CHAPTER

1

ECONOMICS: FOUNDATIONS AND MODELS

LEARNING OBJECTIVES

After studying this chapter you should be able to:

1.1 Explain these three key economic ideas: people are rational, people respond to incentives, and optimal decisions are made at the margin.

1.2 Understand the issues of scarcity and trade-offs, and how the market makes decisions on these issues.

1.3 Understand the role of models in economic analysis.

1.4 Distinguish between microeconomics and macroeconomics.

OFFSHORING TO THE PHILIPPINES—GOOD OR BAD?

MANY AUSTRALIAN, US, Japanese and European firms have for decades been moving the production of goods and services to other countries where wages are lower. This process of firms producing goods and services outside of their home country is called *offshoring* (sometimes also referred to as *outsourcing*).

In recent years, it is not only simple manufacturing that is being offshored, but also jobs that require high skill levels. High-technology manufacturing, research and development, and IT systems analysis are now outsourced to countries like China and India where skilled workers, such as software engineers, typically receive salaries that are 75 per cent lower than those of software engineers in Australia or the United States. A more recent development is the outsourcing of customer services, with future growth likely to occur in knowledge process outsourcing (KPO), which includes professional medical and legal services.

A large number of Australian companies—including Telstra, Vodafone, Jetstar, Foxtel and most of the major banks—are offshoring services to companies in the Philippines—known as business process outsourcing (BPO) companies—to make or receive Australian calls or to respond to customer queries via the Internet. The Philippines is overtaking India as the biggest call-centre operator in the world. The combined IT-BPO sector generates over US$22 billion a year for the poor Southeast Asian country, and employs an estimated 1.3 million people (many who work in crowded open-plan offices). Forecasts by the government of the Philippines suggest that the IT and BPO sectors will continue to thrive in the coming years, but predict that the major growth in jobs will come from KPO services. Multinational firms are now establishing offices in the Philippines for accountants, lawyers, doctors, nurses, teachers and many other professional jobs. Already the outsourcing of medical services employs nearly 100 000 medical professionals in the Philippines, generating more than US$1 billion per year.

Most IT, BPO and KPO workers have a tertiary degree or are students, and have the advantage that their English accent is often more easily understood than the accent of workers in India, making them more customer-friendly. The focus of the debate on offshoring has been around two questions: Has offshoring been good or bad for the Australian economy, and does offshoring move Australian jobs to other countries or does it reduce production costs for Australian businesses, leading to job creation? These questions are some of many that cannot be answered without using economics. In this chapter, and throughout this book, we will see how economics helps in answering important questions such as offshoring, as well as many other issues.

SOURCE: Ehda M. Dagooc (2016), 'IT-BPO sector expects 15% to 18% expansion in 2016', *The Philippine Star*, 1 January, viewed 14 January 2016; Lindsay Murdoch (2013), 'Ready to answer Australia's call', *The Sydney Morning Herald*, 13 January, at <www.smh.com.au/world/ready-to-answer-australias-call-20130112-2cmfa.html>, viewed 14 January 2016.

ECONOMICS IN YOUR LIFE

ARE YOU LIKELY TO LOSE YOUR JOB TO OFFSHORING?

More than 20 000 jobs in Australia's service sector are being outsourced each year to other countries, according to a report by the National Institute of Economic and Industry Research. (National Institute of Economic and Industry Research, 2012)[1] This seems like a large number. Suppose you plan on working as an accountant, a software engineer, a business consultant, a financial analyst or in another industry where some jobs have already been offshored. Is it likely that during your career your job will be outsourced to China, the Philippines, India or some other country? As you read this chapter, see if you can answer this question. You can check your answer with the one we provide on page 13 at the end of the chapter.

ECONOMICS IS USED to answer questions such as the following:

1   How are the prices of goods and services determined?
2   How does pollution affect the economy, and what government policies can be used to deal with it?
3   Why do firms engage in international trade, and how do government policies affect international trade?
4   Why does government control the prices of some goods and services, and what are the effects of those controls?

Economists do not always agree on the answers to every question. In fact, as we will see, economists engage in lively debates on many issues. In addition, economics is a dynamic field with new problems and questions constantly arising. Therefore, economists are always at work developing new methods to analyse economic issues.

All the issues we discuss in this book reflect a basic fact of life: people must make choices as they try to attain their goals. The choices reflect the trade-offs people face because we live in a world of **scarcity**, which means that although our wants are unlimited, the **resources** available to fulfil those wants are limited. You might like to own five Mercedes-Benz cars and spend three months each year in five-star European hotels, but unless you are a close relative of James Packer you probably lack the money to fulfil these dreams. Every day you must make choices about how to spend your limited income on the many goods and services available. The finite amount of time available to you also limits your ability to attain your goals. If you spend an hour studying for your economics test, you have one less hour available to study for your statistics test. Firms and the government are in the same situation that you are: they have limited resources available to them as they attempt to attain their goals. **Economics** is the study of the choices people and societies make to attain their unlimited wants, given their scarce resources.

We begin this chapter by discussing three key economic ideas that we will return to many times in the book: *people are rational, people respond to incentives*, and *optimal decisions are made at the margin*. Then we consider the three fundamental questions that any economy must answer: *What* goods and services will be produced? *How* will the goods and services be produced? and *Who* will receive the goods and services? Next we consider the role of *economic models* in helping us to analyse the many issues presented throughout this book. **Economic models** are simplified versions of reality used to analyse real-world economic situations. Later in this chapter we explore why economists use models and how they construct them. Finally, we discuss the difference between microeconomics and macroeconomics.

THREE KEY ECONOMIC IDEAS

As you try to achieve your goals, whether buying a new computer or finding a part-time job, you will interact with other people in *markets*. A **market** is a group of buyers and sellers of a good or service and the institution or arrangement by which they come together to trade. Much of economics involves analysing what happens in markets. Throughout this book, as we study how people make choices and interact in markets, we will return to three important ideas:

1   People are rational.
2   People respond to economic incentives.
3   Optimal decisions are made at the margin.

People are rational

Economists generally assume that people are rational. This assumption does not mean that economists believe that everyone knows everything or always makes the 'best' decision. It does mean that economists assume that consumers and firms use as much of the available information as they can to achieve their goals. Rational individuals weigh the benefits and costs of each action, and they choose an action only if the benefits outweigh the costs. For example, if a computer store charges a price of $130 for the latest Windows upgrade, economists assume that the managers at the store have estimated that a price of $130 will earn the most profit. The managers

Scarcity
The situation in which unlimited wants exceed the limited resources available to fulfil those wants.

Resources
Inputs used to produce goods and services, including natural resources (such as land, water and minerals), labour, capital and entrepreneurial ability. These are also referred to as the factors of production.

Economics
The study of the choices people and societies make to attain their unlimited wants, given their scarce resources.

Economic models
Simplified versions of reality used to analyse real-world economic situations.

LO 1.1

Explain these three key economic ideas: people are rational, people respond to incentives, and optimal decisions are made at the margin.

LEARNING OBJECTIVE

Market
A group of buyers and sellers of a good or service and the institution or arrangement by which they come together to trade.

may be wrong; perhaps a price of $150 would be more profitable, but economists assume that the managers have acted rationally on the basis of the information available to them in choosing the price. Of course, not everyone behaves rationally all the time. Still, the assumption of rational behaviour is very useful in explaining most of the choices that people make.

People respond to economic incentives

Human beings act from a variety of motives, including religious belief, envy and compassion. Economists emphasise that consumers and firms consistently respond to *economic* incentives. This fact may seem obvious, but it is often overlooked as the following example illustrates. The Pharmaceutical Benefits Scheme (PBS) is an Australian government initiative under which more than 80 per cent of prescriptions are dispensed in Australia. At 1 January 2017, patients pay up to $38.80 for most PBS medicines or $6.30 if they have a concession card; the Australian government pays the remaining cost. Under current arrangements, these amounts are adjusted in line with inflation on 1 January each year.

The government's expenditure on the PBS—currently around $11 billion annually—has been increasing rapidly, mainly due to the high cost of subsidising new and expensive prescription medicines to make them available at prices people can afford. The government paid part of the price of around 208 million prescriptions for subsidised medicines supplied up to the year ending June 2016. That's almost nine prescriptions every year for each Australian. The scheme accounts for around 16 per cent of the total Australian government's health budget.

For a medicine to be available on the PBS, it must not only satisfy the criterion that it has a significant impact on patient health but it must also be cost-effective in that the extra benefit to patients must be worth the cost to government (the taxpayer). Many Australians do not fully understand this second criterion and believe that if a medicine improves your health it must be worth taking no matter what the cost! Some also think that it is unfair to pay for something as important as medicine as it is vital for one's health. However, economists argue, and this is accepted by government, that if medicines were free there would be little incentive for patients or doctors to use medicines wisely.

Optimal decisions are made at the margin

Some decisions are 'all or nothing'. For example, an entrepreneur decides whether or not to open a new restaurant—they either start the new restaurant or they don't. Likewise, you decide whether to enter university or to take a job. But most decisions in life are not all or nothing. Instead, most decisions involve doing a little more or a little less. If you are trying to decrease your spending and increase your saving, the decision is not really a choice between saving every dollar you earn or spending it all. The choice is actually between buying a cappuccino at a café every day or cutting back to three times per week.

Economists use the word *marginal* to mean an extra or additional benefit or cost of a decision. Should you watch another hour of television or spend that hour studying? The *marginal benefit* (MB) of watching more television is the additional enjoyment you receive; the *marginal cost* (MC) is the lower grade you receive from having studied a little less. Should Apple produce an additional 300 000 iPhones? Firms receive revenue from selling goods. Apple's marginal benefit is the additional revenue it receives from selling 300 000 more iPhones; Apple's marginal cost is the additional cost—for wages, parts and so forth—of producing 300 000 more iPhones. *Economists reason that the optimal decision is to continue any activity up to the point where the marginal benefit equals the marginal cost—in symbols, where MB = MC.* Often we apply this rule without consciously thinking about it. Usually you will know whether the additional enjoyment from watching a television program is worth the additional cost involved in not spending that hour studying without giving it a lot of thought. In business situations, however, firms often have to make careful calculations to determine, for example, whether the additional revenue received from increasing production is greater or less than the additional cost of the production. Economists refer to analysis that involves comparing marginal benefits and marginal costs as **marginal analysis**.

In each chapter of this book you will see a special feature entitled 'Solved problem'. This feature will increase your understanding of the material by leading you through the steps of solving an applied economic problem. After reading the problem, you can test your understanding by working through the related problems that appear at the end of the chapter.

Marginal analysis
Analysis that involves comparing marginal benefits and marginal costs.

SOLVED PROBLEM 1.1 APPLE MAKES A DECISION AT THE MARGIN

Suppose Apple is currently selling 10 million iPhones per year worldwide. Managers at Apple are considering whether to raise production to 11 million iPhones per year. One manager argues, 'Increasing production from 10 million to 11 million is a good idea because we will make a total profit of $500 million if we produce 11 million.'

Do you agree with her reasoning? What, if any, additional information do you need to decide whether Apple should produce the additional one million iPhones?

Solving the problem

STEP 1 Review the chapter material. The problem is about making decisions, so you may want to review the section 'Optimal decisions are made at the margin', which begins on page 5. Remember in economics to think 'marginal' whenever you see the word 'additional'.

STEP 2 Explain whether you agree with the manager's reasoning. We have seen that any activity should be continued to the point where the marginal benefit is equal to the marginal cost. In this case, that involves continuing to produce iPhones up to the point where the additional revenue Apple receives from selling more iPhones is equal to the marginal cost of producing them. The Apple manager has not done a marginal analysis, so you should not agree with her reasoning. Her statement about the *total* profit of producing 11 million iPhones is not relevant to the decision of whether to produce the last one million iPhones. You need to know whether the total profit amount of $500 million is the maximum amount that could be earned, or if a different quantity of production is more profitable. To determine this you will need additional information.

STEP 3 Explain what additional information you need. You will need to know and compare the additional (marginal) revenue Apple would earn from selling one million extra iPhones with the additional (marginal) cost of producing them. As long as the marginal revenue for each extra iPhone produced is greater than the marginal cost of producing it, the extra production will add more to total profit. Therefore, Apple should continue to produce iPhones right up to the point where marginal revenue is equal to marginal cost. Furthermore, you should note that producing beyond this point, where marginal cost exceeds marginal revenue, will reduce total profits.

YOUR TURN

For more practice, do **related problems 1.5, 1.6 and 1.7 on pages 16 and 17** at the end of this chapter.

LO 1.2

Understand the issues of scarcity and trade-offs, and how the market makes decisions on these issues.

LEARNING OBJECTIVE

Trade-off

The idea that, because of scarcity, producing more of one good or service means producing less of another good or service.

SCARCITY, TRADE-OFFS AND THE ECONOMIC PROBLEM THAT EVERY SOCIETY MUST SOLVE

We have already noted the important fact that we live in a world of scarcity. As a result, any society faces the economic problem that it has only a limited amount of economic resources—such as workers, machines and natural resources—and therefore can produce only a limited amount of goods and services. Therefore, society faces **trade-offs**: producing more of one good or service means producing less of another good or service. Trade-offs force society to make choices, particularly when answering the following three fundamental questions:

1 *What* goods and services will be produced?
2 *How* will the goods and services be produced?
3 *Who* will receive the goods and services produced?

Throughout this book we will return to these questions many times. For now, we can briefly introduce each question.

What goods and services will be produced?

How will society decide whether to produce more economics textbooks or more Blu-ray players? Should we fund more child care facilities or more university places? Of course, 'society' does not make decisions; only individuals make decisions. The answer to the question of what will be produced is determined by the choices made by consumers, firms and governments. Every day you help to decide which goods and services will be produced when you choose to buy an iPhone rather than a Blu-ray player, or a cappuccino rather than a cup of tea. Similarly, Apple must choose whether to devote its scarce resources to making more iPhones or more iPads. The

federal government must also choose whether to spend more of its limited budget on breast cancer research or national defence. In each case, consumers, firms and the government face the problem of scarcity by trading off one good or service for another.

When analysing the decision to choose between alternative options, economists use the concept of **opportunity cost**. This is one of the most important concepts in economics. The opportunity cost of any activity is the highest-valued alternative that must be given up to engage in that activity. In the above example, if Apple chooses to produce more iPhones it must divert resources from producing iPads. The opportunity cost of producing more iPhones is the loss of production of iPads. Or, if you choose to buy a cup of coffee, your opportunity cost is the cup of tea that you could have chosen instead. Consider the example of an entrepreneur who could receive a salary of $100 000 per year working as a manager at a firm but opens her own business instead. In that case, the opportunity cost of the entrepreneurial services to her own business is $100 000, even though she does not pay herself an explicit salary. We will analyse this important concept of opportunity cost in further detail in the next chapter.

Opportunity cost
The highest-valued alternative that must be given up to engage in an activity.

How will the goods and services be produced?

Firms choose how to produce the goods and services they sell. In many cases, firms face a trade-off between using more workers and using more machines. For example, a local service station has to choose whether to provide car repair services using more diagnostic computers and fewer car mechanics or more car mechanics and fewer diagnostic computers. Similarly, movie studios have to choose whether to produce animated films using highly skilled animators to draw them by hand or fewer animators and more computers. In deciding whether to move production offshore to China, firms are often choosing between a production method in their home country that uses fewer workers and more machines and a production method in China that uses more workers and fewer machines.

Who will receive the goods and services produced?

In Australia, as in most countries, who receives the goods and services produced depends largely on how income is distributed. Those individuals with the highest income have the ability to buy the most goods and services. Often, people are willing to give up some of their income—and therefore some of their ability to purchase goods and services—by donating to charities to increase the incomes of poorer people. An important policy question, however, is whether the government should intervene to make the distribution of income more equal. Such intervention occurs in Australia, because people with higher incomes pay a larger fraction of their incomes in taxes and because the government makes payments to people with low incomes. There is disagreement over whether the current attempts to redistribute income are sufficient or whether there should be more or less redistribution.

Centrally planned economies versus market economies

To answer the three questions—what, how and who—societies organise their economies in two main ways. A society can have a **centrally planned economy** in which the government decides how economic resources will be allocated, or a society can have a **market economy** in which the decisions of households and firms interacting in markets allocate economic resources.

From 1917 to 1991, the most important centrally planned economy in the world was the former Soviet Union. The government decided what goods to produce, how to produce them, and who would receive them. Government employees managed factories and stores. The objective of these managers was to follow the government's orders, rather than to satisfy the wants of consumers. Centrally planned economies like the former Soviet Union have not been successful in producing low-cost, high-quality goods and services. As a result, the standard of living of the average person in a centrally planned economy tends to be quite low. All centrally planned economies have also been political dictatorships. Dissatisfaction with low living standards and political repression finally led to the collapse of the Soviet Union in 1991. Today, only North Korea still has a completely centrally planned economy. All the high-income democracies, such as Australia, the United States, Canada, Japan and many European countries, are in large part market economies. Market economies rely primarily on privately owned firms to produce goods and services and to decide how to produce them. Markets, rather than the government,

Centrally planned economy
An economy in which the government decides how economic resources will be allocated.

Market economy
An economy in which the decisions of households and firms interacting in markets allocate economic resources.

determine who receives the goods and services produced. In a market economy, firms must produce goods and services that meet the wants of consumers or the firms will go out of business. In that sense, it is ultimately consumers who decide what goods and services will be produced. This concept is referred to as **consumer sovereignty**. Because firms in a market economy compete to offer the highest-quality products at the lowest price, they are under pressure to use the lowest-cost methods of production. For example, in the past 20 years some firms in Australia, the United States and elsewhere, particularly in the electronics and furniture industries, have been under pressure to reduce their costs to meet the low-cost competition of Chinese and Indian firms.

In a market economy, the income of an individual is determined by the payments received for what they have to sell. If an individual is a civil engineer and firms are willing to pay a salary of $90 000 per year for engineers with training and skills, this is the amount of income an engineer will have to purchase goods and services and pay taxes. If the engineer also owns a house that is rented out, their income will be even higher. One of the attractive features of markets is that they reward hard work. Generally, the more extensive the training a person has received and the longer the hours the person works, the higher the person's income will be. Of course, luck (both good and bad), inheritance and other factors may also play a role here. We can conclude that market economies answer the question 'Who receives the goods and services produced?' with the answer 'Those who are most willing and able to buy them'.

The modern 'mixed' economy

In the nineteenth and early twentieth centuries, the governments in market economies engaged in relatively little regulation of markets for goods and services. Beginning in the middle of the twentieth century, government intervention in the economy dramatically increased in every market economy. This increase was primarily caused by the high rates of unemployment and business bankruptcies during the Great Depression of the 1930s. Some government intervention was also intended to raise the incomes of the elderly, the sick and people with limited skills. For example, in 1910 Australia established the Social Security System, which now provides government payments to the retired, disabled, unemployed and others including those with children. Governments also provide goods and services that the market does not provide, such as roads, street lighting and national defence, or that the market fails to provide in sufficient quantities or at affordable prices, such as education and health services. In more recent years government intervention in the economy has also expanded to meet such goals as protection of the environment and the promotion of equal opportunity.

Some economists argue that the extent of government intervention makes it no longer accurate to refer to Australian, the United States, Canadian, Japanese and most European economies as market economies. Instead, they should be referred to as *mixed economies*. In a **mixed economy** most economic decisions result from the interaction of buyers and sellers in markets, but the government plays a significant role in the allocation of resources. As we will see in later chapters, economists continue to debate the role government should play in a market economy.

One of the most important developments in the international economy in recent years has been the movement of China from being a centrally planned economy to being a more mixed economy. The Chinese economy suffered decades of economic stagnation following the takeover of the government in 1949 by Mao Zedong and the Communist Party. Although China does not have a democratically elected government, the production of most goods and services is now determined in the market, albeit with substantial government intervention. The result has been rapid economic growth.

Efficiency and equity

Market economies tend to be more efficient than centrally planned economies. There are three types of efficiency: *productive efficiency* (sometimes referred to as technical efficiency), *allocative efficiency* and *dynamic efficiency*. **Productive efficiency** occurs when a good or service is produced using the least amount of resources. **Allocative efficiency** occurs when production reflects consumer preferences and resources are allocated throughout the economy to produce what consumers demand. **Dynamic efficiency** occurs when new technologies and innovation are adopted over time. Markets tend to be efficient because they promote competition and facilitate *voluntary exchange*. **Voluntary exchange** refers to the situation in which both the buyer and seller

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Consumer sovereignty
The concept that in a market economy it is ultimately consumers who decide what goods and services will be produced. This occurs because firms must produce goods and services that meet the wants of consumers or the firms will go out of business.

Mixed economy
An economy in which most economic decisions result from the interaction of buyers and sellers in markets, but in which the government plays a significant role in the allocation of resources.

Productive efficiency
When a good or service is produced using the least amount of resources.

Allocative efficiency
When production reflects consumer preferences; in particular, every good or service is produced up to the point where the last unit provides a marginal benefit to consumers equal to the marginal cost of producing it.

Dynamic efficiency
When new technologies and innovation are adopted over time.

Voluntary exchange
Occurs in markets when both the buyer and seller of a product are made better off by the transaction.

of a product are made better off by the transaction. We know that the buyer and seller are both made better off because otherwise the buyer would not have agreed to buy the product or the seller would not have agreed to sell it. Productive efficiency is achieved when competition between firms in markets forces the firms to produce goods and services using the least amount of resources and therefore at the lowest cost. Allocative efficiency is achieved when the combination of competition between firms and voluntary exchange between firms and consumers results in firms producing the mix of goods and services that consumers prefer most. Similarly, competition can lead to dynamic efficiency, as firms seek to adapt their product and use new technologies over time to secure their share of sales in the market. Competition will force firms to continue producing and selling goods and services as long as the additional benefit to consumers is greater than the additional cost of production. In this way, the mix of goods and services produced will reflect consumer preferences, achieving consumer sovereignty.

Although markets promote efficiency, they don't guarantee it. Inefficiency can arise from various sources. For example, water is a scarce resource which may be overused if government restrictions on water usage and pricing are set at levels that are too low, leading to allocative inefficiency. Or, if we look at productive efficiency, it may take some time to achieve an efficient outcome. For example, when Blu-ray players were introduced, productive efficiency was not achieved instantly—it took several years for firms to discover the lowest-cost method of producing this good. Governments sometimes reduce efficiency by interfering with voluntary exchange in markets. For example, many governments limit the imports of some goods from foreign countries. This limitation reduces efficiency by keeping goods from being produced at the lowest cost. The production of some goods damages the environment. In this case, government intervention can increase efficiency, because without such intervention firms may ignore the costs of environmental damage, and thereby fail to produce the goods at the lowest possible cost from society's perspective.

Just because an economic outcome is efficient, this does not necessarily mean that society finds it desirable. Many people prefer economic outcomes that they consider fair or equitable, even if these outcomes are less efficient. **Equity** is harder to define than efficiency, but it usually involves a 'fair' distribution of economic benefits. For some people, equity involves a more equal distribution of economic benefits than would result from an emphasis on efficiency alone. For example, some people support taxing people with higher incomes to provide the funds for programs that aid the poor. Although equity may be increased by reducing the incomes of high-income people and increasing the incomes of the poor, efficiency may be reduced. People have less incentive to open new businesses, to supply labour and to save if the government takes a significant amount of the income they earn from working or saving. The result is that fewer goods and services are produced and less saving takes place. As this example illustrates, *there is often a trade-off between efficiency and equity*. In this case, the total amount of goods and services produced falls, although the distribution of the income to buy those goods and services is made more equal. Government policy-makers have to confront this trade-off.

Equity
The fair distribution of economic benefits between individuals and between societies.

ECONOMIC MODELS

Economists rely on economic theories or *models* (the words 'theory' and 'model' are used interchangeably) to analyse real-world issues. As mentioned earlier, economic models are simplified versions of reality used to analyse real-world economic situations. Economists are certainly not alone in relying on models: an engineer may use a computer model of a bridge to help to test whether it will withstand high winds, or a biologist may draw a diagrammatic representation of a nucleic acid in order to understand its properties better. One purpose of economic models is to make economic ideas sufficiently explicit and concrete to be used for decision making by individuals, firms or the government. For example, we will see in Chapter 3 that the model of demand and supply is a simplified version of how the prices of products are determined by the interactions between buyers and sellers in markets.

Economists use economic models to answer questions. For example, consider the question arising from the opening case of this chapter: Has offshoring reduced jobs in the Australian economy? For a complicated issue such as the effects of offshoring, economists often use several models to examine different aspects of the issue. For example, they may use an economic model of how wages are determined to analyse how offshoring affects wages in particular industries, and

LO 1.3

Understand the role of models in economic analysis.
LEARNING OBJECTIVE

they may use a model of international trade to analyse how offshoring affects income growth in the countries involved. Sometimes economists use an existing model to analyse an issue, but in other cases they must develop a new model. To develop a model, economists generally follow these steps:

1   Decide on the assumptions to be used in developing the model.
2   Formulate a testable hypothesis.
3   Use economic data to test the hypothesis.
4   Revise the model if it fails to explain well the economic data.
5   Retain the revised model to help answer similar economic questions in the future.

The role of assumptions in economic models

Any model is based on making assumptions because models have to be simplified to be useful. We cannot analyse an economic issue unless we reduce its complexity. For example, economic models make *behavioural assumptions* about the motives of consumers and firms. Economists assume that consumers will buy those goods and services that will maximise their wellbeing or their satisfaction. Similarly, economists assume that firms act to maximise their profits. These assumptions are simplifications because they do not describe the motives of every consumer and every firm. How can we know if the assumptions in a model are too simplified or too limiting? We discover this when we form hypotheses based on these assumptions and test these hypotheses using real-world information.

Forming and testing hypotheses in economic models

Economic variable
Something measurable that relates to resource use and that can have different values; for example, wages, prices or hours worked.

A *hypothesis* in an economic model is a statement that may be either correct or incorrect about an *economic variable*. An **economic variable** is something measurable that can have different values, such as the wages paid to IT workers. An example of a hypothesis in an economic model is the statement that 'Outsourcing to offshore locations reduces wages of IT workers in Australia'. An economic hypothesis is usually about a *causal relationship*; in this case, the hypothesis states that offshoring causes, or leads to, lower wages for IT workers in Australia.

Before accepting a hypothesis, we must test it. To test a hypothesis, we must analyse statistics on the relevant economic variables. In our example, we must gather statistics on the wages paid to IT workers, and perhaps on other variables as well. Testing a hypothesis can be tricky. For example, showing that the wages paid to IT workers fell, or did not rise by as much as average wages, at a time when offshoring was increasing would not be enough to demonstrate that offshoring *caused* the wage changes. Just because two things are *correlated*—that is, they are associated with each other—does not mean that one caused the other. For example, suppose that the number of workers trained in IT greatly increased at the same time that offshoring was increasing. In that case, the fall in wages paid to IT workers in Australia might have been caused by the increase in supply of IT workers increasing competition for jobs, rather than by the effects of relocating some IT jobs overseas in the Philippines or India. Over a period of time, many economic variables will be changing, which complicates testing hypotheses. In fact, when economists disagree about a hypothesis, it is often because of disagreements over interpreting the statistical analysis used to test the hypothesis.

Note that hypotheses must be statements that could in principle turn out to be incorrect. Statements such as 'offshoring is good' or 'offshoring is bad' are value judgments, rather than hypotheses, because it is not possible to prove or disprove them.

Economists accept and use an economic model if it leads to hypotheses that can be confirmed by statistical analysis. In many cases the acceptance is tentative, however, pending the gathering of new data or further statistical analysis. In fact, economists often refer to a hypothesis having been 'not rejected', rather than being 'accepted', by statistical analysis. But what if statistical analysis clearly rejects a hypothesis? For example, what if a model leads to a hypothesis that offshoring by Australian firms leads to lower wages for Australian IT workers, but this hypothesis is rejected by the data? In that case, the model needs to be reconsidered. It may be that an assumption used in the model was too simple or too limiting. For example, perhaps the model used to determine the effect of offshoring on wages paid to IT workers assumed that IT workers in the Philippines and India had the same training and experience as IT workers in Australia. If, in fact, Australian IT workers have more training and experience than Philippine or Indian IT workers, this difference may explain why our hypothesis was rejected by economic statistics.

The process of developing models, testing hypotheses and revising models occurs not just in economics but also in disciplines such as physics, chemistry and biology. It is often referred to as the *scientific method*. Economics is a *social science* because it applies the scientific method to the study of individuals and societies.

Normative and positive analysis

Throughout this book as we build economic models and use them to answer questions, we need to bear in mind the distinction between *positive analysis* and *normative analysis*. **Positive analysis** is concerned with *what is*, and involves value-free statements that can be checked by using the facts. For example, the statement that 'a reduction in taxation rates will lead to an increase in spending by individuals' is a positive statement and can be confirmed or negated by factual data. **Normative analysis** is concerned with *what ought to be*, and involves making value judgments, which cannot be tested. For example, 'Individuals should receive reductions in taxation as they are able to decide how to spend money to maximise their satisfaction better than the government can' is a normative statement as it cannot be tested. Economics is about positive analysis, which measures the costs and benefits of different courses of action.

We can use the minimum wage laws in Australia to compare positive and normative analysis. In early 2017, it was illegal for an employer to hire an adult worker at a wage of less than $17.70 per hour or $672.70 per week. Without the minimum wage laws, some firms and some workers would voluntarily agree to a lower wage. Because of the minimum wage, some workers have difficulty finding jobs and some firms end up paying more for labour than they otherwise would have. A positive analysis of the federal minimum wage uses an economic model to estimate how many workers have lost their jobs because of the minimum wage, its impact on the costs and profits of businesses, and the gains to workers receiving the minimum wage. After economists complete this positive analysis, the decision as to whether the minimum wage is a good idea or a bad idea is a normative one and depends on how people assess the trade-offs involved. Supporters of minimum wages believe that the losses to employers and to workers who are unemployed as a result of minimum wages are more than offset by the gains to those workers who receive higher wages than they would have without a minimum wage. Opponents of the minimum wage believe the losses are greater than the gains. The assessment by any individual would depend, in part, on that person's values and political views. The positive analysis provided by an economist would play a role in the decision but can't by itself decide the issue one way or the other.

In each chapter you will see a 'Don't let this happen to you' box like the one that follows. The goal of these boxes is to alert you to common pitfalls in thinking about economic ideas. After reading the box, test your understanding by working through the related problem that appears at the end of the chapter.

Positive analysis
Analysis concerned with what is and involves value-free statements that can be checked by using the facts.

Normative analysis
Analysis concerned with what ought to be and involves making value judgments, which cannot be tested.

DON'T LET THIS HAPPEN TO YOU

Don't confuse positive analysis with normative analysis

'Economic analysis has shown that the minimum wage is a bad idea because it causes unemployment.' Is this statement accurate?

If there were no minimum wage laws, some workers who currently cannot find any firm willing to hire them at the minimum wage would be able to find employment at a lower wage. Therefore, positive economic analysis indicates that the minimum wage causes unemployment (although economists disagree about how much unemployment is caused by the minimum wage). *But*, those workers who still have jobs benefit from the minimum wage because they are paid a higher wage than they would otherwise be. In other words, the minimum wage law creates both losers (the workers who become unemployed and the firms that have to pay higher wages) and winners (the workers who receive higher wages).

Do the gains to the winners more than offset the losses to the losers? The answer to that question involves normative analysis. Positive economic analysis can only show the consequences of a particular policy; it cannot tell us whether the policy is 'good' or 'bad'. So, the statement at the beginning of this box is inaccurate.

YOUR TURN

Test your understanding by doing **related problem 3.7 on page 18** at the end of this chapter.

Economics as a social science

Because economics studies the actions of individuals and societies it is a social science. Economics is therefore similar to other social science disciplines such as psychology, political science and sociology. As a social science, economics considers human behaviour—particularly decision-making behaviour—in every context, not just in the context of business. Economists have studied such issues as how families decide the number of children to have, why people have difficulty losing weight or attaining other desirable goals, and why people often ignore relevant information when making decisions. Economics also has much to contribute to questions of government policy. As we will see throughout this book, economists have played an important role in formulating government policies in areas such as the environment, health care and poverty.

In each chapter, the feature entitled 'Making the connection' discusses a business news story, or other application, related to the chapter material. Read 'Making the connection 1.1' for a discussion on what positive economics suggests about the effect of immigration on unemployment levels and how economic analysis can differ from widely held public views and subsequent political policy decisions.

Making the **Connection** 1.1

Good economics doesn't always mean good politics

Economic theories and models have had a huge influence on government policy. However, even when economic evidence is very strong, this doesn't mean that it will be adopted by politicians. Most economists agree that immigrants into Australia do not create unemployment; that is, they do not take jobs from existing Australian residents. Instead, immigration creates demand for goods and services, brings skills into Australia and contributes positively to economic growth. This conclusion is based on vast amounts of theory and economic modelling using evidence from many countries, including Australia. In other words, it is based on positive economics. However, politicians are acutely aware of conclusions voters believe to be correct but which may not be supported by positive analysis. Political decisions regarding immigration (and many other issues) are often based not only on positive economics but also on deeply held public views.

In Australia, between 2005 and 2008, net overseas migration (the difference between people migrating to Australia and those leaving Australia to live overseas) increased significantly. The increase in the volume of immigration that occurred largely during the Global Financial Crisis years led to public concern that new immigrants would worsen the rate of unemployment in Australia. Between 2007 and 2008, net overseas migration increased from just over 244 000 to over 314 600. After a significant reduction in 2010 for perceived political gain, to around 172 000 (despite continuing skills shortages), net overseas migration rose to over 237 000 in 2012 before again declining, to an estimated 178 000 in 2014. Of particular concern was the growth of temporary migrants under the '457 visa' program. This program is designed to get skilled workers into Australia relatively quickly to fill vacancies where there is a shortage of Australian workers, which in recent years occurred particularly in the then rapidly growing mining sector. '457' workers do not have to go through the extensive, and often lengthy, processes that permanent migrants must go through.

The 457 visa program exposes the difference between positive economics and normative views held by the public. In 2013, the then prime minister, Julia Gillard, announced that the government wanted to 'stop foreign workers being put at the front of the queue, with Australian workers at the back'. Specific examples of rorts of the system were used as the reason she argued that it should be harder for employers to bring in overseas workers on 457 visas. Ms Gillard stated that she wanted to protect Australian jobs and rejected claims her stance could be damaging to economic growth or national harmony.

In response, the Australian Chamber of Commerce and the Australian Industry Group both predicted continued skills shortages and argued for a steady migration policy instead of major fluctuations. Attacks on skilled migration have also been questioned by economist Professor Phil Lewis, Director of the Centre for Labour Market Research at the University of Canberra. When interviewed by the *Weekend Australian*, he stated: 'You simply won't get Australians to work on many of these projects, so if we don't allow migrants to work on them then we are giving up on creating wealth.' He said that the higher wages being offered to Australians was still insufficient to entice enough tradespeople to move to isolated mining regions with few services. He argued that Ms Gillard's stance was seen as vote-winning policy based on views held by much of the Australian public, rather than on sound economic modelling and positive analysis.

SOURCE: Australian Bureau of Statistics (2015), *Australian Demographic Statistics,* Cat. No. 3101.0, June quarter, Table 16, at <www.abs.gov.au> viewed 18 January 2016; Sid Maher (2013), 'PM faces internal revolt on visas', *The Australian*, 8 March; James Frost (2012), 'Migrants matter as clock ticks on boom', *The Weekend Australian*, 2 June.

globevista.com

Immigration is good for the economy, but not always good for politics. The Abruzzese Emigrant Association monument near Lake Vasto, Perth.

MICROECONOMICS AND MACROECONOMICS

Economic models can be used to analyse decision making in many areas. We group some of these areas together as *microeconomics* and others as *macroeconomics*. **Microeconomics** is the study of how households and firms make choices, how they interact in markets, and how the government attempts to influence their choices. Microeconomic issues include explaining how consumers react to changes in product prices and how firms decide what prices to charge. Microeconomics also involves policy issues, such as analysing the most efficient way to reduce teenage smoking, analysing the costs and benefits of approving the sale of a new prescription drug, and analysing the most efficient way to reduce air pollution.

    Macroeconomics is the study of the economy as a whole, including topics such as inflation, unemployment and economic growth. Macroeconomic issues include explaining why economies experience periods of contraction and increasing unemployment, and why, over the long run, some economies have grown much faster than others have. Macroeconomics also involves policy issues, such as whether government intervention is capable of reducing the severity of economic contractions.

    The division between microeconomics and macroeconomics is not hard and fast. Many economic situations have *both* a microeconomic and a macroeconomic aspect. For example, the level of total investment by firms in new machinery and equipment helps to determine how rapidly the economy grows—which is a macroeconomic issue. But to understand how much new machinery and equipment firms decide to purchase, we have to analyse the incentives individual firms face—which is a microeconomic issue.

<div style="background:#29abe2; color:#fff; padding:1em;">

ARE YOU LIKELY TO LOSE YOUR JOB TO OFFSHORING?

At the beginning of the chapter we posed the question: Is it likely that during your career your job will be outsourced to China, the Philippines, India or some other country? It is important to remember that the number of jobs offshored as a proportion of total employment in Australia is very small. Also, offshoring enables firms to lower their production costs, which keep prices lower for consumers, allowing consumers to spend more on other goods and services, potentially creating more jobs. Furthermore, in a market economy, new jobs are constantly being created as old jobs disappear or become redundant. So while you may lose or change your job one or more times during your career, it will probably not be due to offshoring.

</div>

CONCLUSION

The best way to think of economics is as a group of useful ideas about how individuals make choices. Economists have put these ideas into practice by developing economic models. Consumers, business managers and government policy-makers use these models every day to help them make choices. In this book we explore many key economic models and give examples of how to apply them in the real world.

    Most students taking an introductory economics course do not major in economics or become professional economists. Whatever your major may be, the economic principles you will learn in this book will improve your ability to make choices in many aspects of your life. These principles will also improve your understanding of how decisions are made in business and government.

    Reading news websites, newspapers and magazines is an important part of understanding the current economic climate and learning how to apply economic concepts to a variety of real-world events. At the end of each chapter you will see a feature entitled 'An inside look'. This feature consists of an excerpt from an article that relates to the concepts we have discussed throughout the chapter. A summary and analysis and supporting graph highlight the key economic points of the article. Read 'An inside look' on the next page to learn how economic analysis is used to address the issue of the growth in robotics and the effect this may have on jobs. Test your understanding by answering the 'Thinking critically' questions that follow.

LO 1.4

Distinguish between microeconomics and macroeconomics.

LEARNING OBJECTIVE

Microeconomics

The study of how households and firms make choices, how they interact in markets, and how the government attempts to influence their choices.

Macroeconomics

The study of the economy as a whole, including topics such as inflation, unemployment and economic growth.

ECONOMICS IN YOUR LIFE

AN INSIDE LOOK

Robotics will hit finance jobs harder than offshoring

by Agnes King

A Financial services giants AMP and Westpac are exploring the possibility of automating back office and finance functions, some of which are offshored to low-cost centres in Asia, using software systems. It heralds the beginning of a trend that is expected to affect white-collar jobs in much the same way that machines displaced blue-collar workers on assembly lines.

AMP said it is 'not looking to automate to replace roles'. Rather its aim is to 'automate small, time-consuming processes, such as data entry' and free up employees to 'focus on higher-value tasks that add real value to the customer'.

Automating back office and finance functions will spell job losses somewhere. The tasks Westpac wants to automate are currently performed onshore—clunky manual processes in its business banking division, for example.

'Robotic process automation is actually solving a twentieth-century workload problem,' a Westpac spokesperson said.

But in reality, someone, somewhere in the world, is currently performing these low-level tasks manually. And soon, they won't be. Software is taking a bigger share of the corporate-finance workload. As it does, the finance profession is bracing for a wave of technology-driven change greater than that brought about by outsourcing and offshoring over the last decade.

Sourcing specialist for Mindfields, Mohit Sharma, said one of the reasons software and artificial intelligence will hit finance jobs harder than offshoring is because government departments will be able to utilise it. The public sector is a significant employer of finance professionals, and to date it has largely been denied the efficiency gains of offshoring because of privacy and national security issues, as well as political sensitivities around protecting local jobs.

B Simen Munter (ANZ Bank's general manager of group hubs) argues that automation will not reduce the number of jobs for finance professionals. It will simply create different, 'higher value' jobs.

'Hundreds of people are interacting with robotics on a daily basis. We expect to see this growing extensively through our hubs in the year to come and beyond because the technology has matured in a way that wasn't available some years ago,' he said.

C But this means short-term pain as finance professionals reskill. Change is likely to be felt in low-cost centres as much as in the domestic market. The pace of recruitment has dropped off very significantly at ANZ's hubs in India, the Philippines and China, according to Mr Munter.

KEY POINTS IN THE ARTICLE

This article discusses how Australian businesses have offshored some of their services and the role of 'robotics' in replacing jobs both onshore and offshore. In the financial sector, the term 'robotics' mainly refers to the use of software programs, also referred to as 'computerisation'. Although the article relates specifically to financial services, its main conclusions relate to much of the service sector in Australia and many other countries.

ANALYSING THE NEWS

A The article likens the potential growth in robotic process automation by Australian service industries to Australia's move over previous decades to increasingly mechanised production and to locate manufacturing plants in overseas countries that could produce goods relatively cheaper than in Australia. The article goes on to argue that automating routine operations ('robotics') will have a greater loss of jobs than offshoring ever did, not just in Australia, but also in the countries where many jobs are currently offshored.

Figure 1 shows the jobs that are most at risk and least at risk of computerisation worldwide, based on a study by Oxford University. It can be seen that the jobs most at risk of being replaced by software programs are those involving routine clerical and personal service tasks. As mentioned in the article here, data entry has one of the highest probabilities of being replaced by computers. The jobs least at risk are therapists, teachers and nurses. Interestingly, economists are also not at great risk of being replaced by computers!

B Most economists argue that both the offshoring of services and automating of routine tasks will lead to higher wages and increased prosperity for Australia, just as mechanisation and moving manufacturing production overseas did. This may at first glance seem counter-intuitive. How can moving the provision of goods and services to another country, such as the Philippines, India or China, increase jobs and wages in Australia? How can replacing people with automated processes increase jobs? It is true that some jobs will be lost, and there is debate among economists about whether workers who lose their jobs will eventually find comparable or better jobs. However, lower production costs that can be provided for some Australian businesses through offshoring or automation can make these businesses more profitable, and therefore in a position to invest in other areas of the economy and create new jobs that require more highly skilled and more highly paid Australian workers.

C We have seen in this chapter that economists use models to analyse economic issues such as the effects of offshoring and robotics. One advantage of economic models is that they make explicit the assumptions being made. Models are based on hypotheses that can be tested against the real world. According to the article, the rise of robotics will take jobs from Australians and workers offshore. People who make this argument are implicitly using a model that assumes that 'the number of jobs is fixed, so if some of them go overseas or are replaced by new software, there must be fewer jobs left at home'. However, we know that this model and assumption is not useful, because hundreds of thousands of new jobs are created in Australia each year.

THINKING CRITICALLY

1   There are limits to the number of jobs that can move from developed countries to the Philippines, India and China. What determines those limits?

2   Robotics can reduce production costs and increase economic efficiency. What impacts might they have on equity?

FIGURE 1 The jobs most at risk of computerisation
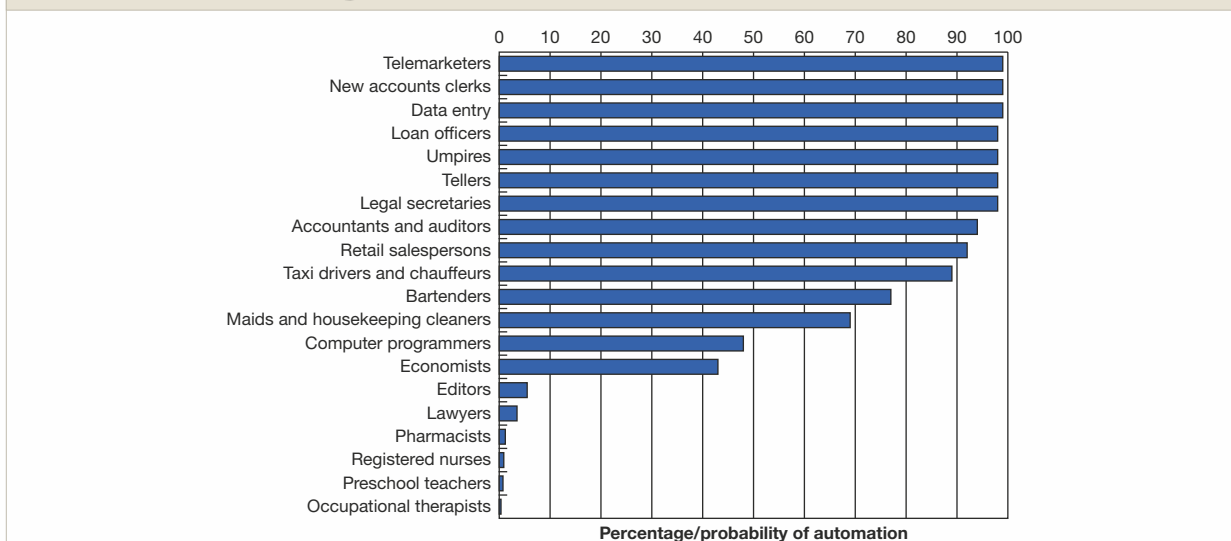
SOURCE: Based on Carl Benedikt Frey and Michael A. Osborne (2013), 'The future of employment: How susceptible are jobs to computerisation?', Oxford University, United Kingdom, at <http://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf>, viewed 19 August 2016.

CHAPTER SUMMARY AND PROBLEMS

KEY TERMS

allocative efficiency	8	macroeconomics	13	positive analysis	11
centrally planned economy	7	marginal analysis	5	productive efficiency	8
consumer sovereignty	8	market	4	resources	4
dynamic efficiency	8	market economy	7	scarcity	4
economic models	4	microeconomics	13	trade-off	6
economic variable	10	mixed economy	8	voluntary exchange	8
economics	4	normative analysis	11		
equity	9	opportunity cost	7		

LO 1.1 LEARNING OBJECTIVE

THREE KEY ECONOMIC IDEAS

PAGES 4–6

LEARNING OBJECTIVE *Explain these three key economic ideas: people are rational, people respond to incentives, and optimal decisions are made at the margin.*

SUMMARY

Economics is the study of the choices people and societies, including consumers, business managers and governments, make to attain their goals, given their scarce resources. We must make choices because of **scarcity** which means that, although our wants are unlimited, the resources available to fulfil those wants are limited. **Resources** are inputs used to produce goods and services, including natural resources (such as land, water and minerals), labour, capital and entrepreneurial ability. A **market** is a group of buyers of a good or service and the institution or arrangement by which they come together to trade.

Economists assume people are rational in the sense that consumers and firms use all available information as they take actions intended to achieve their goals. Rational individuals weigh the benefits and costs of each action, and choose an action only if the benefits outweigh the costs. Although people act from a variety of motives, ample evidence indicates that they respond to economic incentives. Economists use the word 'marginal' to mean extra or additional. **Marginal analysis** involves comparing marginal benefits to marginal costs. The optimal decision is to continue any activity up to the point where the marginal benefit equals the marginal cost.

REVIEW QUESTIONS

1.1 Briefly discuss each of the following economic ideas: people are rational, people respond to incentives, and optimal decisions are made at the margin.

1.2 What is *scarcity*? Why is scarcity central to the study of economics?

PROBLEMS AND APPLICATIONS

1.3 Australian university economics graduates spoke in interviews of how the study of economics provided a solid grounding that was helpful in their subsequent careers, which included working in government departments, private banks, other financial institutions and large private companies such as Shell. (School of Economics, University of Queensland)[2] The students commented that studying economics enabled them to:

- Think logically and critically.
- Develop a way of problem solving that they could apply to most decision making.
- Consider alternative policy solutions and their consequences.

Why might studying economics be particularly good preparation for being a top manager of a corporation, running your own business, working in international public organisations, or having a leading role in government?

1.4 Do you agree or disagree with the following assertion: 'The problem with economics is that it assumes consumers and firms always make the correct decision. But we know everyone's human, and we all make mistakes.'

1.5 [Related to Solved problem 1.1] Suppose Dell Technologies is currently selling 250 000 Inspiron laptops per month. A manager at Dell argues: 'The last 10 000 laptops we produced increased our revenue by $8.5 million and our costs by $8.9 million. However, because we are making a substantial total profit of $25 million from producing 250 000 laptops, I think we are producing the optimal number of laptops.'

Briefly explain whether you agree with the manager's reasoning.

1.6 [Related to Solved problem 1.1] From 2009 onwards, movie studios began to release a number of films in 3D format. To show films in this format, cinemas have to purchase 3D equipment that costs around $75 000 for each projector. Usually, cinema owners charge about $4 more for a ticket to a 3D movie than for a movie in the conventional 2D format. If you owned a cinema, discuss how you would go about deciding whether to invest in 3D equipment.

1.7   [Related to Solved problem 1.1] Two students are discussing Solved problem 1.1.

Joe: 'I think the key additional information you need to know in deciding whether to produce one million more iPhones is the amount of profit you are currently making while producing 10 million. Then you can compare the profit earned from selling 11 million iPhones with the profit earned from selling 10 million. This information is more important than the additional revenue and additional cost of the last one million iPhones produced.'

Jill: 'Actually, Joe, knowing how much profits change when you sell one million more iPhones is exactly the same as knowing the additional revenue and the additional cost.'

Briefly evaluate their arguments.

1.8   Late in the semester a friend tells you, 'I was going to drop my psychology unit so that I could concentrate on my other units, but I had already put so much time into the unit that I decided not to drop it.'

What do you think of your friend's reasoning and what economic concepts are involved in your friend's reasoning? Would it make a difference to your answer if your friend has to pass the psychology unit at some point to graduate? Briefly explain.

LO 1.2 LEARNING OBJECTIVE

SCARCITY, TRADE–OFFS AND THE ECONOMIC PROBLEM THAT EVERY SOCIETY MUST SOLVE
PAGES 6–9

LEARNING OBJECTIVE *Understand the issues of scarcity and trade-offs, and how the market makes decisions on these issues.*

SUMMARY

At any point in time in any country, resources such as labour, natural resources, equipment and machinery are in limited or fixed supply; that is, they are *scarce*. However, the wants of people are unlimited. Therefore choices must be made between alternative uses for the resources. This involves **trade-offs**, as with scarce resources an economy cannot produce unlimited goods and services to meet unlimited wants. The concept of opportunity cost is used by economists when evaluating the alternative choices available. The **opportunity cost** of any activity is the highest-valued alternative that must be given up to engage in that activity. Therefore, opportunity cost enables us to see what is forgone when a choice is made; that is, it enables us to understand the trade-offs.

In a **market economy,** most economic decisions are made by consumers and firms. In a market economy, firms must produce goods and services that meet the wants of consumers or the firms will go out of business. In that sense, it is consumers who decide what goods and services will be produced, which is referred to as **consumer sovereignty**. In a **centrally planned economy**, most economic decisions are made by the government. Most economies, including that of Australia, are **mixed economies** in which most economic decisions are made by consumers and firms, but in which the government also plays a significant role.

REVIEW QUESTIONS

2.1   Explain how the concept of *opportunity cost* arises from the central economic problem of scarce resources and unlimited wants.

2.2   What are the three economic questions that every society must answer? Briefly discuss the differences in how centrally planned, market and mixed economies answer these questions.

2.3   What is the difference between *productive, allocative* and *dynamic efficiency*?

2.4   What is the difference between *efficiency* and *equity*? Why do government policy-makers often face a trade-off between efficiency and equity?

PROBLEMS AND APPLICATIONS

2.5   Does Bill Gates, one of the richest people in the world, face scarcity? Does everyone? Are there any exceptions?

2.6   In a market economy, why does a firm have a strong incentive to be productively, allocatively and dynamically efficient? What does the firm earn if it is efficient, and what happens if it is not?

2.7   Would you expect new and better machinery and equipment to be adopted more rapidly in a market economy or in a centrally planned economy? Briefly explain.

2.8   Centrally planned economies have been less efficient than market economies.

   a   Has this happened by chance or is there some underlying reason?

   b   If market economies are more economically efficient than centrally planned economies, would there ever be a reason to prefer having a centrally planned economy rather than a market economy?

2.9   When it comes to health care, we usually want everything medical technology can offer. Why then do governments limit services such as health care and, furthermore, why don't governments make health care free for everyone?

2.10   Assume that the state and territory governments throughout Australia increase the price of water in an attempt to reduce consumption for domestic use. What are the equity considerations with this policy?

2.11   Suppose that your local police recover 100 tickets to a big football match in a drug raid. It decides to distribute these to residents and announces that tickets will be given away at 10 a.m. on Monday at the Town Hall.

a What groups of people will be most likely to try to get the tickets? Think of specific examples and then generalise.

b What is the opportunity cost of distributing the tickets this way?

c Productive efficiency occurs when a good or service (such as the distribution of tickets) is produced at the lowest possible cost. Is this an efficient way to distribute the tickets? If possible, think of a more efficient method of distributing the tickets.

d Is this an equitable way to distribute the tickets? Explain.

LO 1.3
LEARNING OBJECTIVE

ECONOMIC MODELS

PAGES 9–12

LEARNING OBJECTIVE *Understand the role of models in economic analysis.*

SUMMARY

An economic variable is something measurable that relates to resource use that can have different values; for example, wages, prices, hours worked. Economists rely on economic models when they apply economic ideas to real-world problems. **Economic models** are simplified versions of reality used to analyse real-world economic situations. Economists accept and use an economic model if it leads to hypotheses that are confirmed by statistical analysis. In many cases the acceptance is tentative, however, pending the gathering of new data or further statistical analysis. Economics is a *social science* because it applies the scientific method to the study of the interactions between individuals. Economics is concerned with positive analysis rather than normative analysis. **Positive analysis** is concerned with what is; **normative analysis** is concerned with what ought to be. There are three types of efficiency: productive, allocative and dynamic. **Productive efficiency** occurs when a good or service is produced using the least amount of resources; **allocative efficiency** occurs when production is in accordance with consumer preferences; **dynamic efficiency** occurs when new technologies and innovation are adopted over time. **Voluntary exchange** occurs in markets when both the buyer and seller of a product are made better off by the transaction. **Equity** involves the fair distribution of economic benefits. Policy-makers often face a trade-off between equity and efficiency.

REVIEW QUESTIONS

3.1 Why do economists use models? How are economic data used to test models?

3.2 Describe the five steps by which economists arrive at a useful economic model.

3.3 What is the difference between *normative analysis* and *positive analysis*? Is economics concerned mainly with normative analysis or mainly with positive analysis? Briefly explain.

PROBLEMS AND APPLICATIONS

3.4 Suppose an economist develops an economic model and finds that 'it works well in theory, but it fails in practice'. What should the economist do next?

3.5 Dr Strangelove's theory is that the price of mushrooms is determined by the activity of subatomic particles that exist in another universe parallel to ours. When the subatomic particles are emitted in profusion, the price of mushrooms is also high. When subatomic particle emissions are low, the price of mushrooms is also low. How would you go about testing Dr Strangelove's theory? Discuss whether or not this theory is useful.

3.6 [Related to the opening case] Some firms have begun offshoring work to the Philippines.

a Why have firms done this?

b Is offshoring work to lower paid workers in the Philippines a risk-free proposition for firms?

3.7 [Related to Don't let this happen to you] Explain which of the following statements represent positive analysis and which represent normative analysis.

a A $2 per-packet tax on cigarettes will reduce smoking by teenagers by 12 per cent.

b The federal government should spend more on cancer research.

c Rising paper prices will increase textbook prices.

d The price of coffee at a café is too high.

3.8 [Related to Making the connection 1.1] Making the connection 1.1 explains that the debate over immigration has both positive and normative elements. What economic statistics would be most useful in evaluating the positive elements in this debate? Assuming that these statistics are available or could be gathered, are they likely to resolve the normative issues in this debate?

3.9 If you want to buy or sell a home, land or investment property, you will have to sign a sale contract. The legal work involved in preparing the sale contract, mortgage and other related documents is called conveyancing. Until fairly recently in New South Wales (NSW), this work had to be carried out by a solicitor. The NSW government abolished this restriction and allowed licensed conveyancers, who were not qualified lawyers, to do conveyancing.

a How might the old system have protected consumers?

b Why did critics of the old system argue that it protected lawyers more than it did consumers?

c Briefly discuss whether you think changing the law was a good idea.

LO 1.4 LEARNING OBJECTIVE

MICROECONOMICS AND MACROECONOMICS
PAGE 13

LEARNING OBJECTIVE *Distinguish between microeconomics and macroeconomics.*

SUMMARY

Microeconomics is the study of how households and firms make choices, how they interact in markets, and how the government attempts to influence their choices. **Macroeconomics** is the study of the economy as a whole, including topics such as inflation, unemployment and economic growth.

REVIEW QUESTIONS

4.1   Briefly discuss the difference between *microeconomics* and *macroeconomics*.

PROBLEMS AND APPLICATIONS

4.2   Briefly explain whether each of the following is primarily a microeconomic issue or a macroeconomic issue:

a The effect of higher cigarette taxes on the quantity of cigarettes sold.

b The effect of higher income taxes on the total amount of consumer spending.

c The reasons why the economies of East Asian countries grow faster than the economies of sub-Saharan African countries.

d The reasons for low rates of profit in the airline industry.

4.3   Briefly explain whether you agree with the following assertion:

Microeconomics is concerned with things that happen in one particular place, such as the unemployment rate in one city. In contrast, macroeconomics is concerned with things that affect the country as a whole, such as how the rate of teenage smoking in Australia would be affected by an increase in the tax on cigarettes.

APPENDIX

Review the use of graphs and formulas.

LEARNING OBJECTIVE

USING GRAPHS AND FORMULAS

Graphs are used to illustrate key economics ideas. Graphs appear not just in economics textbooks but also in news and magazine articles that discuss business and economic ideas. Why are graphs used so commonly? Because they serve two useful purposes: (1) they simplify economic ideas, and (2) they make the ideas more concrete so that they can be applied to real-world problems. Economic and business issues can be complicated, but a graph can help cut through complications and highlight the key relationships needed to understand a business issue. In that sense, a graph can be like a street map.

For example, suppose you take a bus from the airport to see the Sydney Opera House. After arriving at Circular Quay, you will probably use a map similar to the one shown below to find your way to the Opera House.
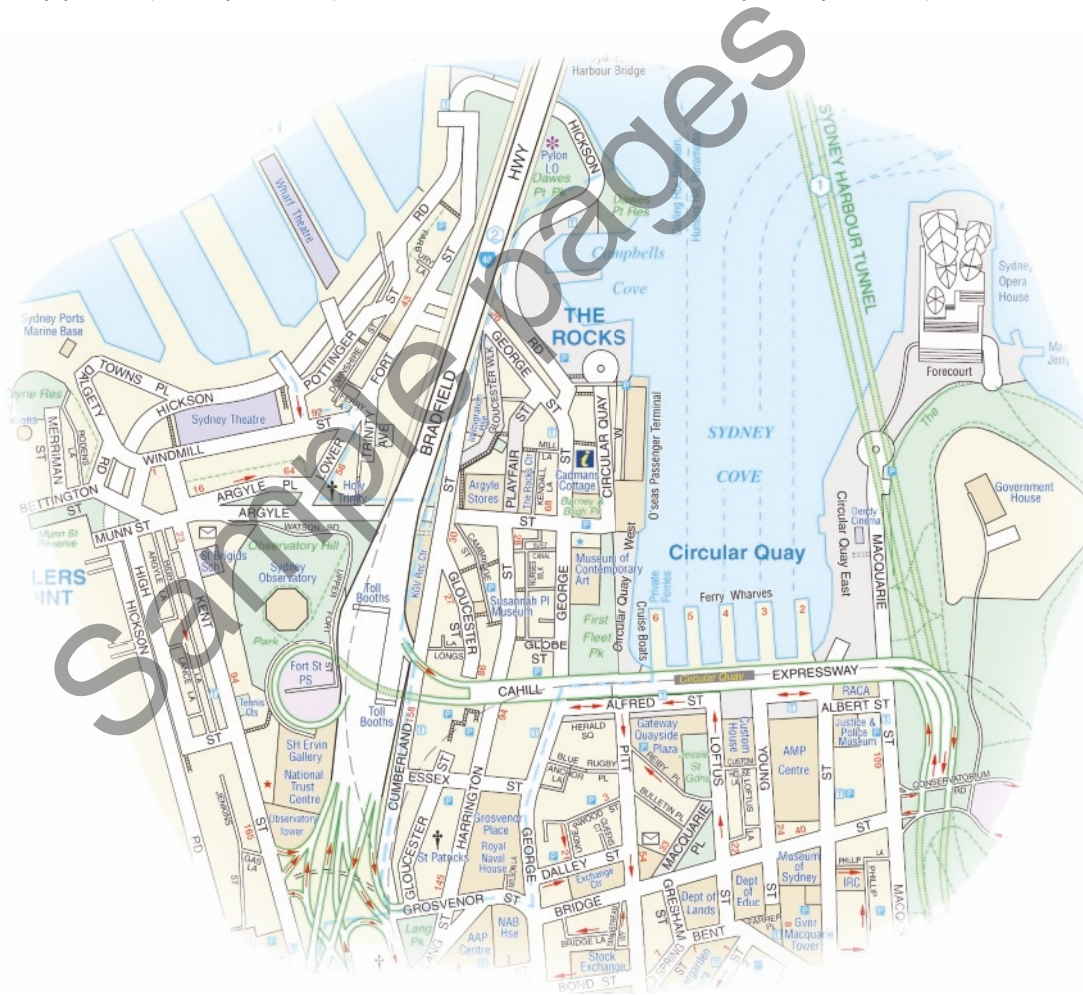
Reproduced with the kind permission of National Roads and Motorists' Association Limited.

Maps are very familiar to just about everyone, so we don't usually think of them as being simplified versions of reality, but they are. This map does not show much more than the streets in this part of Sydney and some of the most important landmarks. The names, addresses and telephone numbers of the people who live and work in the area aren't given. Almost none of the stores and buildings those people work and live in are shown either. It doesn't tell you which streets allow roadside parking and which don't. In fact, the map tells you almost nothing about the messy reality of life in this section of Sydney, except how the streets are laid out and the essential information you need to get from Circular Quay to the Opera House.

Think about someone who says, 'I know how to get around in the city, but I just can't work out how to read a map.' It is certainly possible to find your destination in a city without a map but it's a lot easier with one. The same is true of using graphs in economics. It is possible to arrive at a solution to a real-world problem in economics and business without using graphs, but it is usually a lot easier if you do use them.

Often the difficulty students have with graphs and formulas is just a lack of familiarity. With practice, all the graphs and formulas in this text will become familiar to you. Once you are familiar with them, you will be able to use them to analyse problems that would otherwise seem very difficult. What follows is a brief review of how graphs and formulas are used.

GRAPHS OF ONE VARIABLE

Figure 1A.1 displays values for Australian *merchandise exports* (goods) by destination using two common types of graphs. Export shares show the percentage of exports accounted for by different countries. Panel (a) displays the information on export shares as a *bar graph*, where the market share of each country is represented by the height of its bar. Panel (b) displays the same information as a *pie chart*, with the export share of each destination represented by the size of its slice of the pie.

FIGURE 1A.1 BAR GRAPHS AND PIE CHARTS

Values for an economic variable are often displayed as a bar graph or as a pie chart. In this case, panel (a) shows export share data for Australia as a bar graph, where the export share of each country is represented by the height of its bar, while panel (b) displays the same information as a pie chart, where the export share of each country is represented by the size of its slice of the pie.
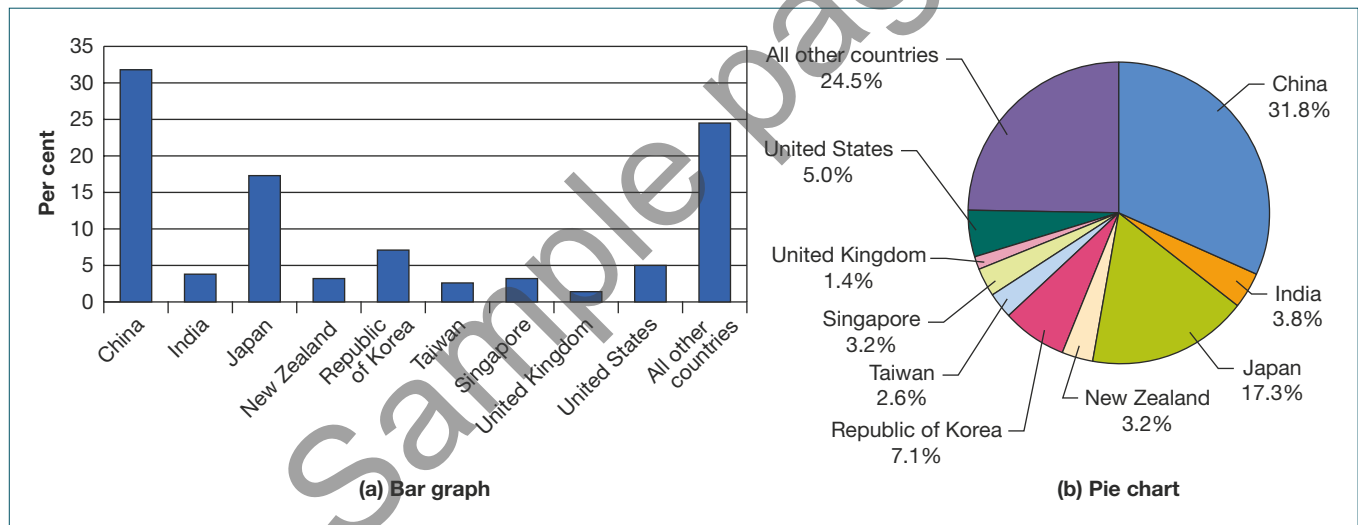
SOURCE: Based on Australian Bureau of Statistics (2016), *International Trade in Goods and Services, Australia*, Cat. No. 5368.0, Times Series Workbook, Table 14a, at <www.abs.gov.au>, viewed 19 January 2016.

Information on economic variables is also often displayed in *time-series graphs*. The date, often the year, in which the variable is measured is depicted along the horizontal axis (or *x*-axis), and the value of the variable is measured on the vertical axis (or *y*-axis). In Figure 1A.2 we depict time on the horizontal axis, and we measure the rate of unemployment in Australia on the vertical axis. In time-series graphs, the height of the line at each date shows the value of the variable measured on the vertical axis. Both panels of Figure 1A.2 show Australia's unemployment rate for each year from 1980 to 2015. The difference between panels (a) and (b) illustrates the importance of the scale used in a time-series graph. In panel (a) the scale on the vertical axis begins at 4 per cent (i.e. it does not start at zero) and finishes at 12 per cent. In panel (b) the scale begins at zero and finishes at 20 per cent. In panel (b) the fluctuations in the rate of unemployment appear smaller than in panel (a).

GRAPHS OF TWO VARIABLES

We often use graphs to show the relationship between two variables. For example, suppose you are interested in the relationship between the price of a pepperoni pizza and the quantity of pizzas sold per

FIGURE 1A.2 TIME–SERIES GRAPHS

Both panels of Figure 1A.2 show Australia's unemployment rate for each year from 1980 to 2015. Panel (a) begins the vertical axis at 4 per cent (i.e. it does not start at zero) and finishes at 12 per cent, while panel (b) begins the vertical axis at zero and finishes at 20 per cent. As a result, the fluctuations in the rate of unemployment appear smaller in panel (b) than in panel (a).

Panel (a)

Panel (b)
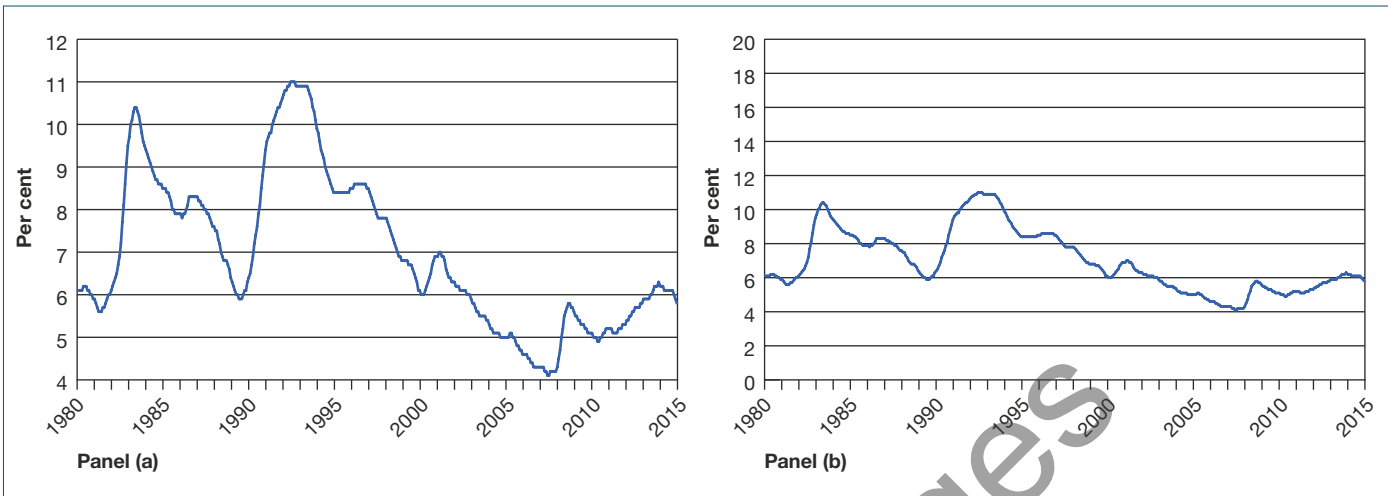
SOURCE: Based on Australian Bureau of Statistics (2016), *Labour Force, Australia,* Table 01, Cat. No. 6202.0, Time Series Workbook, at <www.abs.gov.au>, viewed 19 January 2016.

week in a small town. A graph showing the relationship between the price of a good and the quantity of the good demanded at each price is called a *demand curve*. (As we will discuss later, in drawing a demand curve for a good we have to hold constant any variables other than price that might affect the willingness of consumers to buy the good.) Figure 1A.3 shows the data you have collected on price and quantity. The

FIGURE 1A.3 PLOTTING PRICE AND QUANTITY POINTS ON A GRAPH

The figure shows a two-dimensional grid on which we measure the price of pizza along the vertical axis (*y*-axis) and the quantity of pizza sold per week along the horizontal axis (*x*-axis). Each point on the grid represents one of the price and quantity combinations listed in the table. By connecting the points by a line, we can illustrate better the relationship between the two variables.
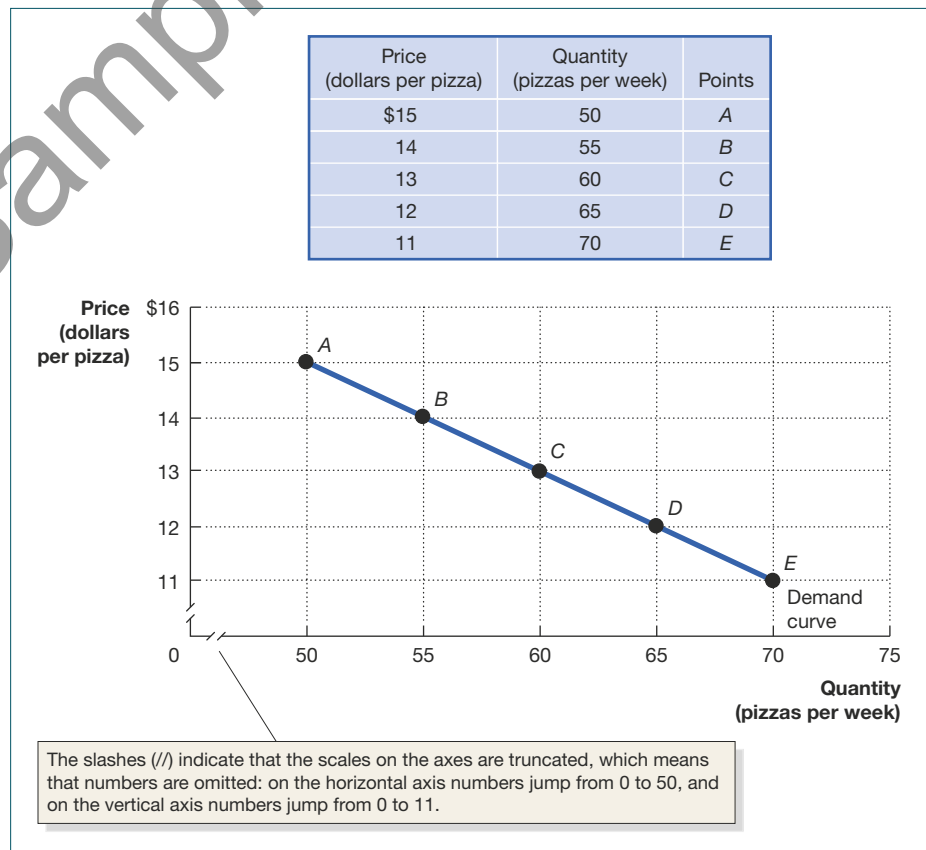
Price (dollars per pizza)	Quantity (pizzas per week)	Points
$15	50	A
14	55	B
13	60	C
12	65	D
11	70	E

The slashes (//) indicate that the scales on the axes are truncated, which means that numbers are omitted: on the horizontal axis numbers jump from 0 to 50, and on the vertical axis numbers jump from 0 to 11.

figure shows a two-dimensional grid on which we measure the price of pizza along the *y*-axis and the quantity of pizza sold per week along the *x*-axis. Each point on the grid represents one of the price and quantity combinations listed in the table. We can connect the points to form the demand curve for pizza for the town. Notice that the scales on both axes in the graph are truncated. In this case, truncating the axes allows the graph to illustrate more clearly the relationship between price and quantity by excluding low prices and quantities.

Slopes of lines

Once you have plotted the data in Figure 1A.3, you may be interested in how much the quantity of pizza sold increases as the price decreases. The *slope* of a line tells us how much the variable we are measuring on the *y*-axis changes as the variable we are measuring on the *x*-axis changes. We often use the Greek letter delta (Δ) to stand for the change in a variable.

$$\text{Slope} = \frac{\text{change in value on the vertical axis}}{\text{change in value on the horizontal axis}} = \frac{\Delta y}{\Delta x}$$

Figure 1A.4 reproduces the graph from Figure 1A.3. Because the slope of a straight line is the same at any point, we can use any two points in the figure to calculate the slope of the line. For example, when the price of pizza decreases from \$14 to \$12, the quantity of pizza sold increases from 55 per week to 65 per week. Therefore, the slope is:

$$\text{Slope} = \frac{\Delta \text{ price of pizza}}{\Delta \text{ quantity of pizza}} = \frac{(\$12 - \$14)}{65 - 55} = \frac{-2}{10} = -0.2$$

The slope of this line gives us some insight into how responsive consumers are to changes in the price of pizza. The larger the value of the slope (ignoring the negative sign), the steeper the line will be, which indicates that not many additional pizzas are sold when the price falls. The smaller the value of the slope, the flatter the line will be, which indicates a greater increase in pizzas sold when the price falls.

Taking into account more than two variables on a graph

The demand curve graph in Figure 1A.4 shows the relationship between the price of pizza and the quantity of pizza sold, but we know that the quantity of any good sold depends on more than just the price of the good. For example, the quantity of pizza sold in a given week can be affected by such other variables as the price of burgers, whether an advertising campaign by local pizza parlours has begun that week, and so on. Allowing the values of any other variables to change will cause the position of the demand curve in the graph to change.

Suppose, for example, that the demand curve for pizzas in Figure 1A.4 was drawn holding the price of burgers constant at \$1.50. If the price of burgers rises to \$2.00 some consumers will switch from buying burgers to buying pizza and more pizzas will be sold at every price. The result on the graph will be to shift
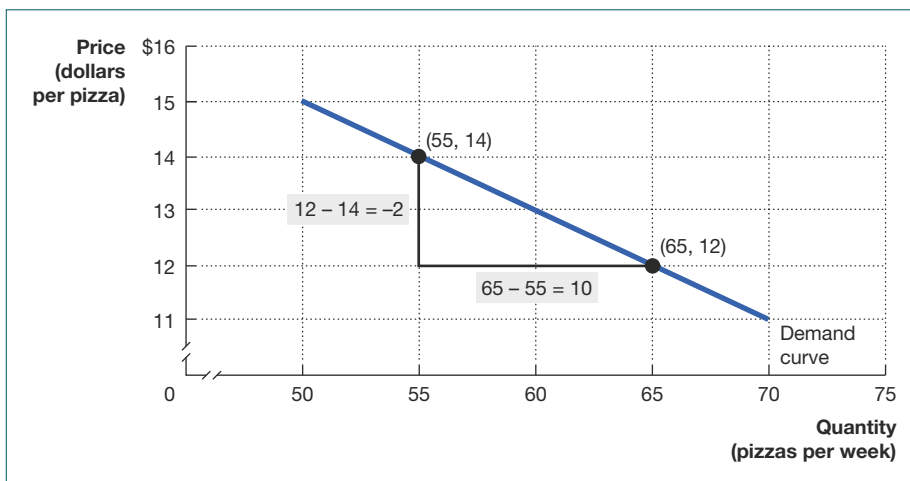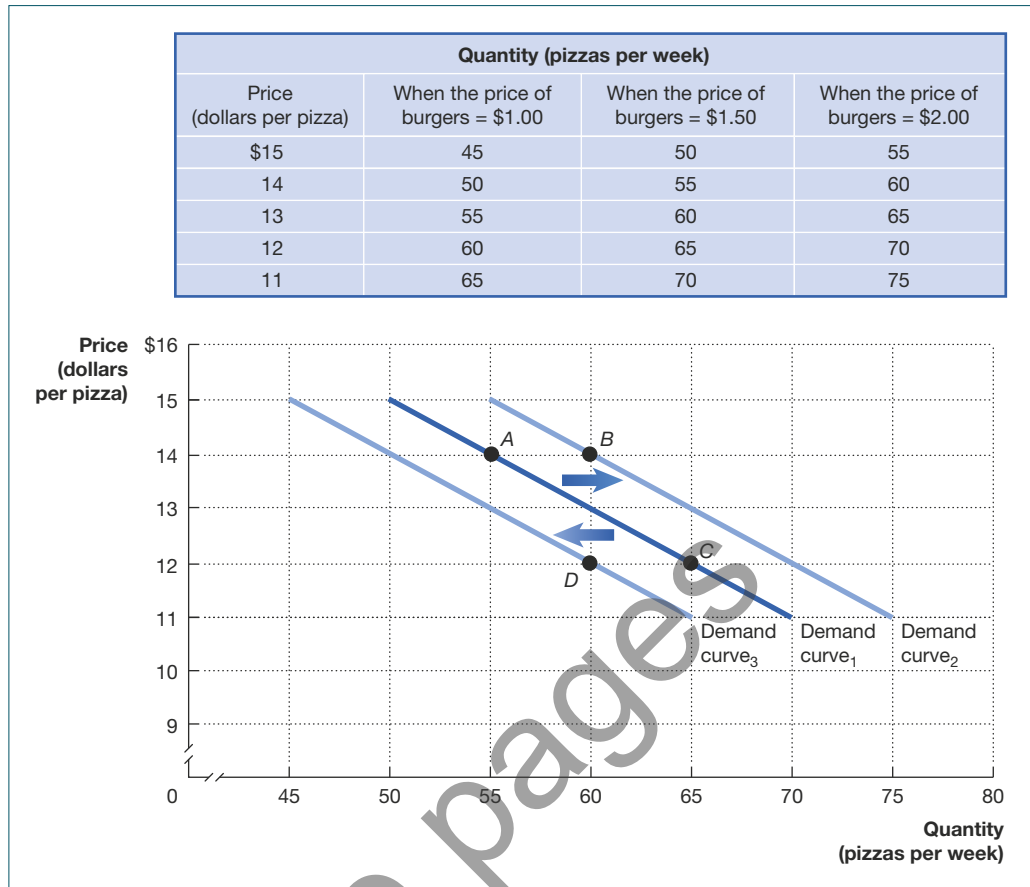
FIGURE 1A.4 CALCULATING THE SLOPE OF A LINE
We can calculate the slope of a line as the change in the value of the variable on the *y*-axis divided by the change in the value of the variable on the *x*-axis. Because the slope of a straight line is constant, we can use any two points in the figure to calculate the slope of the line. For example, when the price of pizza decreases from \$14 to \$12 the quantity of pizza demanded increases from 55 per week to 65 per week. So, the slope of this line equals −2 divided by 10, or −0.2.

FIGURE 1A.5 SHOWING THREE VARIABLES ON A GRAPH

The demand curve for pizza shows the relationship between the price of pizzas and the quantity of pizza demanded, holding constant other factors that might affect the willingness of consumers to buy pizza. If the price of pizza is $14 (point *A*), an increase in the price of burgers from $1.50 to $2.00 increases the quantity of pizzas demanded from 55 to 60 per week (point *B*) and shifts us to Demand curve$_2$. Or, if we start on Demand curve$_1$, and the price of pizza is $12 (point *C*), a decrease in the price of burgers from $1.50 to $1.00 decreases the quantity of pizzas demanded from 65 to 60 per week (point *D*), and shifts us to Demand curve$_3$.

	Quantity (pizzas per week)		
Price (dollars per pizza)	When the price of burgers = $1.00	When the price of burgers = $1.50	When the price of burgers = $2.00
$15	45	50	55
14	50	55	60
13	55	60	65
12	60	65	70
11	65	70	75

the line representing the demand curve to the right. Similarly, if the price of burgers falls from $1.50 to $1.00, some consumers will switch from buying pizza to buying burgers and fewer pizzas will be sold at every price. The result on the graph will be to shift the line representing the demand curve to the left.

The table in Figure 1A.5 shows the effect of a change in the price of burgers on the quantity of pizza demanded. For example, suppose at first we are on the line labelled Demand curve$_1$. If the price of pizza is $14 (point *A*), an increase in the price of burgers from $1.50 to $2.00 increases the quantity of pizza demanded from 55 to 60 per week (point *B*), and shifts us to Demand curve$_2$. Or, if we start on Demand curve$_1$ and the price of pizza is $12 (point *C*), a decrease in the price of burgers from $1.50 to $1.00 decreases the quantity of pizza demanded from 65 to 60 per week (point *D*) and shifts us to Demand curve$_3$. By shifting the demand curve, we have taken into account the effect of changes in the value of a third variable—the price of burgers. We will use this technique of shifting curves to allow for the effects of additional variables many times in this book.

Positive and negative relationships

We can use graphs to show the relationships between any two variables. Sometimes the relationship between the variables is *negative*, meaning that as one variable increases in value the other variable decreases in value. This was the case with the price of pizza and the quantity of pizza demanded. The relationship between two variables can also be positive, meaning that the values of both variables increase together. This positive co-movement is the case, for example, with the level of *disposable personal income* (income from all sources less tax) received by households and the level of total *consumption spending*, which is spending by households on all types of goods and services, apart from houses. The table in Figure 1A.6 shows hypothetical values for income and consumption spending for the years 2015–2018 (the values are in billions of dollars). The graph plots the data from the table, with disposable personal income measured along the horizontal axis and consumption spending measured along the vertical axis. Notice that the four points do not all fall exactly on the line. This is often the case with real-world data. To examine the relationship between two variables, economists often use the straight line that best fits the data.

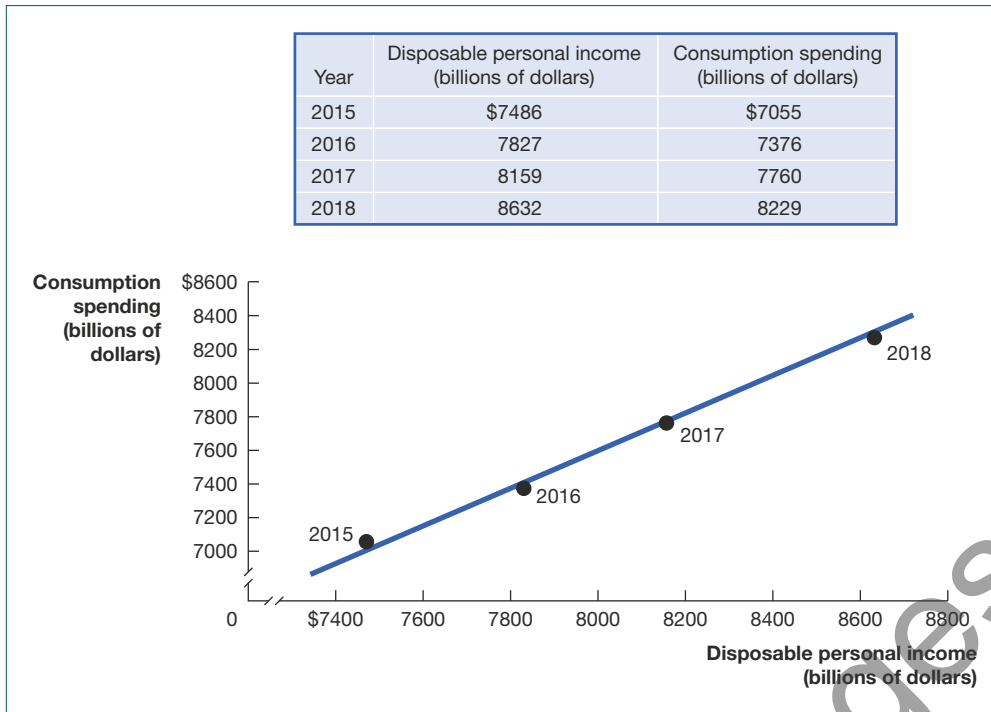| Year	Disposable personal income (billions of dollars)	Consumption spending (billions of dollars)
2015	$7486	$7055
2016	7827	7376
2017	8159	7760
2018	8632	8229

FIGURE 1A.6 IN A POSITIVE RELATIONSHIP BETWEEN TWO ECONOMIC VARIABLES, AS ONE VARIABLE INCREASES, THE OTHER VARIABLE ALSO INCREASES
This figure shows the positive relationship between disposable personal income and consumption spending. As disposable personal income has increased, so has consumption spending.
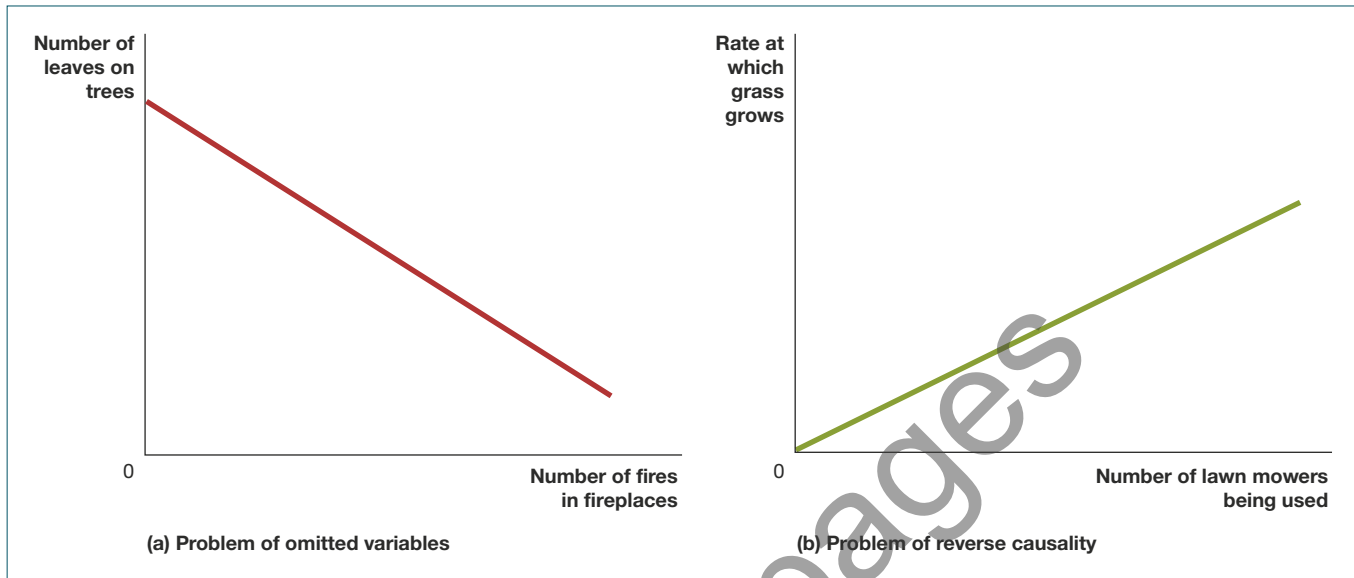
Determining cause and effect

When we graph the relationship between two variables, we usually want to draw conclusions about whether changes in one variable are causing changes in the other variable. Doing so can, however, lead to mistakes. Suppose you graph over the course of a year the number of homes in a neighbourhood that have a wood fire burning in a fireplace and the number of leaves on trees in the neighbourhood. You would get a relationship like that shown in panel (a) of Figure 1A.7: The more fireplaces in use in the neighbourhood, the fewer leaves the trees have. Can we draw the conclusion from this graph that using a wood fire causes trees to lose their leaves? We know, of course, that such a conclusion would be incorrect. In spring and summer, there are relatively few fireplaces being used, and the trees are full of leaves. In the autumn, when some trees begin to lose their leaves, fireplaces are used more frequently. And in winter, more wood fires are being used and some trees have lost all their leaves. The reason that the graph in Figure 1A.7 is misleading about cause and effect is that there is obviously an *omitted variable* in the analysis—the season of the year. An omitted variable is one that affects other variables, and its omission can lead to false conclusions about cause and effect.

Although in our example the omitted variable is obvious, there are many debates about cause and effect where the existence of an omitted variable has not been clear. For instance, it has been known for many years that people who smoke cigarettes suffer from higher rates of lung cancer than do non-smokers. For some time, tobacco companies and some scientists argued that there was an omitted variable—perhaps a failure to exercise or a poor diet—that made some people more likely to smoke and more likely to develop lung cancer. If this omitted variable existed, then the finding that smokers were more likely to develop lung cancer would not have been evidence that smoking *caused* lung cancer. In this case, however, nearly all scientists eventually concluded that the omitted variable did not exist and that, in fact, smoking does cause lung cancer.

A related problem in determining cause and effect is known as *reverse causality*. The error of reverse causality occurs when we conclude that changes in variable X cause changes in variable Y when, in fact, it is actually changes in variable Y that cause changes in variable X. For example, panel (b) of Figure 1A.7 plots the number of lawn mowers being used in a neighbourhood against the rate at which grass on lawns in the neighbourhood is growing. We could conclude from this graph that using lawn mowers *causes* the grass to grow faster. We know, however, that in reality, the causality is usually in the other direction. Rapidly growing grass during the spring and summer causes the increased use of lawn mowers, while slowly growing grass in the autumn or winter or during periods of low rainfall causes the decreased use of lawn mowers.

FIGURE 1A.7 DETERMINING CAUSE AND EFFECT

Using graphs to draw conclusions about cause and effect can be hazardous. In panel (a), we see that there are fewer leaves on the trees in a neighbourhood when many homes have wood fires burning in fireplaces. We cannot draw the conclusion that using wood fires causes the leaves to fall because we have an *omitted variable*—the season of the year. In panel (b), we see that more lawn mowers are used in a neighbourhood during times when the grass grows rapidly and fewer lawn mowers are used when the grass grows slowly. Concluding that using lawn mowers *causes* the grass to grow faster would be making the error of *reverse causality*.

(a) Problem of omitted variables   **(b) Problem of reverse causality**

Once again, in our example, the potential error of reverse causality is obvious. In many economic debates, however, cause and effect can be more difficult to determine. For example, changes in the money supply, or the total amount of money in the economy, tend to occur at the same time as changes in the total amount of income people in the economy earn. A famous debate in economics was about whether the changes in the money supply caused the changes in total income or whether the changes in total income caused the changes in the money supply. Each side in the debate accused the other side of committing the error of reverse causality.

## Are graphs of economic relationships always straight lines?

The graphs of relationships between two economic variables that we have drawn so far have been straight lines. The relationship between two variables is *linear* when it can be represented by a straight line. Few economic relationships are actually linear. For example, if we carefully plot data on the price of a product and the quantity demanded at each price, holding constant other variables that affect the quantity demanded, we will usually find a curved—or *non-linear*—relationship rather than a linear relationship. In practice, however, it is often useful to approximate a non-linear relationship with a linear relationship. If the relationship is reasonably close to being linear, the analysis is not significantly affected. In addition, it is easier to calculate the slope of a straight line, and it is also easier to calculate the area under a straight line. So, in this textbook, we often assume that the relationship between two economic variables is linear, even when we know that this assumption is not precisely correct.

Slopes of non-linear curves

In some situations, we need to take into account the non-linear nature of an economic relationship. For example, panel (a) of Figure 1A.8 shows the hypothetical relationship between Apple's total cost of producing iPhones and the quantity of iPhones produced. The relationship is curved, rather than linear. In this case the cost of production is increasing at an increasing rate, which often happens in manufacturing. Put a different way, as we move up the curve, its slope becomes steeper. (Remember that with a straight line, the slope is always constant). To see why, first remember that we calculate the slope of a curve by dividing the change in the variable on the *y*-axis by the change in the variable on the *x*-axis. In moving from point *A* to point *B*, the quantity produced increases by one million iPhones, while the total cost of production

FIGURE 1A.8 THE SLOPE OF A NON-LINEAR CURVE

The relationship between the quantity of iPhones produced and the total cost of production is curved, rather than linear. In panel (a), in moving from point A to point B, the quantity produced increases by one million iPhones, while the total cost of production increases by $50 million. Further up the curve, as we move from point C to point D, the change in quantity is the same—one million iPhones—but the change in the total cost of production is now much larger: $250 million. Because the change in the y-variable has increased, while the change in the x-variable has remained the same, we know that the slope has increased. In panel (b), we measure the slope of the curve at a particular point by the slope of the tangent line. The slope of the tangent line at point B is 75, and the slope of the tangent line at point C is 150.
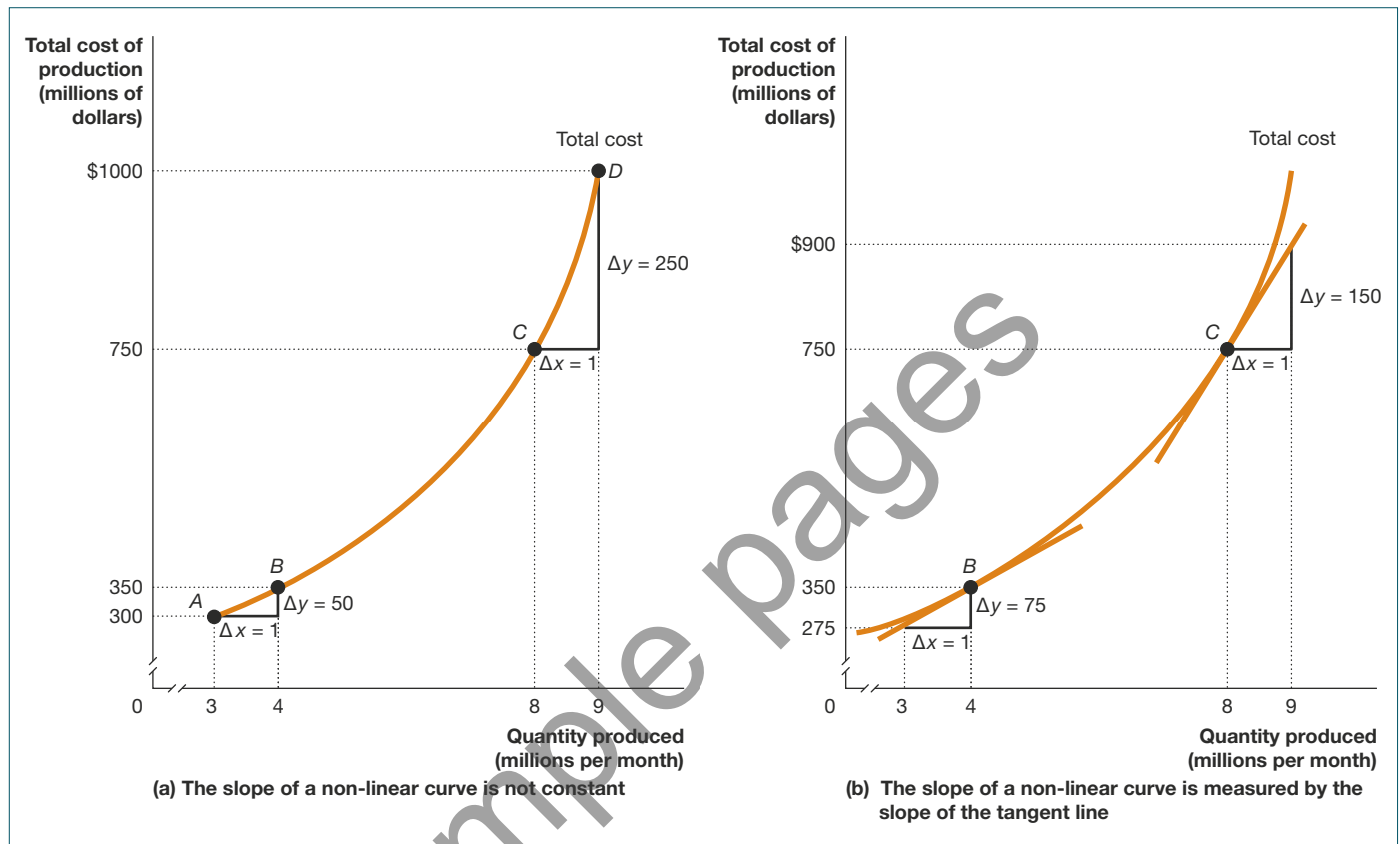
(a) The slope of a non-linear curve is not constant

(b) The slope of a non-linear curve is measured by the slope of the tangent line

increases by $50 million. Further up the curve, as we move from point C to point D, the change in quantity is the same—one million iPhones—but the change in the total cost of production is now much larger: $250 million. Because the change in the y-variable has increased, while the change in the x-variable has remained the same, we know that the slope has increased.

To measure the slope of a non-linear curve at a particular point, we must measure the slope of the *tangent line* to the curve at that point. A tangent line will only touch the curve at that point. We can measure the slope of the tangent line just as we would the slope of any straight line. In panel (b) of Figure 1A.8, the tangent line at point B has a slope equal to:

$$\frac{\Delta \text{ cost}}{\Delta \text{ quantity}} = \frac{75}{1} = 75$$

The tangent line at point C has a slope equal to:

$$\frac{\Delta \text{ cost}}{\Delta \text{ quantity}} = \frac{150}{1} = 150$$

Once again we see that the slope of the curve is larger at point C than at point B.

FORMULAS

We have just seen that graphs are an important economic tool. In this section, we will review several useful formulas and show how to use them to summarise data and to calculate important relationships.

Formula for a percentage change

One important formula is the *percentage change*. The percentage change is the change in some economic variable, usually from one period to the next, expressed as a percentage. An important macroeconomic measure is the 'real' *gross domestic product*, or RGDP. RGDP is the value of all the final goods and services produced in a country during a year. RGDP is corrected for the effects of inflation. When economists say that the Australian economy grew by 2.4 per cent during 2015, they mean that RGDP was 2.4 per cent higher in 2015 than it was in 2014. The formula for making this calculation is:

$$\left(\frac{RGDP_{2015} - RGDP_{2014}}{RGDP_{2014}} \right) \times 100$$

or, more generally for any two periods:

$$\text{Percentage change} = \left(\frac{\text{value in the second period} - \text{value in the first period}}{\text{value in the first period}} \right) \times 100$$

Suppose RGDP was \$1558 billion in 2014 and \$1596 billion in 2015. The growth rate of the economy during 2015 would have been:

$$\left(\frac{\$1596 - \$1558}{\$1558} \right) \times 100 = 2.4\%$$

Notice that it didn't matter that in using the formula we ignored the fact that RGDP is measured in billions of dollars. In fact, when calculating percentage changes, *the units don't matter*. The percentage increase from \$1558 billion to \$1596 billion is exactly the same as the percentage increase from \$1558 to \$1596.

Formulas for the areas of a rectangle and a triangle

Areas that form rectangles and triangles on graphs can have important economic meaning. For example, Figure 1A.9 shows the demand curve for Pepsi. Suppose that the price is currently \$2.00 per bottle and that 125 000 bottles of Pepsi are sold at that price. A firm's *total revenue* is equal to the amount it receives from selling its product, or the price times the quantity sold. In this case, total revenue will equal \$2.00 per bottle times 125 000 bottles, or \$250 000.

The formula for the area of a rectangle is:

$$\text{Area of a rectangle} = \text{base} \times \text{height}$$

In Figure 1A.9, the shaded rectangle also represents the firm's total revenue because its area is given by the base of 125 000 bottles multiplied by the price of \$2.00 per bottle.

FIGURE 1A.9 SHOWING A FIRM'S TOTAL REVENUE
ON A GRAPH
The area of a rectangle is equal to its base multiplied by its height. Total revenue is equal to price multiplied by quantity. Here, total revenue is equal to the price of \$2.00 per bottle times 125 000 bottles, or \$250 000. The area of the shaded rectangle shows the firm's total revenue.
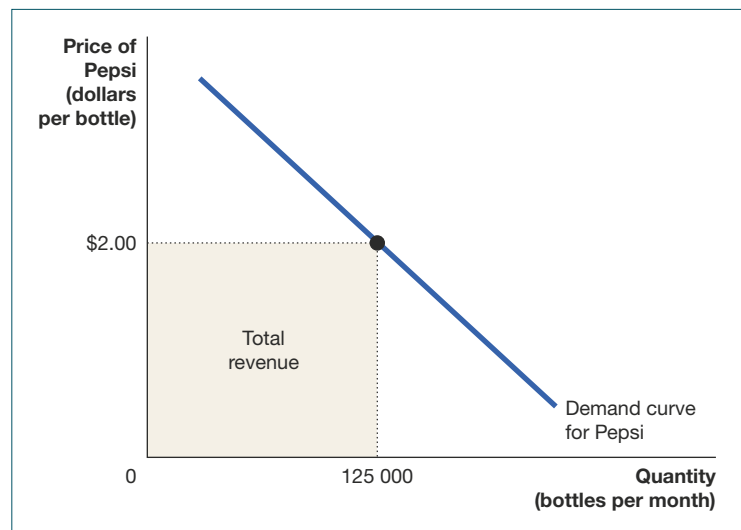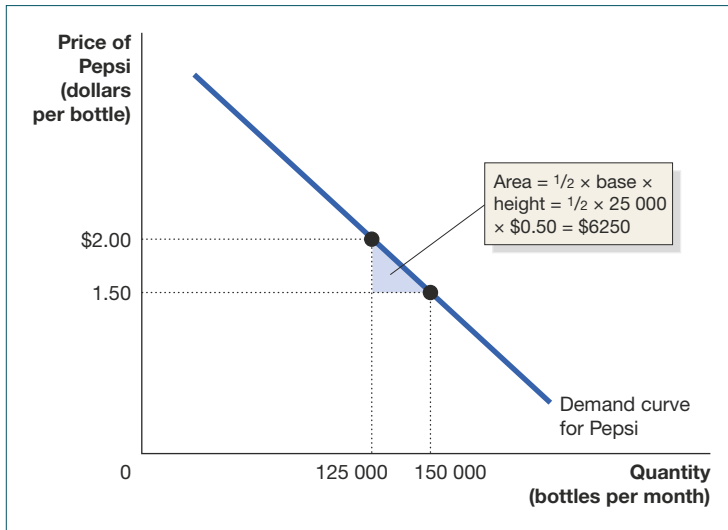
FIGURE 1A.10 THE AREA OF A TRIANGLE

The area of a triangle is equal to one-half of its base multiplied by its height. The area of the blue-shaded triangle has a base equal to 150 000 – 125 000, or 25 000, and a height equal to $2.00 – $1.50, or $0.50. Therefore, its area equals ½ × 25 000 × $0.50, or $6250.

We will see in later chapters that areas that are triangles can also have economic significance. The formula for the area of a triangle is:

$$\text{Area of triangle} = 1/2 \times \text{base} \times \text{height}$$

The blue-shaded area in Figure 1A.10 is a triangle. The base equals 150 000 – 125 000, or 25 000. Its height equals $2.00 – $1.50, or $0.50. Therefore, its area equals 1/2 x 25,000 x $0.50, or $6250. Notice that the blue area is only a triangle if the demand curve is a straight line, or linear. Not all demand curves are linear. However, the formula for the area of a triangle will usually still give us a good approximation, even if the demand curve is not linear.

Summary of using formulas

You will encounter several other formulas in this book. Whenever you must use a formula, you should follow these steps:

1   Make sure you understand the economic concept that the formula represents.

2   Make sure that you are using the correct formula for the problem you are solving.

3   Make sure that the number you calculate using the formula is economically reasonable. For example, if you are using a formula to calculate a firm's revenue and your answer is a negative number, you know you have made a mistake somewhere.

APPENDIX

QUESTIONS AND PROBLEMS

LO
LEARNING OBJECTIVE

USING GRAPHS AND FORMULAS

PAGES 20–29

LEARNING OBJECTIVE *Review the use of graphs and formulas.*

PROBLEMS AND APPLICATIONS

1A.1 The following table gives the relationship between the price of pies and the number of pies Bruce buys per week.

    a Is the relationship between the price of pies and the number of pies Bruce buys a positive relationship or a negative relationship?

PRICE	QUANTITY OF PIES	WEEK
$3.00	6	2 July
2.00	7	9 July
5.00	4	16 July
6.00	3	23 July
1.00	8	30 July
4.00	5	6 August

    b Plot the data from the table on a graph similar to the one in Figure 1A.3. Draw a straight line that best fits the points.

    c Calculate the slope of the line.

1A.2 The following table gives information on the quantity of glasses of lemonade demanded on sunny and overcast days. Plot the data from the table on a graph similar to the one in Figure 1A.5. Draw two straight lines representing the two demand curves—one for sunny days, the other for overcast days.

| PRICE (DOLLARS PER GLASS)	QUANTITY (GLASSES OF LEMONADE PER DAY)	WEATHER
$0.80	30	Sunny
0.80	10	Overcast
0.70	40	Sunny
0.70	20	Overcast
0.60	50	Sunny
0.60	30	Overcast
0.50	60	Sunny
0.50	40	Overcast

1A.3 Real GDP in Australia in 2004/05 was $1 216 443 million and in 2014/15 real GDP was $1 596 501 million. (Australian Bureau of Statistics, 2016)[3] What was the percentage change in real GDP from 2004/05 to 2014/15? What do economists call the percentage change in real GDP from one year to the next?

**1A.4** Assume the demand curve for Pepsi passes through the following two points:

PRICE PER BOTTLE OF PEPSI	NUMBER OF BOTTLES OF PEPSI SOLD
$2.50	100 000
1.25	200 000

    a Draw a graph with a linear demand curve that passes through these two points.

    b Show on the graph the areas representing total revenue at each price. Give the value for total revenue at each price.

1A.5 What is the area of the blue triangle shown in the following figure?
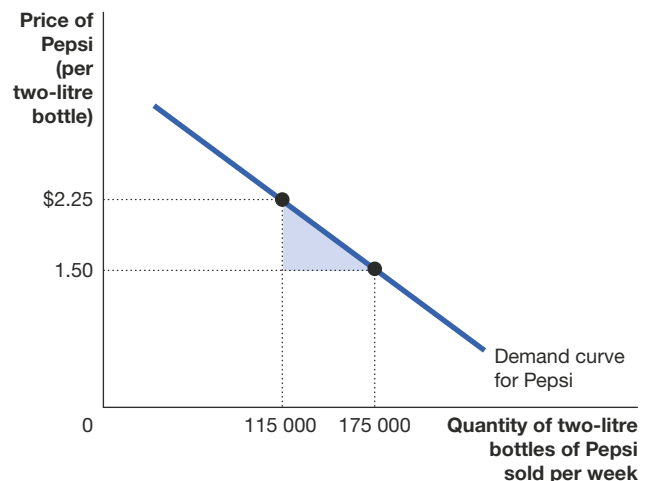
1A.6 Calculate the slope of the total cost curve at point *A*
and at point *B* in the following figure.
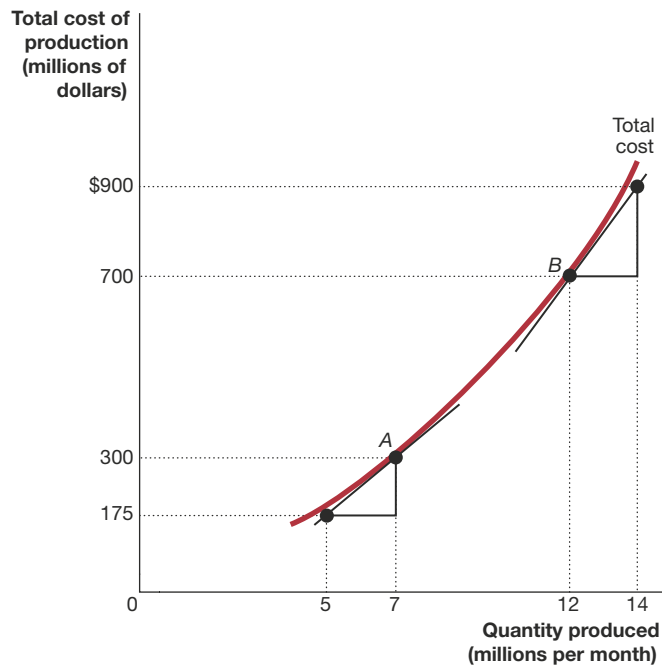
ENDNOTES

1   National Institute of Economic and Industry Research (2012), *Off-shore and off work: The future of Australia's service industries in a global economy: An update*. A report for the Australian Services Union and the Finance Sector Union, at <https://www.fsunion.org.au>, viewed 18 January 2016.

2   Alumni Profiles, School of Economics, University of Queensland, at <http://www.uq.edu.au/economics/bachelor–of–economics–graduates>, viewed 5 October 2014.

3   Australian Bureau of Statistics (2016), Australian National Accounts: National Income, Expenditure and Product, June quarter, Cat. No. 5206.0, Time Series Workbook, Table 1, at <www.abs.gov.au>, viewed 20 January 2016.