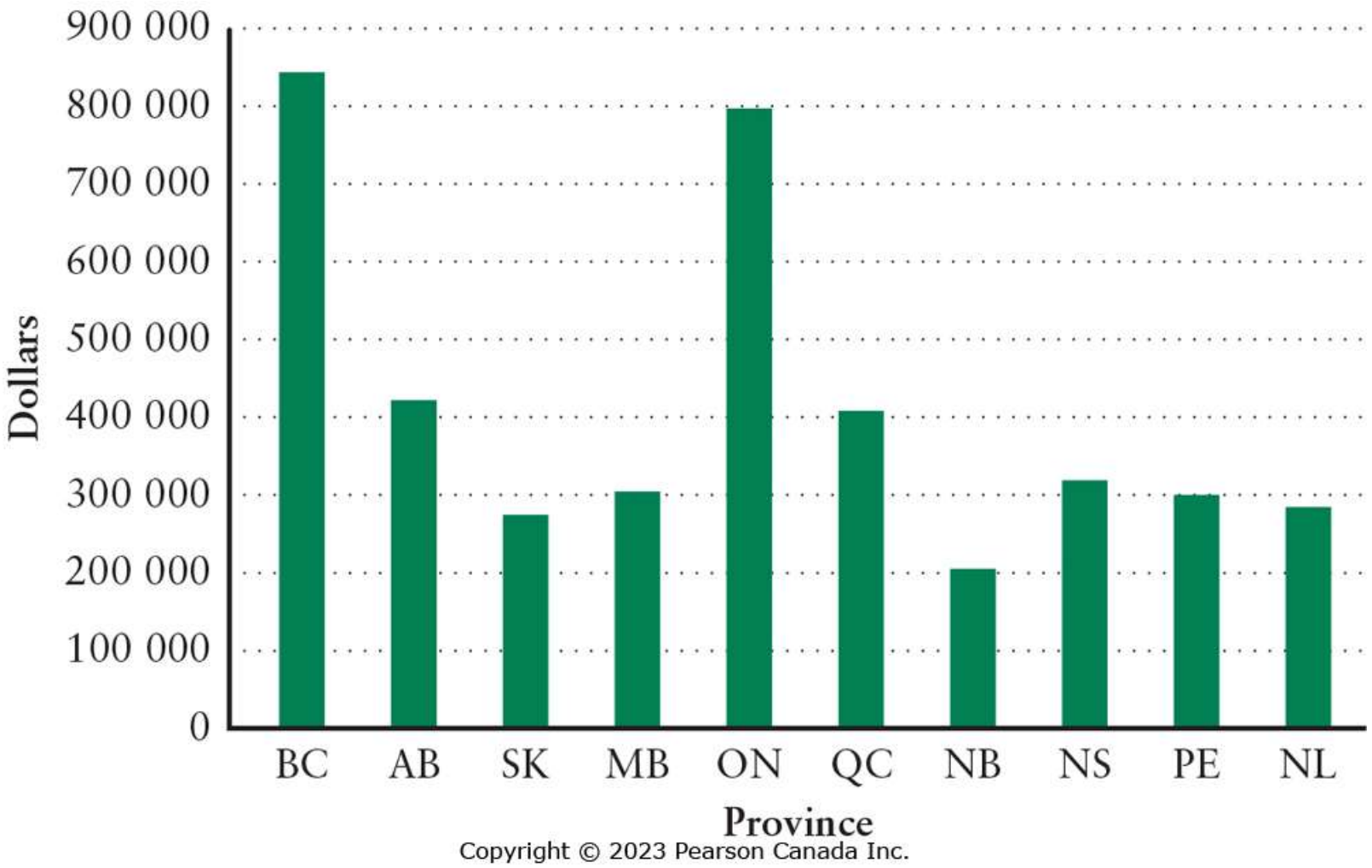
Figure 2-2 Index Values for Steel and Newsprint Output



Graphing Economic Data

- A single economic variable, such as unemployment, national income, or the average price of a house, can come in two basic forms:
  - **Cross-sectional data**
  - **Time-series data**
- Another way to represent data is with a scatter diagram.
  - A graph showing two variables, one measured on each axis.
  - Each point represents the values of the variables for a particular unit of observation.

Figure 2-3 A Cross-Sectional Graph of Average House Prices for 10 Canadian Provinces, 2021



(*Source:* Adapted from MLS® Statistics © 2021 The Canadian Real Estate Association; www.crea.ca/housing-market-stats/national-price-map)

Figure 2-4 A Time-Series Graph of the Canadian Unemployment Rate, 1978–2021

(*Source:* Annual average of monthly, seasonally adjusted data from Statistics Canada, CANSIM Table 282-0087; both sexes, 15 years and over)

2.4 Graphing Economic Theories

When one variable, X, is related to another variable, Y, in such a way that to every value of X there is only one possible value of Y, we say that Y is a function of X: Y = f(X)

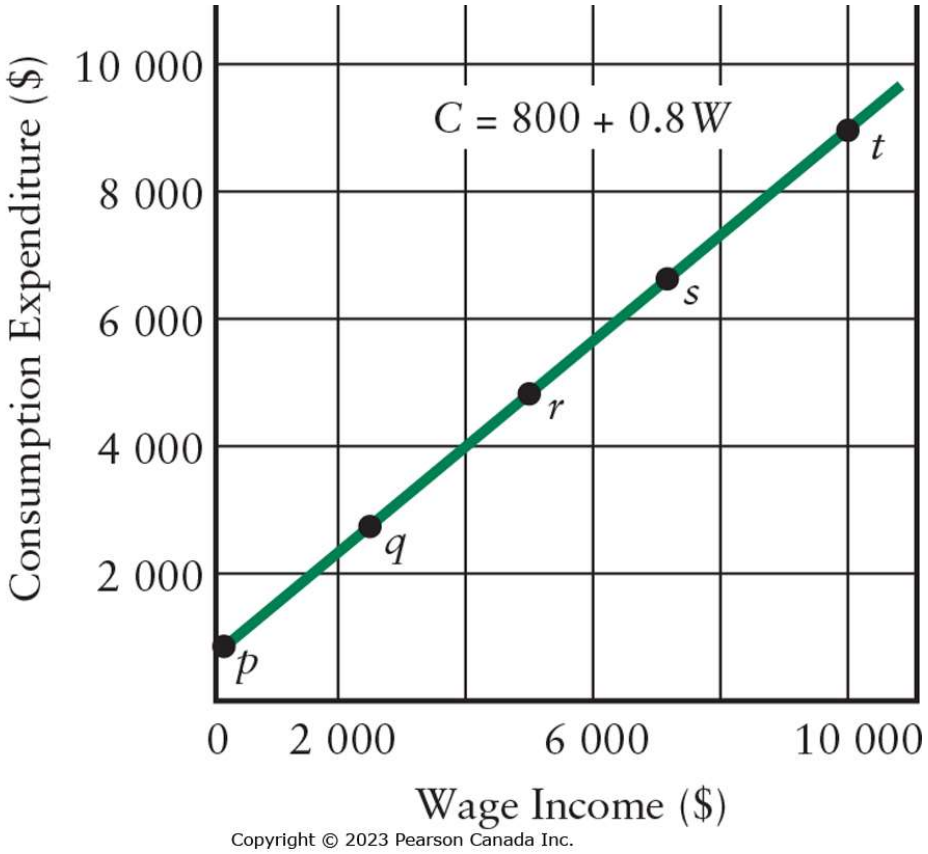
- A function can be expressed:
  - in a verbal statement
  - in a numerical schedule (a table)
  - in a mathematical equation
  - in a graph

Example:

When W (wage income) is zero, consumption is $800 a year. For every extra $1 of wage income the person will increase consumption by 80 cents : ***C = $800 + 0.8W***

C = f(W) – consumption is a function of wage income

Figure 2-6 Income and Consumption



Wage Income (w)	Consumption (C)	Reference Letter
$0	$800	*p*
2 500	2 800	*q*
5 000	4 800	*r*
7 500	6 800	*s*
10 000	8 800	*t*

Graphing Functions

- When two variables move together, the variables are *positively related*.
- When two variables move in opposite directions, the variables are *negatively related*.
- If the graphs of these relationships are straight lines, the variables are *linearly related* to each other.
- A function that is not graphed as a straight line is a non-linear function.

The Slope of a Straight Line

- The **slope** of a straight line is calculated as $\Delta P/\Delta E$
- Between points A and B it costs \$2000 to reduce pollution by 1000 tonnes:
  - $\Delta P = -1000$ (-1 unit decrease)
  - $\Delta E = 2000$ ($+2$ unit increase)
- The slope of the line, therefore, is -0.5 at any point on the line

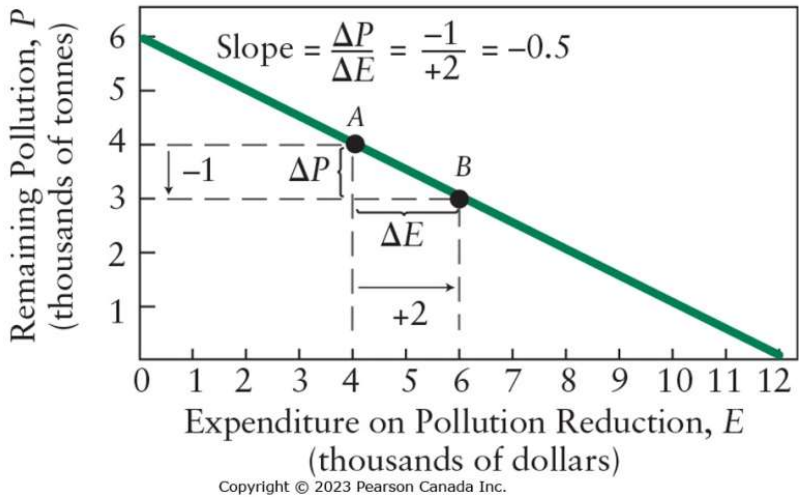


Figure 2-7 Linear Pollution Reduction

Non-Linear Functions (1 of 2)

- For non-linear functions, the slope of the curve changes as X changes. Therefore, the marginal response of Y to a change in X depends on the value of X.
- This figure illustrates **diminishing marginal response**.

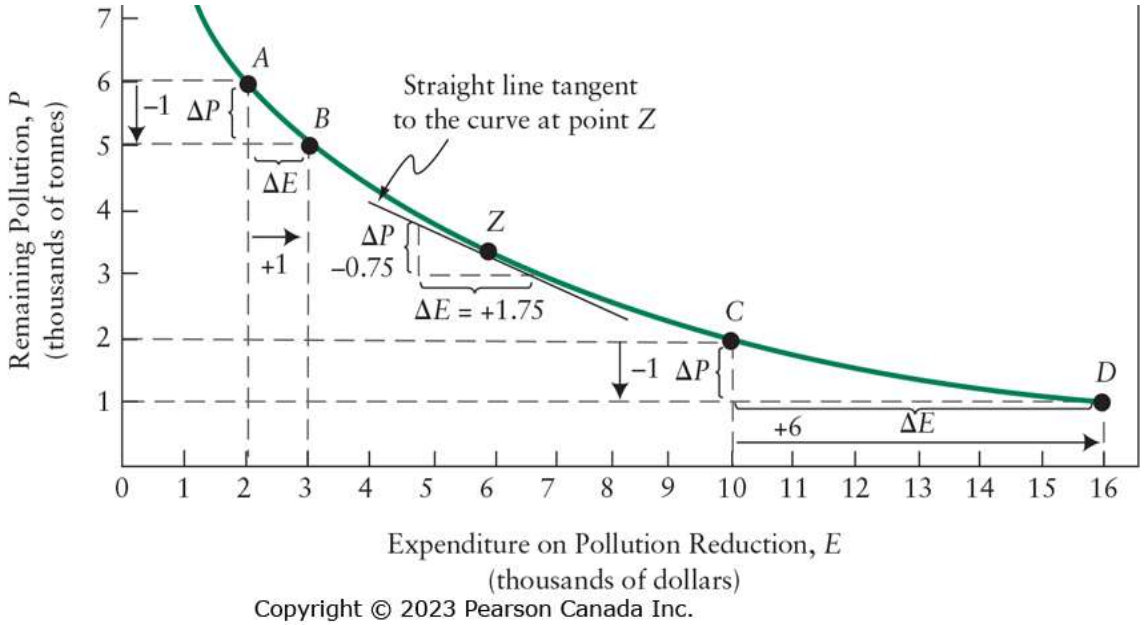


FIGURE 2-8 Non-linear Pollution Reduction

Non-Linear Functions (2 of 2)

- This figure illustrates **increasing marginal cost**

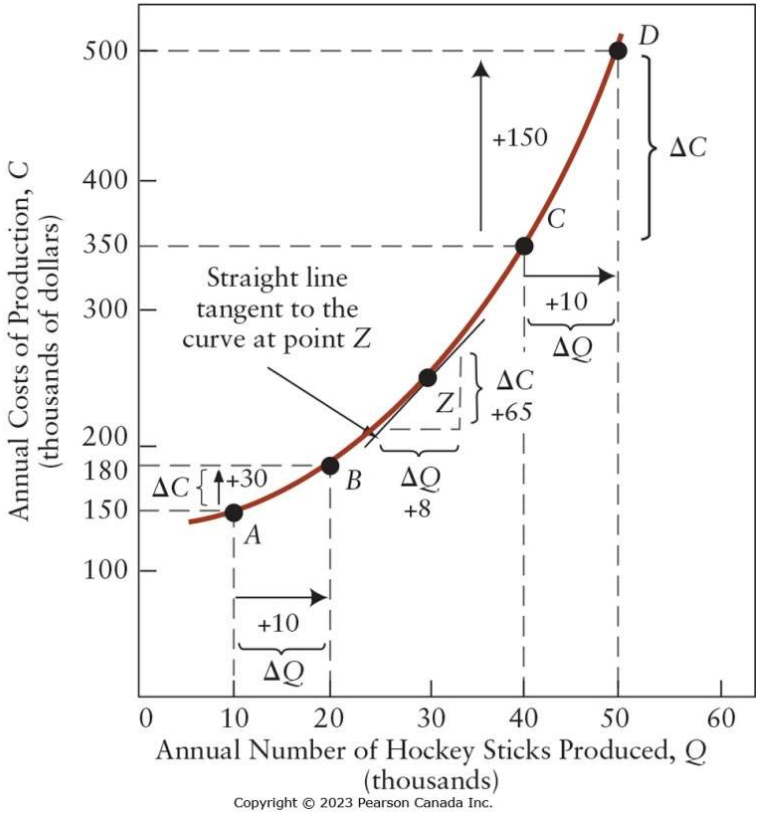


Figure 2-9 Increasing Marginal Production Costs

Functions with a Minimum or Maximum

A Function with Maximum

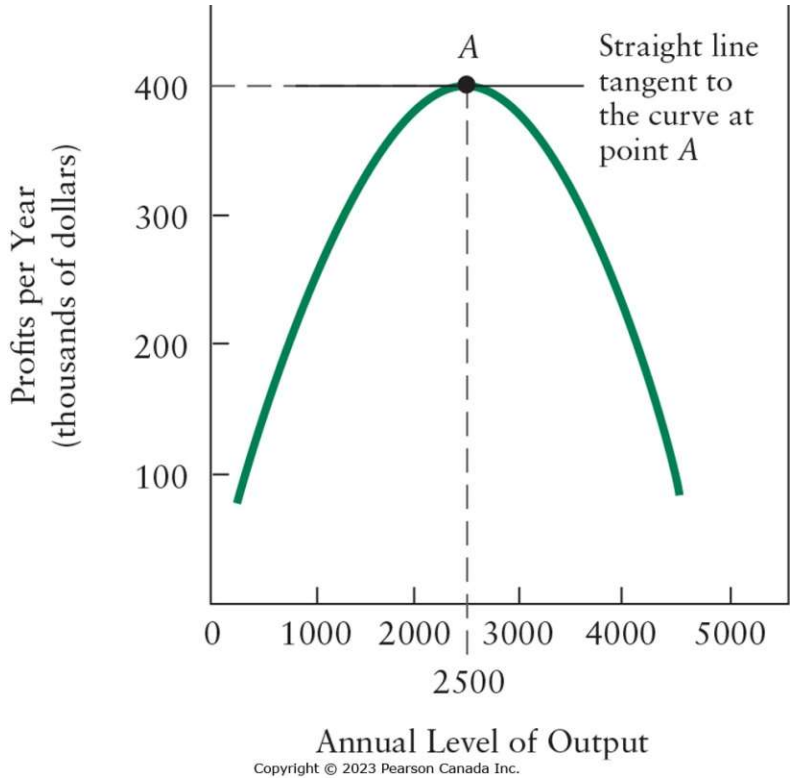


Figure 2-10 Profits as a Function of Output

A Function with Minimum

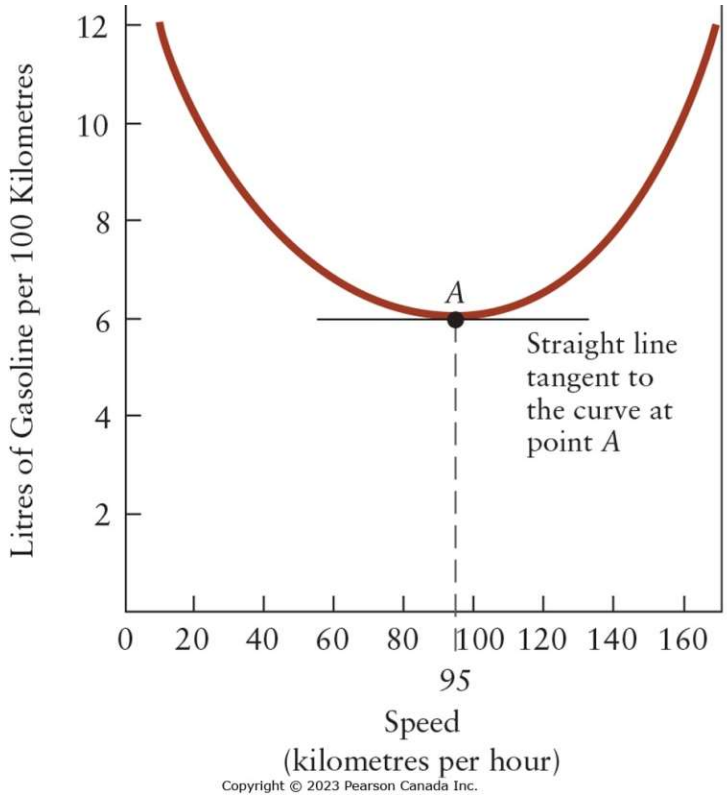


Figure 2-11 Average Fuel Consumption as a Function of Speed

A Final Word

- We have discussed why economists develop theories (or models) to help them understand economic events in the real world.
- We have discussed how they test their theories and how there is a continual back-and-forth process between empirical testing of predictions and refining the theory.
- Finally, we have explored the many ways data can be displayed in graphs and how economists use graphs to illustrate their theories.