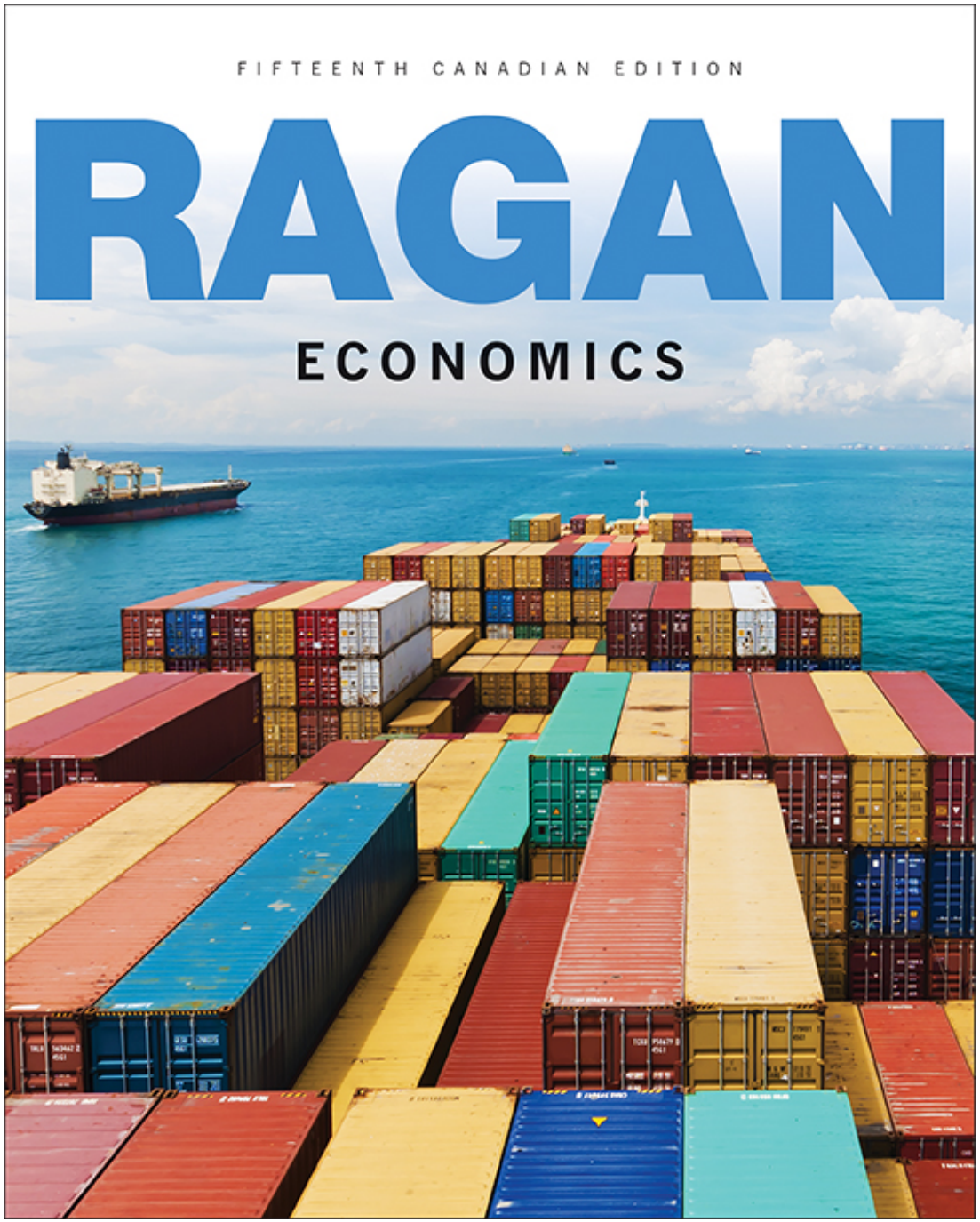


Chapter 2:
Economic Theories, Data, and Graphs

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. see that the slope of a line on a graph relating two variables shows the "marginal response" of one variable to a change in the other.

2.1 Positive and Normative Statements

Normative statements depend on value judgments and opinions—they cannot be settled by recourse to facts.

e.g. The government ought to try harder to reduce unemployment.

Positive statements do not involve value judgments. They are statements about what is, was, or will be.

e.g. An effective way to reduce unemployment is to reduce unemployment insurance benefits.

Positive statements (table 2-1)

Raising interest rates encourages people to save.

High rates of income tax encourage people to evade paying taxes.

Lowering the price of tobacco leads people to smoke less.

The majority of the population would prefer a policy that reduced unemployment to one that reduced inflation.

Normative statements (table 2-1)

People should be encouraged to save.

Governments should arrange taxes so that people cannot avoid paying them.

The government should raise the tax on tobacco to discourage people from smoking.

Unemployment is a more important social problem than inflation.

Disagreements Among Economists

Economists often disagree with each other in public discussions—often because of poor communication or failure to acknowledge the full state of their ignorance.

Perhaps the biggest source of public disagreement is based on the positive/normative distinction.

Economists must differentiate normative proffered advice from positive facts.

Poor communication: How would you test each of the following assertions?

Free-market economic systems are the best in the world.

'best'? Highest income per capita? Greatest equality? Growth rate?

Laws requiring equal pay for work of equal value will make women better off.

'better off'? Wages? Unemployment?

2.2 Building and Testing Economic Theories

Theories

Theories are constructed to explain things.

e.g. what determines quantity/price of eggs bought and sold this month in Montreal. We can use theories of demand and supply

A theory consists of:

- a set of definitions about **variables**; endogenous, exogenous.
- a set of **assumptions**; motives, causation, applicability unrealistic?
- a set of **predictions** (or **hypotheses**).

Identify the endogenous and exogenous variables

1. The amount of rainfall on the Canadian prairies determines the amount of wheat produced in Canada.
2. When the world price of coffee increases, there is a change in the price of your cup of coffee at Tim Hortons.
3. If student loans were no longer available, there would be fewer students attending university.
4. An increase in the tax on gasoline leads people to drive more fuel-efficient vehicles.

Discuss some situation in which each of these assumptions might be a useful simplification

1. Earth is flat
2. There are only two periods: this year and next year
3. A country produces only two types of good
4. People are wholly selfish

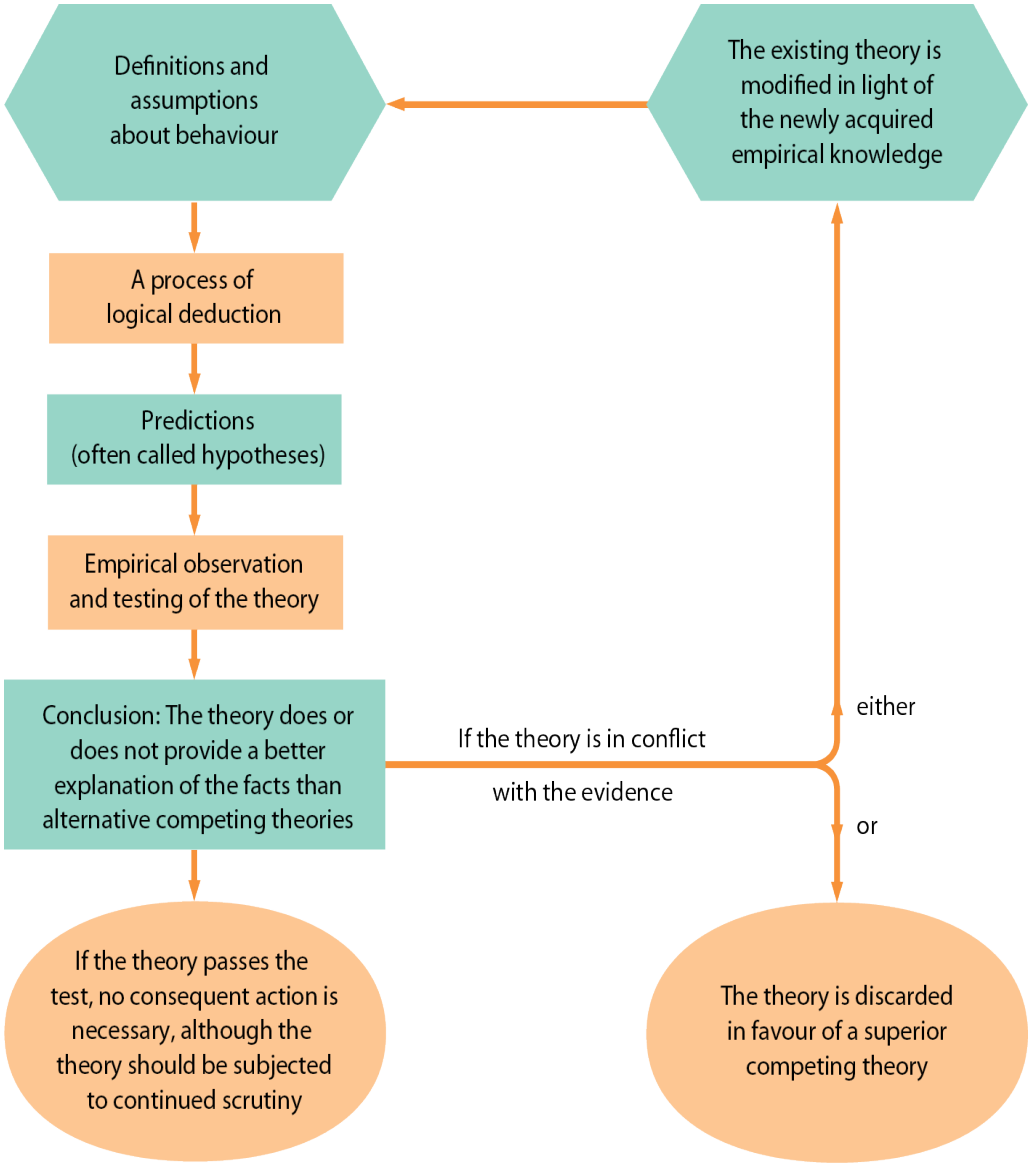
Testing Theories

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.

Fig. 2-1 The Interaction Between Theory and Empirical Observation



Rejection Versus Confirmation

A hypothesis can be tested and may be **rejected** by the data. This rejection brings the value of the theory into question.

An alternative is to search for **confirming** evidence for a theory.

But no matter how unlikely the theory is, **some** confirming evidence can generally be found.

Rejection Versus Confirmation

Theory: Latitude maps directly into average temperature.

Prediction: average temperature in Montreal is similar to the South of France

But no matter how unlikely the theory is, some confirming evidence can generally be found. E.g: last week's weather

An alternative is to see if the hypothesis can be rejected by data. E.g. average temperature in January....

Statistical Analysis

Statistical analysis is used to test a hypothesis such as "if X increases, then Y will also increase."

Economists are compelled to use millions of "uncontrolled" experiments going on every day in the economy.

These activities can be observed and recorded continuously, producing a mass of data.

The analysis of such data requires the use of appropriate—and often quite complex—statistical techniques.

Correlation Versus Causation

Positive correlation means only that X and Y move together.

Negative correlation means that X and Y move in opposite directions.

- But X and Y may not be **causally** related. Or they may be related in the opposite way to what is expected—**reverse causality**.
- Most economic predictions attempt to establish causality. Statistical tests often attempt to distinguish between correlation and causality.

2.3 Economic Data

Economists use real-world observations: data collected by others, often government statisticians

After data are collected can be displayed in **tables** or using **graphs**

When interested in relative movements we will use **index numbers.**

E.g.: compare volume of output in the steel and newsprint industries.

Index Numbers

Used to compare changes in some variable relative to some **base period**.

$$\textit{Value of index in given period} = \frac{\textit{absolute value in given period}}{\textit{absolute value in base period}} \; X \; 100$$

Fig. 2-2 Index Values for Steel and Newsprint Output

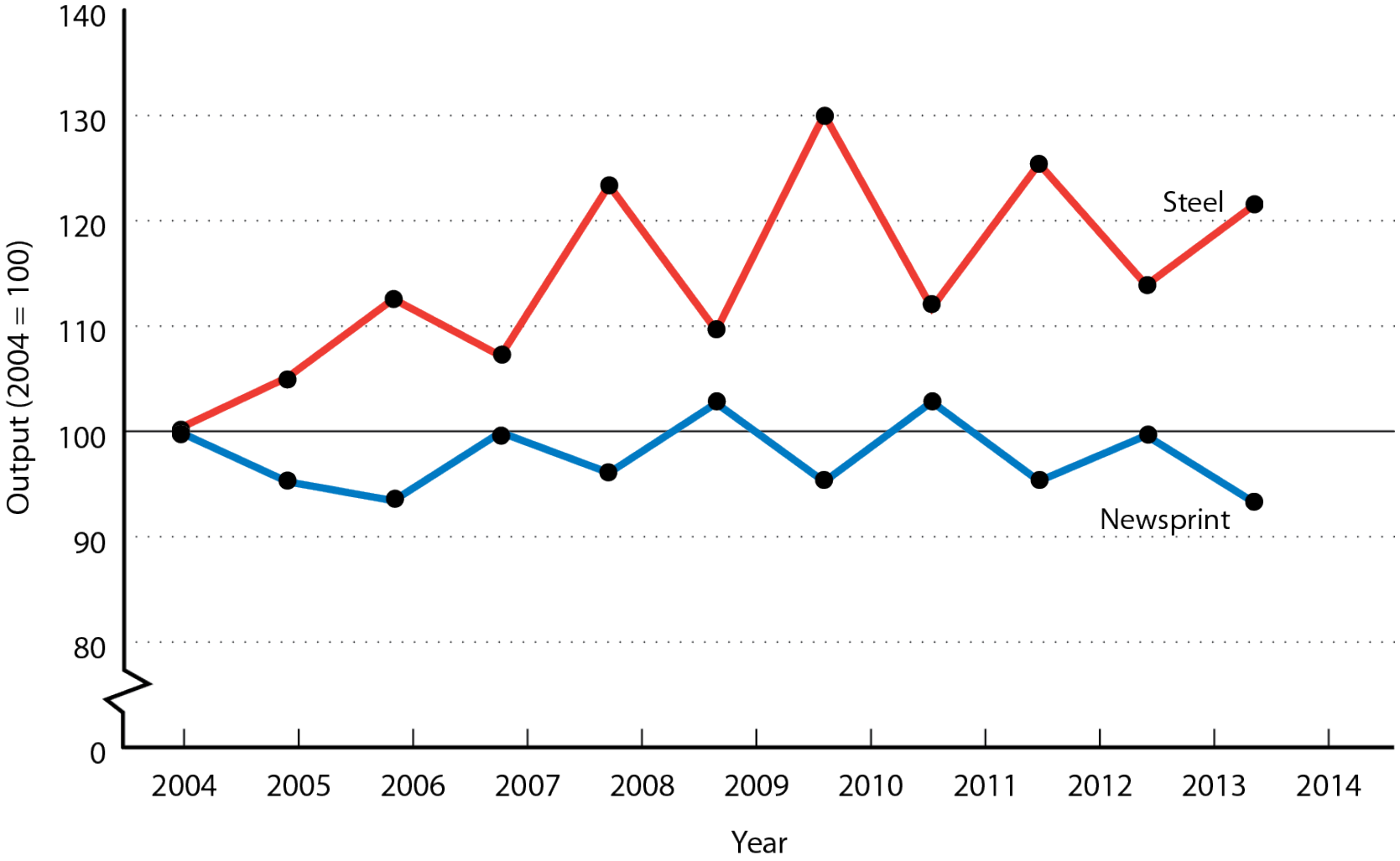


Fig. 2-2 **Index Values for Steel and Newsprint Output**

For each index number the value in the base year is 100.

Index Steel in 2011=115

that means that in 2011 the steel output was 15% greater than in 2004.

How much steel output changed from 2005 to 2008?

Index steel output in 2005=105

Index steel output in 2008=123

Percentage increase: (123-105)/105=0.17, or 17%

Index Values: Physics textbook price index

year	price ($)	Physics textbook price index
2010	85	
2011	90	
2012	105	
2013	107	
2104	110	

Index Values: Physics textbook price index

year	price ($)	Physics textbook price index
2010	85	(85/85)*100 = 100
2011	90	(90/85)*100 = 105.9
2012	105	(105/85)*100 = 123.5
2013	107	(107/85)*100 = 125.9
2104	110	(110/85)*100 = 129.4

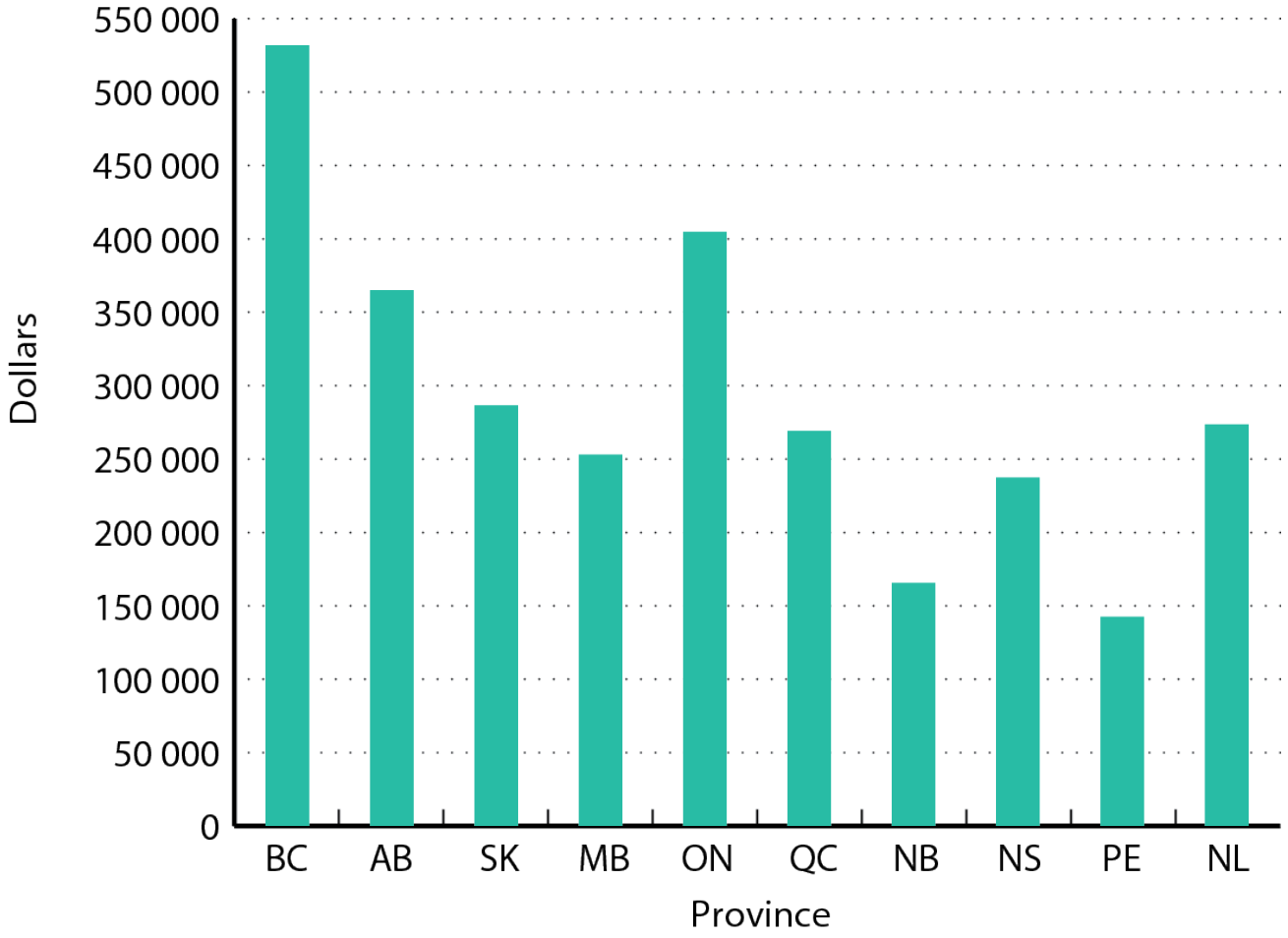
Graphing Economic Data

Economic variables usually come in two basic forms:

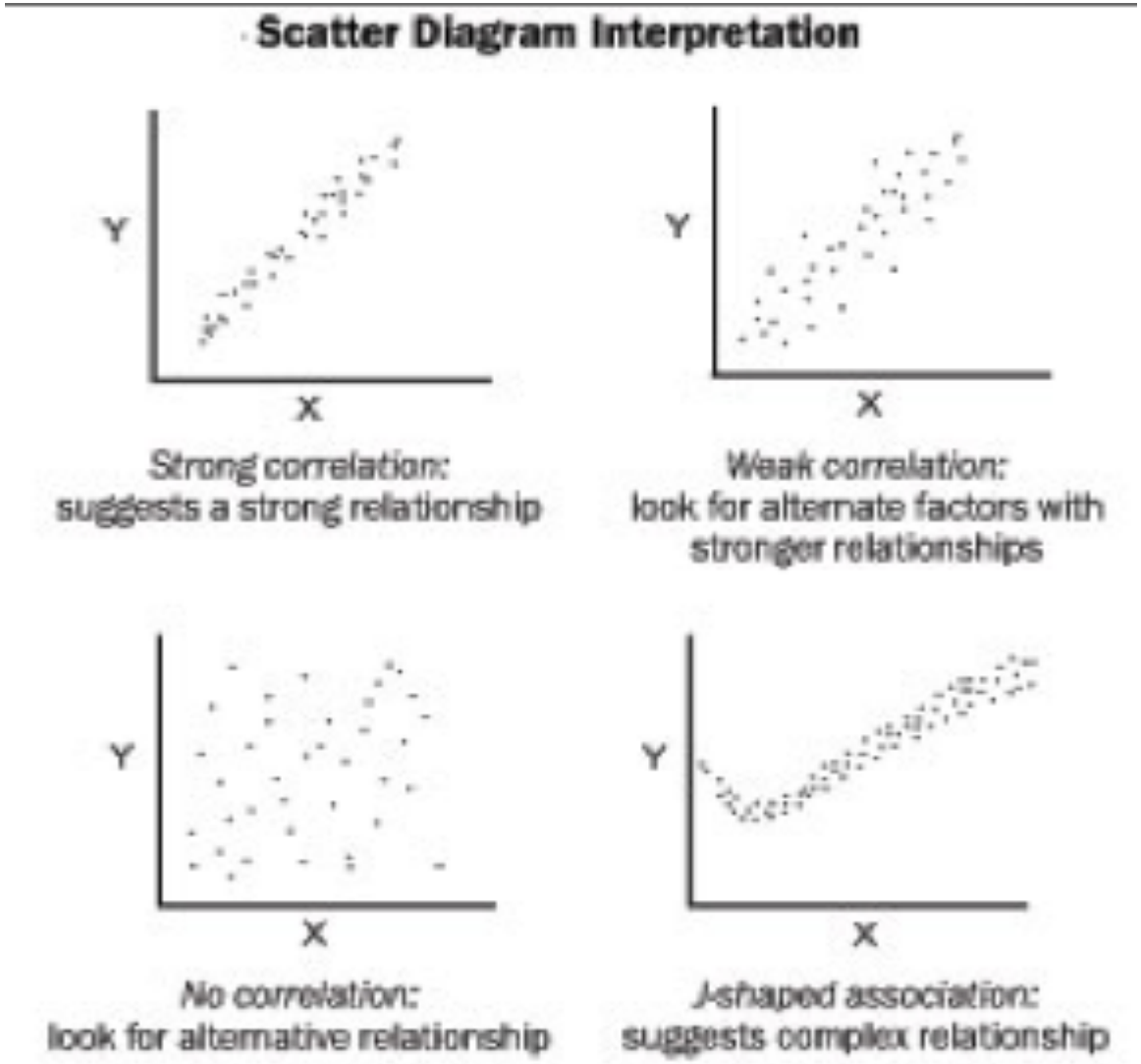
- **Cross-sectional data**
- **Time-series data**

A **scatter diagram** is a useful and common way of looking at the relationship between two variables.

Fig. 2-3 **A Cross-Sectional Graph of Average House Prices for Ten Canadian Provinces, 2012**



Scatter-diagram



What would be the appropriate graph: Canada's prime interest rate in 2008

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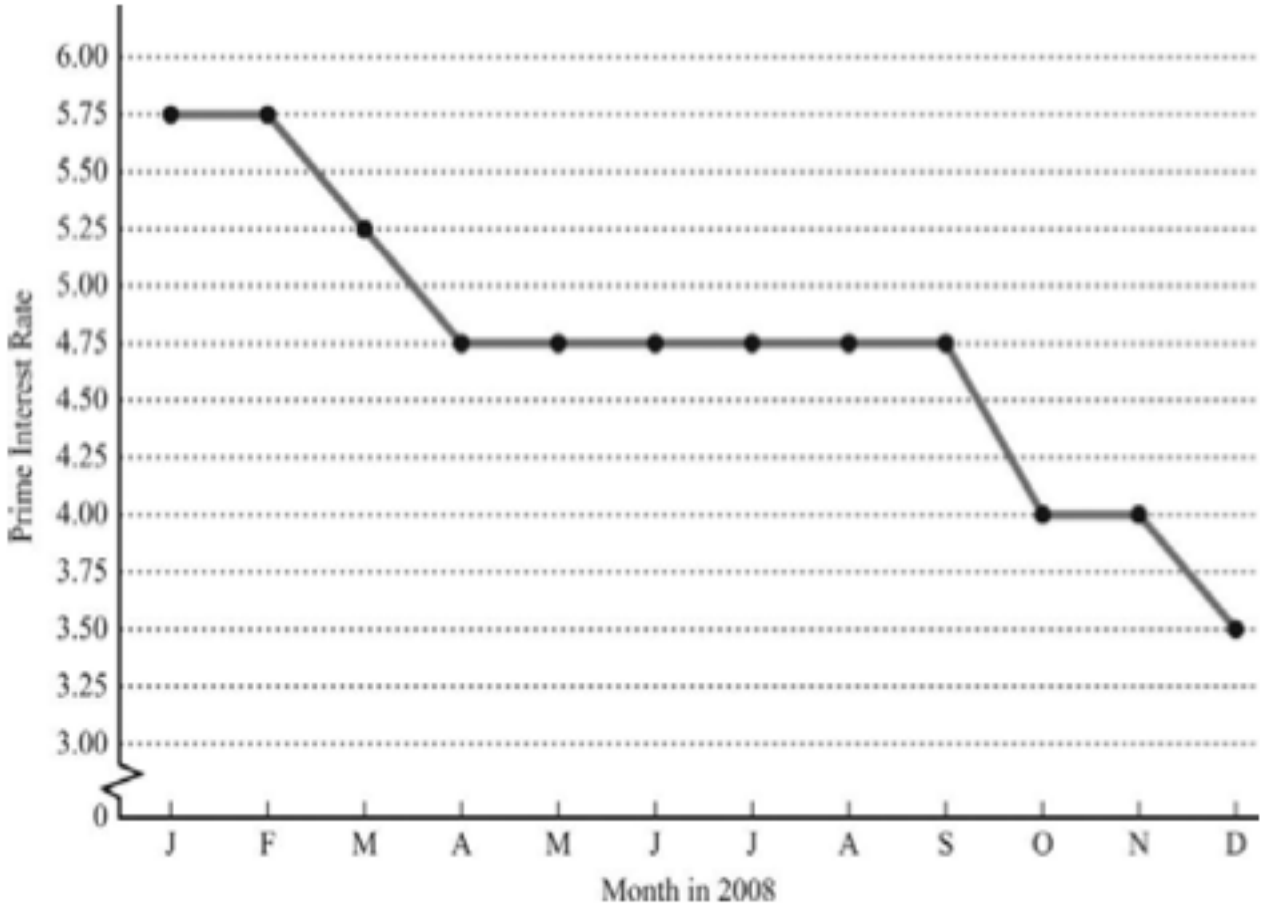

What would be the appropriate graph: average household expenditures across provinces and territories in 2007

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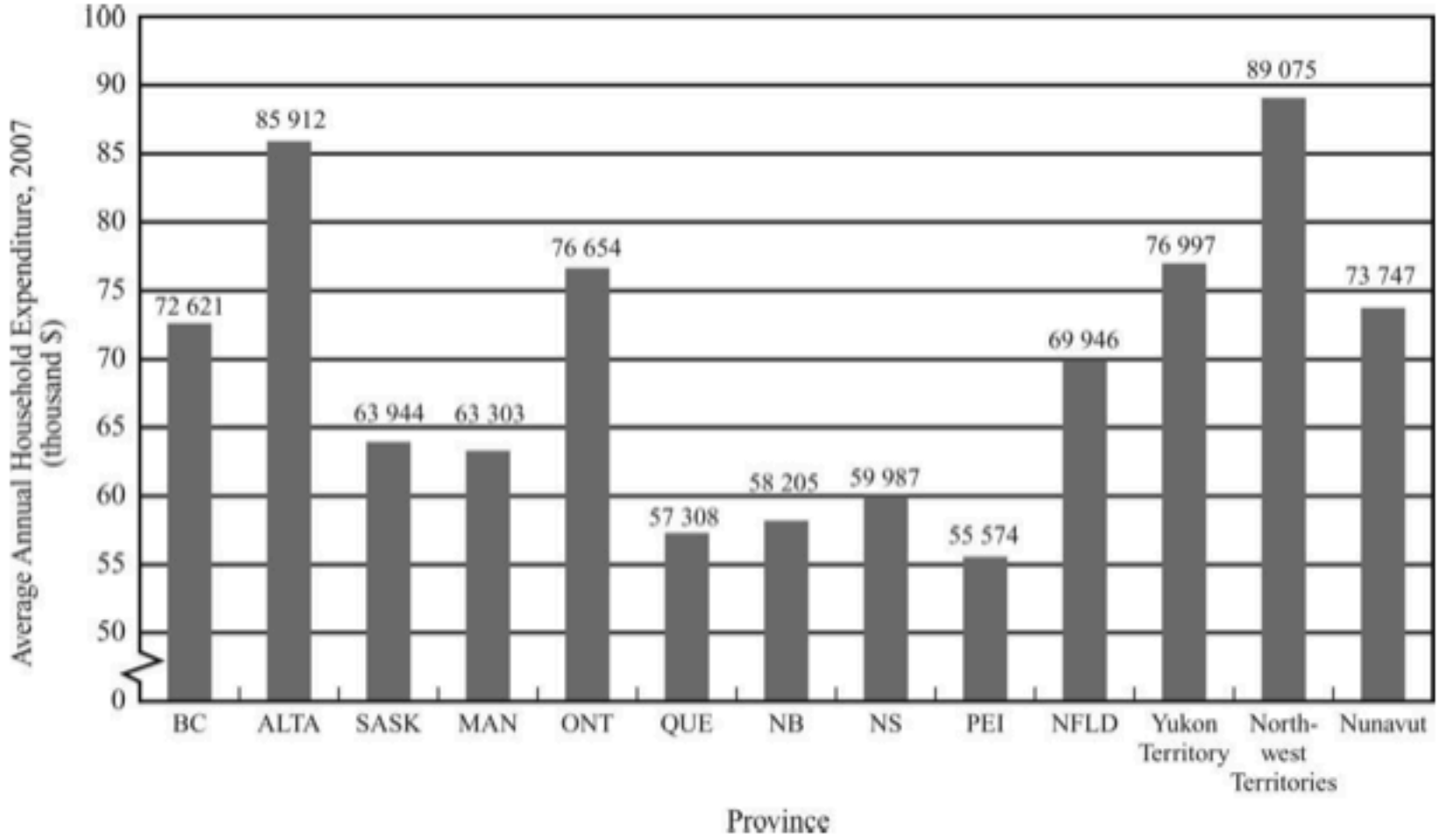

What would be the appropriate graph:
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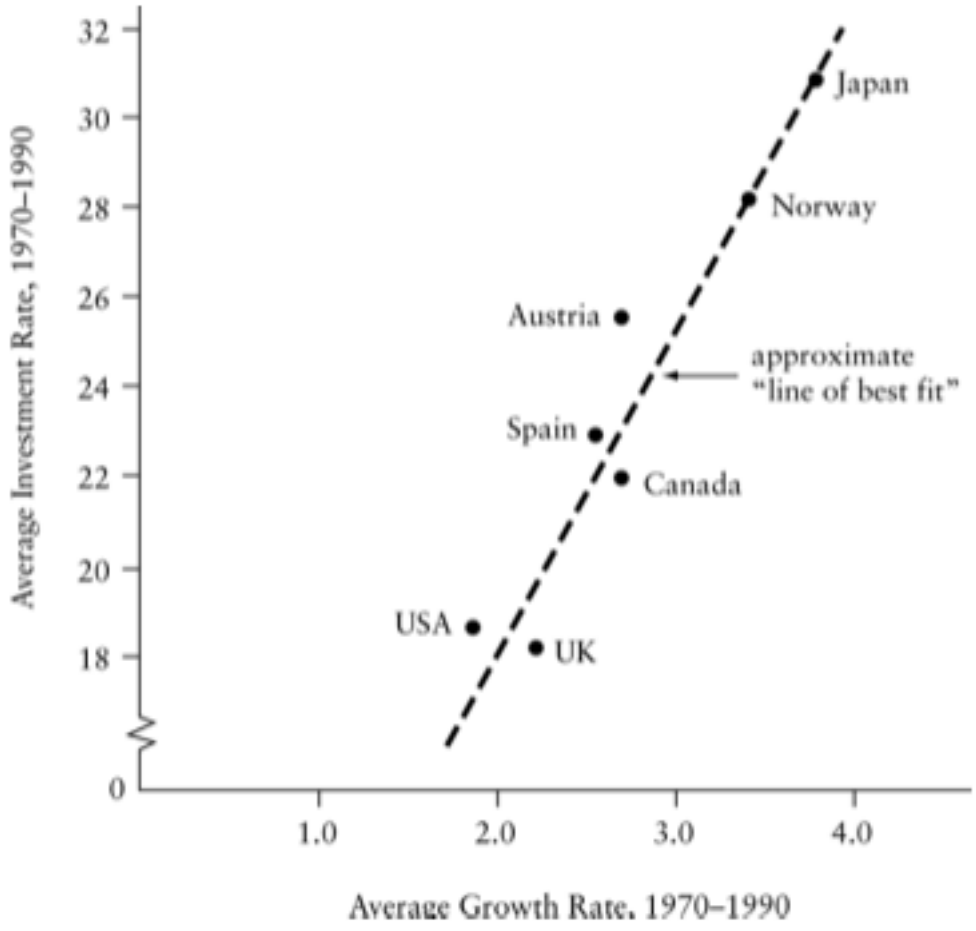


2.4 Graphing Economic Theories

A **functional relation** can be expressed:

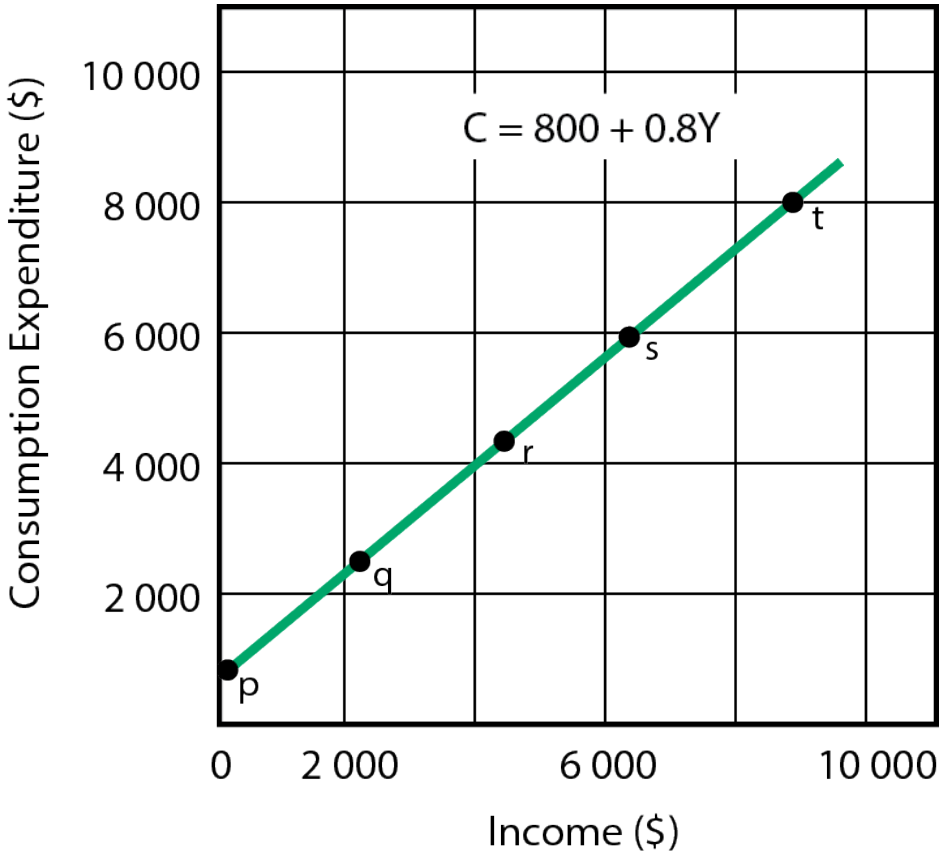
- in a verbal statement
- in a numerical schedule (a table)
- in a mathematical equation
- in a graph

Example:

When income is zero, the person will spend $800 a year, and for every extra $1 of income the person will increase expenditure by 80 cents.

$$C = \$800 + 0.8Y$$

Fig. 2-6 Income and Consumption



Annual Income	Consumption	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*

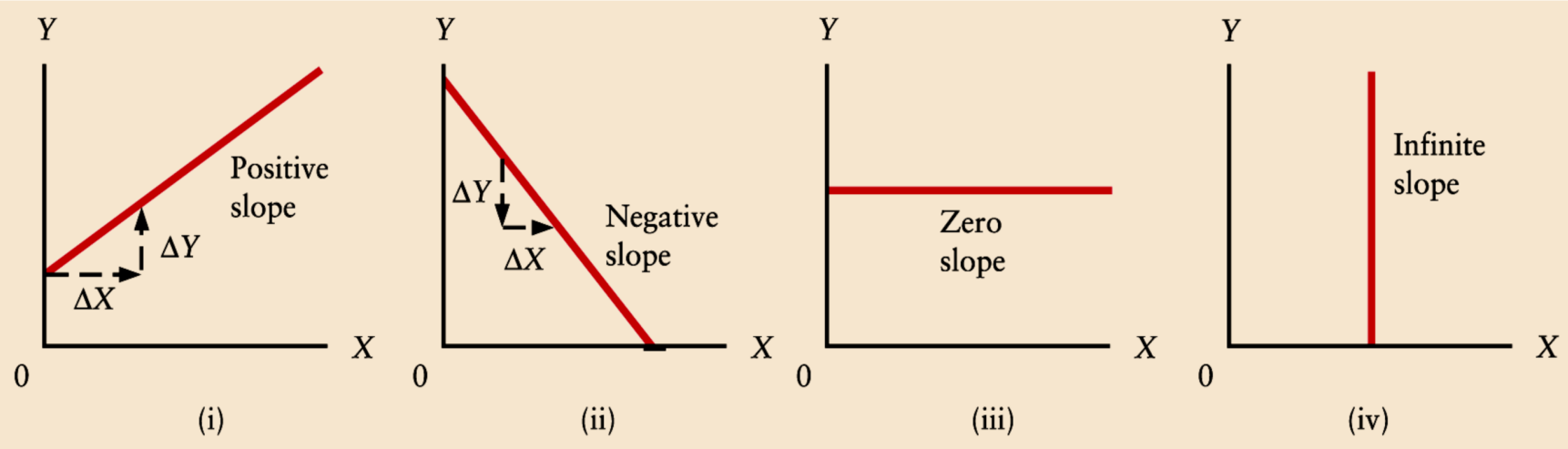
Graphing Functional Relations

The relationship between two variables may be **positive** or **negative**.

If the graphs of these relationships are straight lines, the variables are **linearly related** to each other.

Otherwise, variables are said to be **non-linearly related**.

Four Linear Relationships

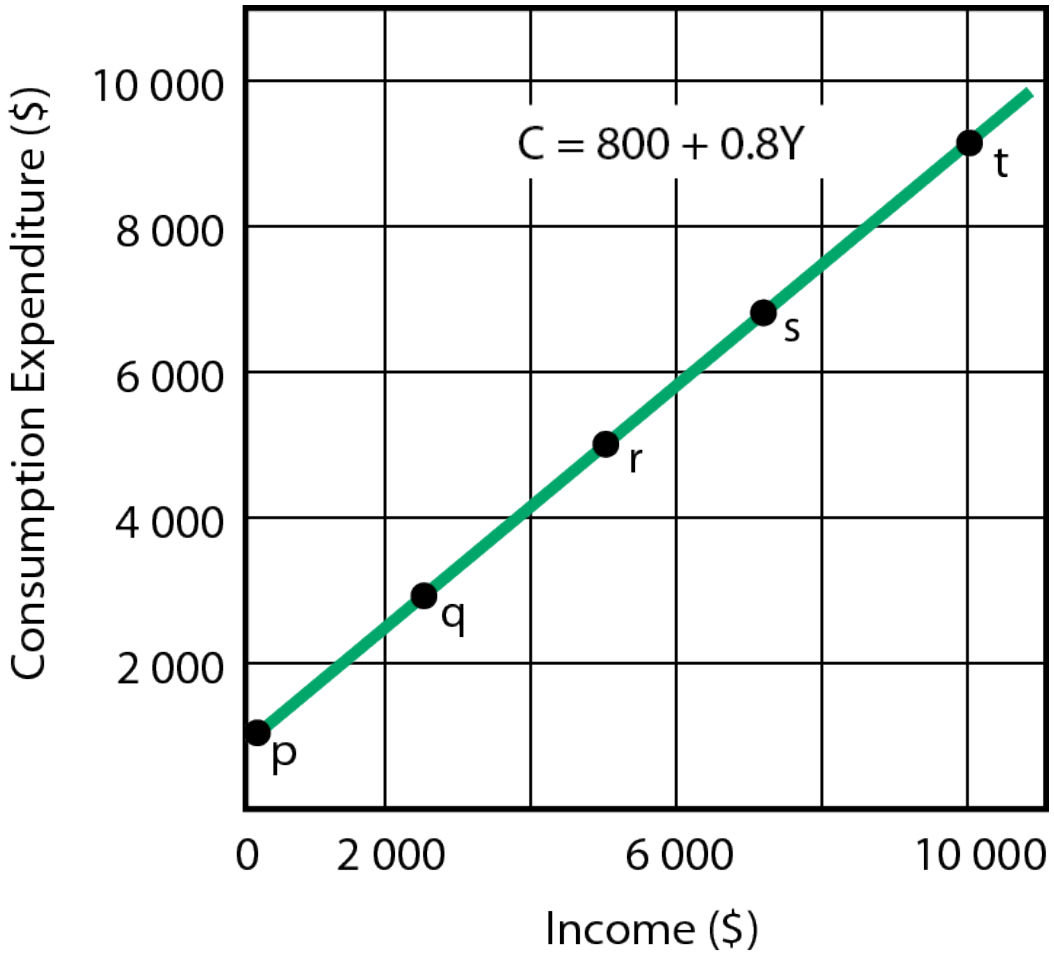


Let ***X*** be the variable measured on the horizontal axis and ***Y*** the variable measured on the vertical axis.

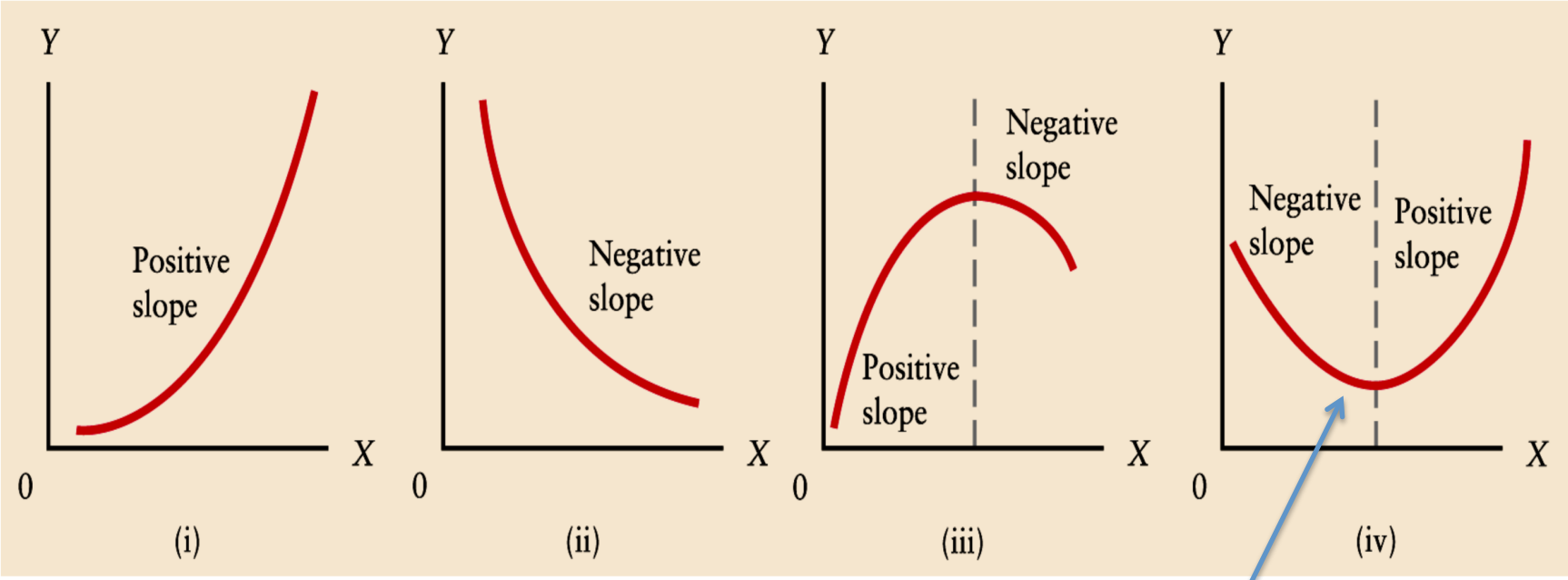
The **slope** of a straight line is then Δ ***Y***/Δ ***X***.

A Specific Example

Fig. 2-6 **Income and Consumption**



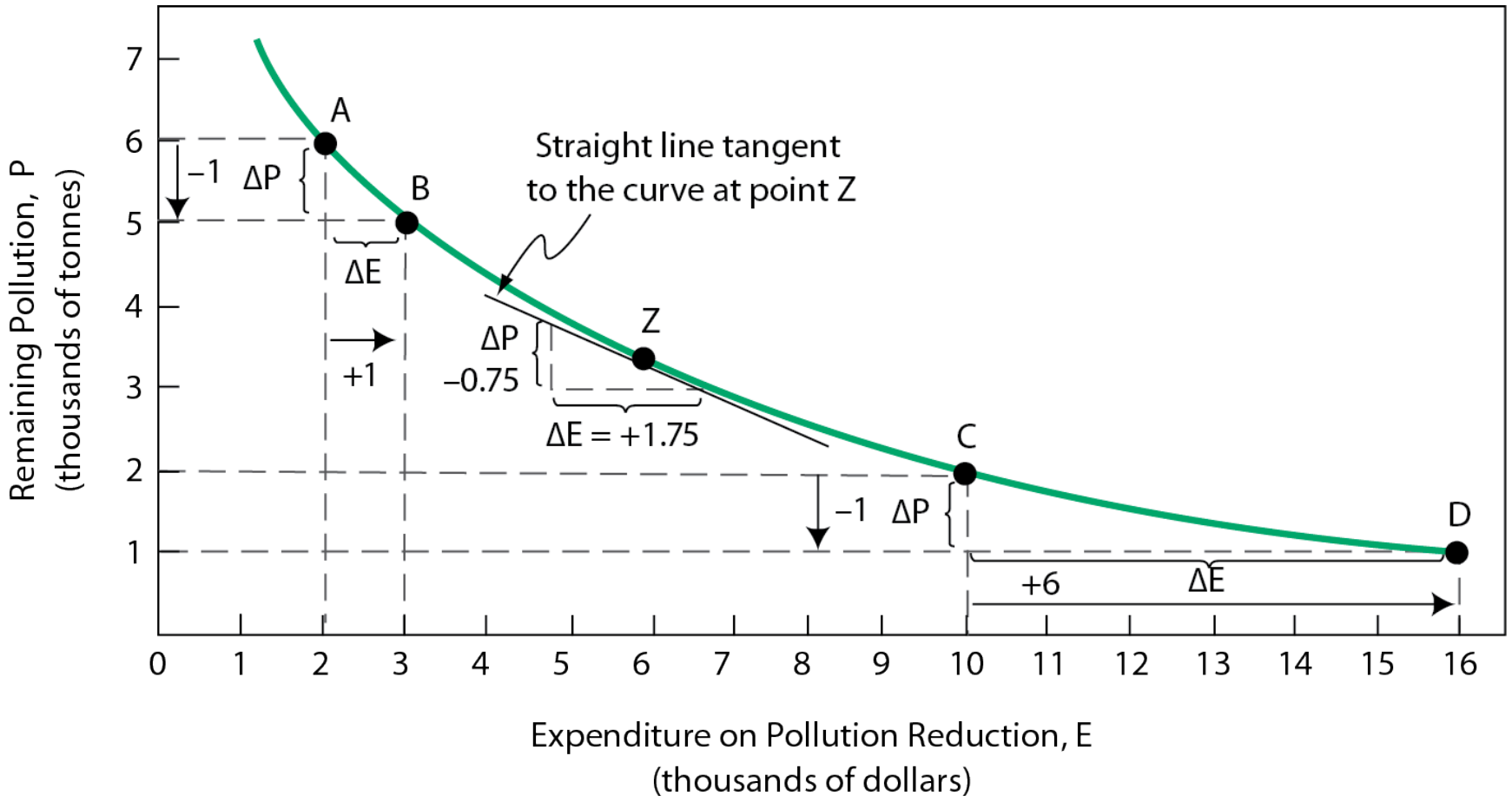
Four Non-Linear Relationships



In general, non-linear relations are much more common than linear ones.

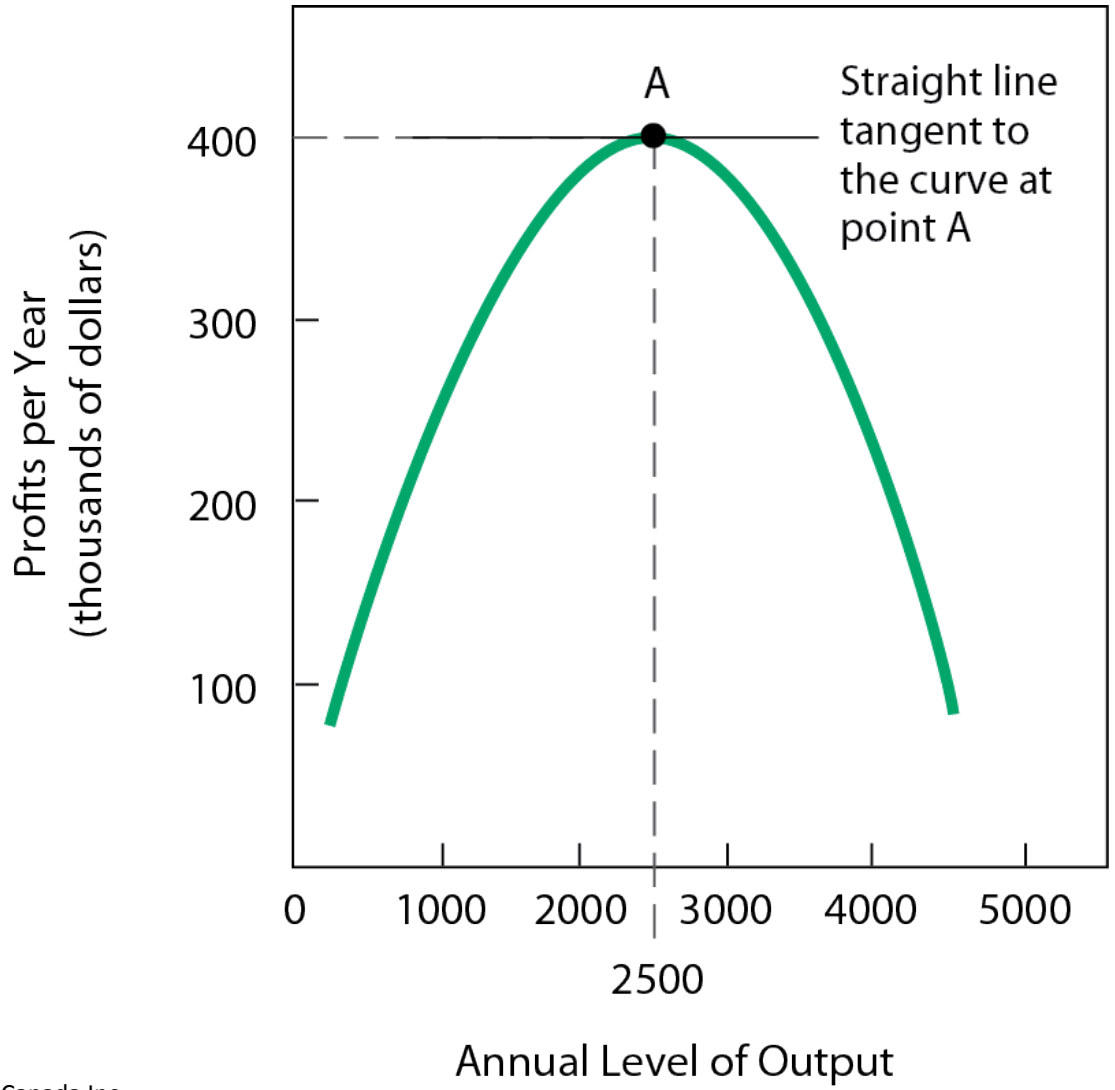
Some Specific Examples

Fig. 2-8 **Non-linear Pollution Reduction**



Some Specific Examples

Fig. 2-10 **Profits as a Function of Output**



Non Linear Functions

1.Recognize if the slope is positive or negative.

2.Recognize if the absolute value of the slope is increasing or decreasing.

What happens to Y when X changes marginally?

What is the response of Y to marginal changes in X?

We will use the absolute value of the slope to answer this question!

Marginal response of Y to a change in X

1.the marginal response of *Y* to a change in *X* is constant and equal to 2. This is the slope of the line.

2. the marginal response of *Y* to a change in *X* is always positive, but the marginal response increases as the value of *X* increases. This is why the line gets steeper as *X* increases.

3. the marginal response of *Y* to a change in *X* is positive at low levels of *X*. But after *X*=20, the marginal response becomes negative. Hence the slope of the line switches from positive to negative. Note that for values of *X* further away from *X*=20, the marginal response of *Y* to a change in *X* is larger in absolute value. That is, the curve flattens out as we approach *X*=20 and becomes steeper as we move away (in either direction) from *X*=20.

A Final Word

We have discussed why economists use theory and how they build economic models.

We have discussed how there is a continual back-and-forth process between empirical testing of predictions and refining the theoretical models.

We have explored the many ways data can be displayed in graphs and how economists use graphs to illustrate their theories.