

Chapter 1

The foundations of economics

This chapter is an introduction to the study of economics. It is also an introduction to many topics that will be explored in depth in later chapters.

1.1 Scarcity, choice and opportunity cost

The fundamental problem of economics: scarcity and choice

The problem of scarcity

- ◆ Explain that scarcity exists because factors of production are finite and wants are infinite.

The term 'economics' is derived from the ancient Greek expression οἶκον νέμειν (*oikon nemein*), which originally meant 'one who manages and administers all matters relating to a household'. Over time, this expression evolved to mean 'one who is prudent in the use of resources'. By extension, economics has come to refer to the careful management of society's scarce resources to avoid waste. Let's examine this idea more carefully.

Human beings have very many needs and wants. Some of these are satisfied by physical objects and others by non-physical activities. All the physical objects people need and want are called *goods* (food, clothing, houses, books, computers, cars, televisions, refrigerators, and so on); the non-physical activities are called *services* (education, health care, entertainment, travel, banking, insurance and many more).

The study of economics arises because people's needs and wants are unlimited, or infinite. Whereas some individuals may be satisfied with the goods and services they have or can buy, most would prefer to have more. They would like to have more and better computers, cars, educational services, transport services, housing, recreation, travel, and so on; the list is endless.

Yet it is not possible for societies and the people within them to produce or buy all the things they want. Why is this so? It is because there are not enough **resources**. Resources are the inputs used to produce goods and services wanted by people, and for this reason are also known as **factors of production**. They include things like human labour, machines and factories, and 'gifts of nature' like agricultural land and metals inside the earth. Factors of production do not exist in unlimited abundance: they are *scarce*, or limited and insufficient in relation to unlimited uses that people have for them.

Scarcity is a very important concept in economics. It arises whenever there is not enough of something in relation to the need for it. For example, we could say that food is scarce in poor countries, or we could say that clean air is scarce in a polluted city. In economics, scarcity is especially important in describing a situation of *insufficient factors of production*, because this in turn leads to insufficient goods and services. Defining scarcity, we can therefore say that:

Scarcity is the situation in which available resources, or factors of production, are finite, whereas wants are infinite. There are not enough resources to produce everything that human beings need and want.

Why scarcity forces choices to be made

- ◆ Explain that as a result of scarcity, choices have to be made.

The conflict between unlimited wants and scarce resources has an important consequence. Since

people cannot have everything they want, they must make *choices*. The classic example of a choice forced on society by resource scarcity is that of ‘guns or butter’, or more realistically the choice between producing defence goods (guns, weapons, tanks) or food: more defence goods mean less food, while more food means fewer defence goods. Societies must choose how much of each they want to have. Note that if there were no resource scarcity, a choice would not be necessary, since society could produce as much of each as was desired. But resource scarcity forces the society to make a choice between available alternatives. Economics is therefore a study of choices.

The conflict between unlimited needs and wants, and scarce resources has a second important consequence. Since resources are scarce, it is important to avoid waste in how they are used. If resources are not used effectively and are wasted, they will end up producing less; or they may end up producing goods and services that people do not really want or need. Economics must try to find how best to use scarce resources so that waste can be avoided. Defining economics, we can therefore say that:

Economics is the study of choices leading to the best possible use of scarce resources in order to best satisfy unlimited human needs and wants.

As you can see from this definition of economics, economists study the world from a social perspective, with the objective of determining what is in society’s best interests.

Test your understanding 1.1

- 1 Think of some of your most important needs and wants, and then explain whether these are satisfied by goods or by services.
- 2 Why is economics a study of choices?
- 3 Explain the relationship between scarcity and the need to avoid waste in the use of resources.
- 4 Explain why diamonds are far more expensive than water, even though diamonds are a luxury while water is a necessity without which we cannot live.

Three basic economic questions: resource allocation and output/income distribution

- ◆ Explain that the three basic economic questions that must be answered by any economic system are: ‘What to produce?’, ‘How to produce?’ and ‘For whom to produce?’
- ◆ Explain that economics studies the ways in which resources are allocated to meet needs and wants.

Scarcity forces every economy in the world, regardless of its form of organisation, to answer three basic questions:

- **What to produce.** All economies must choose what particular goods and services and what quantities of these they wish to produce.
- **How to produce.** All economies must make choices on how to use their resources in order to produce goods and services. Goods and services can be produced by use of different combinations of factors of production (for example, relatively more human labour with fewer machines, or relatively more machines with less labour), by using different skill levels of labour, and by using different technologies.
- **For whom to produce.** All economies must make choices about how the goods and services produced are to be distributed among the population. Should everyone get an equal amount of these? Should some people get more than others? Should some goods and services (such as education and health care services) be distributed more equally?

The first two of these questions, *what to produce* and *how to produce*, are about *resource allocation*, while the third, *for whom to produce*, is about the *distribution of output and income*.

Resource allocation refers to assigning available resources, or factors of production, to specific uses chosen among many possible alternatives, and involves answering the *what to produce* and *how to produce* questions. For example, if a *what to produce* choice involves choosing a certain amount of food and a certain amount of weapons, this means a decision is made to *allocate* some resources to the production of food and some to the production of weapons. At the same time, a choice must be made about *how to produce*: which particular factors of production and in what quantities (for example, how much labour, how many machines, what types of machines, etc.) should be assigned to produce food, and which and how many to produce weapons.

If a decision is made to change the amounts of goods produced, such as more food and fewer weapons, this involves a **reallocation** of resources. Sometimes, societies produce the ‘wrong’ amounts of goods and services relative to what is socially desirable. For example, if too many weapons are being produced, we say there is an **overallocation** of resources in production of weapons. If too few socially desirable goods or services are being produced, such as education or health care, we say there is an **underallocation** of resources to the production of these.

An important part of economics is the study of how to allocate scarce resources, in other words how to assign resources to answer the *what to produce* and *how to produce* questions, in order to meet human needs and wants in the best possible way.

The third basic economic question, for *whom to produce*, involves the *distribution of output* and is concerned with how much output different individuals or different groups in the population receive. This question is also concerned with the **distribution of income** among individuals and groups in a population, since the amount of output people can get depends on how much of it they can buy, which in turn depends on the amount of income they have. When the distribution of income or output changes so that different social groups now receive more, or less, income and output than previously, this is referred to as **redistribution of income**.

Test your understanding 1.2

- 1 What are the three basic economic questions that must be addressed by any economy?
- 2 Explain the relationship between the three basic economic questions, and the allocation of resources and the distribution of income or output.
- 3 Consider the following, and identify each one as referring to output/income distribution or redistribution; or to resource allocation, reallocation, overallocation or underallocation (note that there may be more than one answer).
 - (a) Evidence suggests that over the last two decades in many countries around the world the rich are getting richer and the poor are getting poorer.
 - (b) In Brazil, the richest 10% of the population receive 48% of total income.

- (c) Whereas rich countries typically spend 8–12% of their income on providing health care services to their populations, many poor countries spend as little as 2–3% of income.
- (d) Many developing countries devote a large proportion of their government budget funds for education to spending on university level education, while large parts of their population remain illiterate.
- (e) If countries around the world spent less on defence, they would be in a position to expand provision of social services, including health care and education.
- (f) Pharmaceutical companies spend most of their research funds on developing medicines to treat diseases common in rich countries, while ignoring the treatment of diseases common in poor countries.

Resources as factors of production

We have seen that resources, or all inputs used to produce goods and services, are also known as factors of production.

The four factors of production

Economists group factors of production under four broad categories:

- **Land** includes all natural resources, including all agricultural and non-agricultural land, as well as everything that is under or above the land, such as minerals, oil reserves, underground water, forests, rivers and lakes. Natural resources are also called ‘gifts of nature’.
- **Labour** includes the physical and mental effort that people contribute to the production of goods and services. The efforts of a teacher, a construction worker, an economist, a doctor, a taxi driver or a plumber all contribute to producing goods and services, and are all examples of labour.
- **Capital**, also known as *physical capital*, is a man-made factor of production (it is itself produced) used to produce goods and services. Examples of physical capital include machinery, tools, factories, buildings, road systems, airports, harbours, electricity generators and telephone supply lines. Physical capital is also referred to as a capital good or investment good.

- **Entrepreneurship** (management) is a special human skill possessed by some people, involving the ability to innovate by developing new ways of doing things, to take business risks and to seek new opportunities for opening and running a business. Entrepreneurship organises the other three factors of production and takes on the risks of success or failure of a business.

Other meanings of the term ‘capital’

The term ‘capital’, in a most general sense, refers to resources that can produce a future stream of benefits. Thinking of capital along these lines, we can understand why this term has a variety of different uses, which although are seemingly unrelated, in fact all stem from this basic meaning.

- **Physical capital**, defined above, is one of the four factors of production consisting of man-made inputs that provide a stream of future benefits in the form of the ability to produce greater quantities of output: physical capital is used to produce more goods and services in the future.
- **Human capital** refers to the skills, abilities and knowledge acquired by people, as well as good levels of health, all of which make them more productive. Human capital provides a stream of future benefits because it increases the amount of output that can be produced in the future by people who embody skills, education and good health.
- **Natural capital**, also known as *environmental capital*, refers to an expanded meaning of the factor of production ‘land’ (defined above). It includes everything that is included in land, plus additional natural resources that occur naturally in the environment such as the air, biodiversity, soil quality, the ozone layer, and the global climate. Natural capital provides a stream of future benefits because it is necessary to humankind’s ability to live, survive and produce in the future.
- **Financial capital** refers to investments in financial instruments, like stocks and bonds, or the funds (money) that are used to buy financial instruments like stocks and bonds. Financial capital also provides a stream of future benefits, which take the form of an income for the holders, or owners, of the financial instruments.

Test your understanding 1.3

- 1 **(a)** Why are resources also called ‘factors of production’? **(b)** What are the factors of production?
- 2 How does physical capital differ from the other three factors of production?
- 3 Why is entrepreneurship considered to be a factor of production separate from labour?
- 4 **(a)** What are the various meanings of the term ‘capital’? **(b)** What do they all have in common?

Scarcity, choice and opportunity cost: the economic perspective

- ♦ Explain that when an economic choice is made, an alternative is always foregone.

Opportunity cost

Opportunity cost is defined as the value of the next best alternative that must be given up or sacrificed in order to obtain something else.

When a consumer chooses to use her \$100 to buy a pair of shoes, she is also choosing not to use this money to buy books, or CDs, or anything else; if CDs are her favourite alternative to shoes, the CDs she sacrificed (did not buy) are the opportunity cost of the shoes. When a business chooses to use its resources to produce hamburgers, it is also choosing not to produce hotdogs or pizzas, or anything else; if hotdogs are the preferred alternative, the hotdogs sacrificed (not produced) are the opportunity cost of the hamburgers. Note that if the consumer had endless amounts of money, she could buy everything she wanted and the shoes would have no opportunity cost. Similarly, if the business had endless resources, it could produce hotdogs, pizzas and a lot of other things in addition to hamburgers, and the hamburgers would have no opportunity cost. If resources were limitless, no sacrifices would be necessary, and the opportunity cost of producing anything would be zero.

The concept of **opportunity cost**, or the value of the next best alternative that must be sacrificed to obtain something else, is central to the economic perspective of the world, and results from scarcity that forces choices to be made.

Test your understanding 1.4

- 1 Explain the relationship between scarcity and choice.
- 2 Define opportunity cost.
- 3 Think of three choices you have made today, and describe the opportunity cost of each one.

The production possibilities model

- ◆ Explain that a production possibilities curve (production possibilities frontier) model may be used to show the concepts of scarcity, choice, opportunity cost and a situation of unemployed resources and inefficiency.

The production possibilities model is a simple model of the economy illustrating some important concepts.

Introducing the production possibilities curve

Consider a simple hypothetical economy producing only two goods: microwave ovens and computers. This economy has a fixed (unchanging) quantity and quality of resources (factors of production) and a fixed technology (the method of production is unchanging). Table 1.1 shows the combinations of the two goods this economy can produce. Figure 1.1 plots the data of Table 1.1: the quantity of microwave ovens is plotted on the vertical axis, and the quantity of computers on the horizontal axis.

If all the economy's resources are used to produce microwave ovens, the economy will produce 40 microwave ovens and 0 computers, shown by point A. If all resources are used to produce computers, the economy will produce 33 computers and 0 microwave ovens; this is point E. All the points on the curve joining A and E represent other production possibilities where some of the resources are used to produce microwave ovens and the rest to produce computers. For example, at point B there would be production of 35 microwave ovens and 17 computers; at point C, 26 microwave ovens and 25 computers, and so on. The line joining

Point	Microwave ovens	Computers
A	40	0
B	35	17
C	26	25
D	15	31
E	0	33

Table 1.1 Combinations of microwave ovens and computers

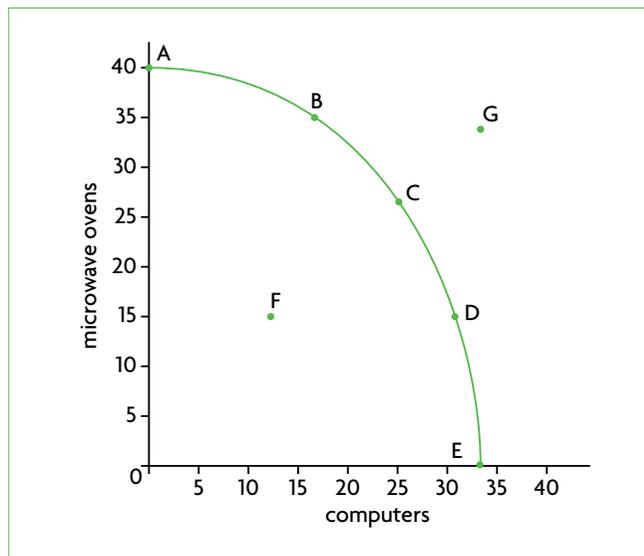


Figure 1.1 Production possibilities curve

points A and E is known as the production possibilities curve (PPC) or production possibilities frontier (PPF).

In order for the economy to produce the greatest possible output, in other words somewhere on the PPC, two conditions must be met:

- **All resources must be fully employed.** This means that all resources are being fully used. If there were unemployment of some resources, in which case they would be sitting unused, the economy would not be producing the maximum it can produce.
- **All resources must be used efficiently.** Specifically, there must be **productive efficiency**. The term 'efficiency' in a general sense means that resources are being used in the best possible way to avoid waste. (If they are not used in the best possible way, we say there is 'inefficiency'.) Productive efficiency means that output is produced by use of the fewest possible resources; alternatively, we can say that output is produced at the lowest possible cost. If output were not produced using the fewest possible resources, the economy would be 'wasting' some resources.

The **production possibilities curve (or frontier)** represents all combinations of the maximum amounts of two goods that can be produced by an economy, given its resources and technology, when there is full employment of resources and productive efficiency. All points on the curve known as **production possibilities**.

What would happen if either of the two conditions (full employment and productive efficiency) is not met? Very simply, the economy will not produce at a

point on the *PPC*; it will be somewhere inside the *PPC*, such as at point F. At F, the economy is producing only 15 microwave ovens and 12 computers, indicating that there is either unemployment of resources, or productive inefficiency, or both. If this economy could use its resources fully and efficiently, it could, for example, move to point C and produce 26 microwave ovens and 25 computers.

However, in the real world no economy is ever likely to produce on its *PPC*.

An economy's **actual output**, or the quantity of output actually produced, is always at a point inside the *PPC*, because in the real world all economies have some unemployment of resources and some productive inefficiency. The greater the unemployment or the productive inefficiency, the further away is the point of production from the *PPC*.

The production possibilities curve and scarcity, choice and opportunity cost

The production possibilities model is very useful for illustrating the concepts of scarcity, choice and opportunity cost:

- **The condition of scarcity does not allow the economy to produce outside its *PPC*.** With its fixed quantity and quality of resources and technology, the economy cannot move to any point outside the *PPC*, such as G, because it does not have enough resources (there is resource scarcity).
- **The condition of scarcity forces the economy to make a choice about what particular combination of goods it wishes to produce.** Assuming it could achieve full employment and productive efficiency, it must decide at which particular point on the *PPC* it wishes to produce.

(In the real world, the choice would involve a point inside the *PPC*.)

- **The condition of scarcity means that choices involve opportunity costs.** If the economy were at any point on the curve, it would be impossible to increase the quantity produced of one good without decreasing the quantity produced of the other good. In other words, when an economy increases its production of one good, there must necessarily be a sacrifice of some quantity of the other good; this sacrifice is the opportunity cost.

Let's consider the last point more carefully. Say the economy is at point C, producing 26 microwave ovens and 25 computers. Suppose now that consumers would like to have more computers. It is impossible to produce more computers without sacrificing production of some microwave ovens. For example, a choice to produce 31 computers (a move from C to D) involves a decrease in microwave oven production from 26 to 15 units, or a sacrifice of 11 microwave ovens. The sacrifice of 11 microwave ovens is the opportunity cost of 6 extra computers (increasing the number of computers from 25 to 31). Note that opportunity cost arises when the economy is on the *PPC* (or more realistically, somewhere close to the *PPC*). If the economy is at a point inside the curve, it can increase production of both goods with no sacrifice, hence no opportunity cost, simply by making better use of its resources: reducing unemployment or increasing productive efficiency.

The shape of the production possibilities curve

In Figure 1.2(a) the *PPC*'s shape is similar to that of Figure 1.1, while in Figure 1.2(b) it is a straight line. When the *PPC* bends outward and to the right, as in Figure 1.2(a), opportunity costs change as the economy moves from one point on the *PPC* to another. In part (a),

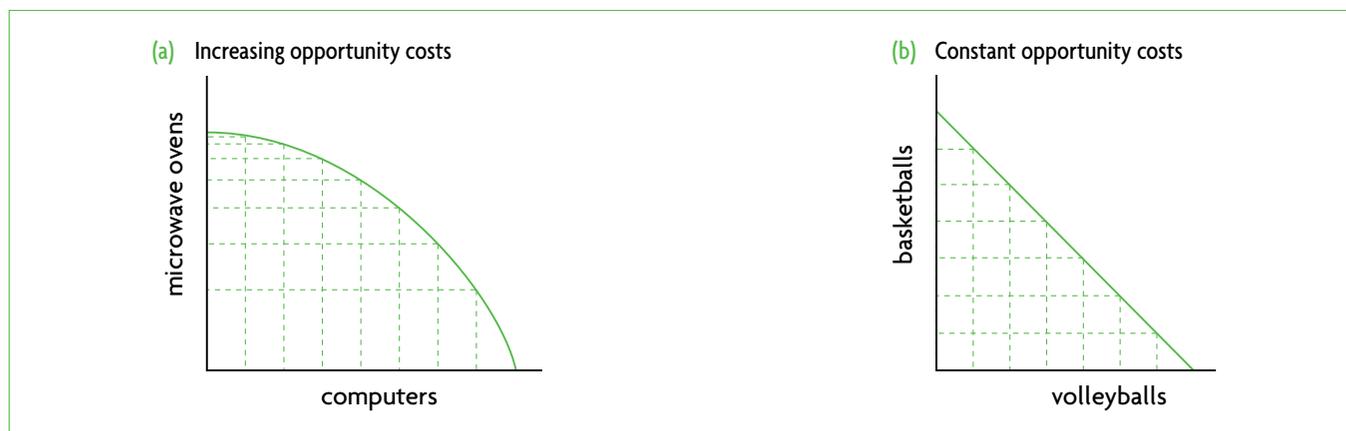


Figure 1.2 Production possibilities curve with increasing and constant opportunity costs

for each additional unit of computers that is produced, the opportunity cost, consisting of microwave ovens sacrificed, gets larger and larger as computer production increases. This happens because of specialisation of factors of production, which makes them not equally suitable for the production of different goods and services. As production switches from microwave ovens to more computers, it is necessary to give up increasingly more microwave ovens for each extra unit of computers produced, because factors of production suited to microwave oven production will be less suited to computer production. By contrast, when the *PPC* is a straight line (as in Figure 1.2(b)), opportunity costs are constant (do not change) as the economy moves from one point of the *PPC* to another. Constant opportunity costs arise when the factors of production are equally well suited to the production of both goods, such as in the case of basketballs and volleyballs, which are very similar to each other, therefore needing similarly specialised factors of production to produce them. As we can see in Figure 1.2(b), for each additional unit of volleyballs produced, the opportunity cost, or sacrifice of basketballs, does not change.

Test your understanding 1.5

- 1 Consider the production possibilities data in Table 1.1 and Figure 1.1. If the economy is initially at point A and moves to point B, computer production will increase by 17 units. **(a)** What is the opportunity cost of the increase in computer production? **(b)** If the economy moves from D to C, what will be the gain and what will be its opportunity cost? **(c)** If it moves from point C to B, what will be the gain and what will be its opportunity cost?
- 2 Use the concept of opportunity cost to explain why the following two statements have the same meaning: **(a)** productive efficiency means producing by use of the fewest possible resources, and **(b)** productive efficiency means producing at the lowest possible cost.
- 3 **(a)** Distinguish between output actually produced and output on the *PPC*. **(b)** Why is an economy's actual output most likely to be located somewhere inside its *PPC*?
- 4 Say an economy is initially at point F, producing 15 microwave ovens and 12 computers (Figure 1.1). What would be the opportunity cost of moving to a point on the production possibilities curve, such as point C, where it would be producing 26 microwave ovens and 25 computers?

1.2 Economics as a social science

The nature and method of economics

Economics as a social science

- ◆ Explain that economics is a social science.

The **social sciences** are academic disciplines that study human society and social relationships. They are concerned with discovering general principles describing how societies function and are organised. The social sciences include anthropology, economics, political science, psychology, sociology and others.

Economics is a *social science* because it deals with human society and behaviour, and particularly those aspects concerned with how people organise their activities and how they behave to satisfy their needs and wants. It is a *social science* because its approach to studying human society is based on the social scientific method.

The social scientific method

- ◆ Outline the social scientific method.

As a social science, economics tries to explain in a systematic way why economic events happen the way they do, and attempts to predict economic events likely to occur in the future. To accomplish all this, economists use the **social scientific method**. This is the same as the scientific method, which you may already be familiar with through your studies of one or more of the natural sciences (for example, biology, chemistry, and physics). It is a method of investigation used in all the social and natural sciences, allowing us to acquire knowledge of the world around us.

The social scientific (or scientific) method consists of the following steps:

Step 1: Make observations of the world around us, and select an economic question we want to answer. Let's consider an example from economics. We observe that people living in the city of Olemoo buy different amounts of oranges per week at different times in the year. We want to answer the question: why are more oranges bought in some weeks and fewer in others?

Step 2: Identify variables we think are important to answer the question. A variable is any measure that can take on different values, such as temperature, or weight, or distance. In our example the variables we choose to study are the

quantity of oranges that residents of Olemoo buy each week, and the price of oranges.

Step 3: Make a hypothesis about how the variables are related to each other. A hypothesis is an educated guess, usually indicating a cause-and-effect relationship about an event. Hypotheses are often stated as: if ..., then Our hypothesis is the following: *if the price of oranges increases, then the quantity of oranges Olemooans want to buy each week will fall.* Notice that this hypothesis indicates a cause-and-effect relationship, where price is the ‘cause’ and the quantity of oranges is the ‘effect’. The hypothesis also involves a prediction, because it claims that changes in the price of oranges will lead to a particular change in the quantity of oranges Olemooans buy.

Step 4: Make assumptions. An assumption is a statement we suppose to be true for the purposes of building our hypothesis. In our example we are making two important assumptions. (a) We assume that the price of oranges is the only variable that influences the quantity of oranges Olemooans want to buy, while all other variables that could have influenced their buying choices do not play a role. (b) We assume that the residents of Olemoo

spend their money on oranges (and other things they want) so that they will get the greatest possible satisfaction from their purchases. We will examine both these assumptions later in this section.

Step 5: Test the hypothesis to see if its predictions fit with what actually happens in the real world. To do this, we compare the predictions of the hypothesis with real-world events, based on real-world observations. Here, the methods of economics differ from those of the natural sciences. Whereas in the natural sciences it is often (though not always) possible to perform experiments to test hypotheses, in economics the possibilities for experiments are very limited. Economists therefore rely on a branch of statistics called econometrics to test hypotheses. This involves collecting data on the variables in the hypothesis, and examining whether the data fit the relationships stated in the hypothesis. In our example, we must collect data on the quantity of oranges bought by Olemoo’s residents during different weeks throughout the year, and compare these quantities with different orange prices at different times in the year. (Econometrics is usually studied at university level, and is not part of IB requirements.)



Theory of knowledge

More on testing hypotheses and the scientific method

We have seen how hypotheses are tested using the social scientific method. If the data fit the predictions of a hypothesis, the hypothesis is accepted. However, this does not make the hypothesis necessarily ‘true’ or ‘correct’. The only knowledge we have gained is that *according to the data used, the hypothesis is not false*. There is always a possibility that as testing methods are improved and as new and possibly more accurate data are used, a hypothesis that earlier had been accepted now is rejected as false. Therefore, no matter how many times a hypothesis is tested, we can never be sure that it is ‘true’.

But by the same logic, we can never be sure that a hypothesis that is rejected is necessarily false. It is possible that our hypothesis testing, maybe because of poor data or poor testing methods, incorrectly rejected a hypothesis. Testing of the same hypothesis with different methods or data could show that the hypothesis had been wrongly rejected.

If our results from hypothesis testing are subject to so many uncertainties, how can economic knowledge about the world develop and progress? Economists and other

social and natural scientists work with hypotheses that have been tested and not falsified (not rejected). While the possibility exists that the hypotheses may be false, they use these hypotheses *on the assumption* that they are not false. As more and more testing is done, and as unfalsified hypotheses accumulate, it becomes more and more likely that they are not false (though we can never be sure). This way, it is possible to accumulate knowledge about the world, on the understanding, however, that this knowledge is tentative and provisional; in other words, it can never be proven to be correct or true.

Thinking points

- Is it possible to ever arrive at the truth of a statement about the real world based on empirical testing?
- Even assuming that testing methods could be perfected and data vastly improved, can there ever be complete certainty about our knowledge of the social (and natural) worlds?

Step 6: Compare the predictions of the hypothesis with real-world outcomes.

If the data do not fit the predictions of the hypothesis, the hypothesis is rejected, and the search for a new hypothesis could begin. In our example, this would happen if we discovered that as the price of oranges increases, the quantity of oranges Olemooans want to buy each week also increases. Clearly, this would go against our hypothesis, and we would have to reject the hypothesis as invalid. If, on the other hand, the data fit the predictions, the hypothesis is accepted. In our example, this would occur if our data show that as the price of oranges increases, Olemoo's residents buy fewer oranges. We can therefore conclude that according to the evidence, our hypothesis is a valid one.

Economists as model builders

◆ Explain the process of model building in economics.

In economics, as in other social (and natural) sciences, our efforts to gain knowledge about the world involve the formulation of hypotheses, theories, laws and models. The relationships between these ideas are explored in the Theory of knowledge feature on page 10. Here we focus on the role of models.

Everyone is familiar with the idea of a model. As children, many of us played with paper aeroplanes, which are models of real aeroplanes. In chemistry at school, we studied molecules and atoms, which are models of what matter is made of. Models are a simplified representation of something in the real world, and are used a lot by scientists and social scientists in their efforts to understand or explain real-world situations. Models represent only the important aspects of the real world being investigated, ignoring unnecessary details, thereby allowing scientists and social scientists to focus on important relationships.

Whereas sciences like biology, chemistry and physics offer the possibility to construct three-dimensional models (as with molecules and atoms), this cannot be done in the social sciences, because these are concerned with human society and social relationships. In economics, models are often illustrated by use of diagrams showing the relationships between important variables. In more advanced economics, models

are illustrated by use of mathematical equations. (Note that both diagrams and mathematical equations are used to represent models in natural sciences, such as physics, as well.) To construct a model, economists select particular variables and make assumptions about how these are interrelated. Different models represent different aspects of the economic world. Some models may be better than others in their ability to explain economic phenomena.

Models are often closely related to theories, as well as to laws. A theory tries to explain *why* certain events happen and to make predictions; a law is a concise statement of an event that is supposed to have universal validity. Models are often built on the basis of well-established theories or laws, in which case they may illustrate, through diagrams or mathematical equations, the important features of the theory or law. When this happens, economists use the terms 'model' and 'theory' interchangeably, because in effect they refer to one and the same thing. For example, in Chapter 7, we will use models to illustrate the ideas contained in the theory of firm behaviour. Later, in Chapter 9, different models of the macroeconomy will be used to illustrate alternative theories of income and output determination.

However, models are not always representations of theories. In some cases, economists use models to isolate important aspects of the real world and show connections between variables but without any explanations as to *why* the variables are connected in some particular way. In such cases, models are purely descriptive; in other words, they describe a situation, without explaining anything about it. For example, the production possibilities model, which we studied on page 5, is a simple model that is very important because of its ability to *describe* scarcity, choice and opportunity cost. The model describes the basic problem of economics, which is that societies are forced to make choices that involve sacrifices because of the condition of scarcity. There is no theory involved here.

Descriptive models that are not based on a theory are in no way less important than models that illustrate a theory. Both kinds of model are very effective as tools used by economists to highlight and understand important relationships and phenomena in the economics world. In our study of economics, we will encounter a variety of economic models and will make extensive use of diagrams.



Theory of knowledge

Hypotheses, theories, laws and models

We have seen that a hypothesis is an educated guess about a cause-and-effect relationship in a single event. A *theory* is a more general explanation of a set of interrelated events, usually (though not always) based on several hypotheses that have been tested successfully (in other words, they have not been rejected, based on evidence; see the Theory of knowledge feature on page 8). A theory is a generalisation about the real world that attempts to organise complex and interrelated events and present them in a systematic and coherent way to explain *why* these events happen. Based on their ability to systematically explain events, theories attempt to make predictions.

A *law*, on the other hand, is a statement that describes an event in a concise way, and is supposed to have universal validity; in other words, to be valid at all times and in all places. Laws are based on theories and are known to be valid in the sense that they have been successfully tested very many times. They are often used in practical applications and in the development of further theories because of their great predictive powers. However, laws are much simpler than theories, and do not try to explain events the way theories do.

Referring to the example of oranges (page 7), the relationship between the price of oranges and the quantity of oranges residents of Olemoo buy at each price was a hypothesis. This kind of hypothesis has been successfully tested a great many times for many different goods, and the data support the presence in the real world of such a relationship. However, this relationship is not a theory, because it only shows how two variables relate to each other, and does not explain anything about *why* buyers behave the way they do when they make decisions to buy something. To explain this relationship in a general way, economists have developed ‘marginal

utility theory’ and ‘indifference curve analysis’ based on a more complicated analysis involving more variables, assumptions and interrelationships. These theories try to answer the question *why* people behave in ways that make the observed relationship between price and quantity a valid one.

Yet, the simple relationship between the quantity of a good that people want to buy and its price, while not a theory, has the status of one of the most important *laws* of economics, called the *law of demand*. This law is a statement describing an event in a simple way. It has great predictive powers and is used as a building block for very many complex theories. We will study the law of demand in detail in Chapter 2 and we will use it repeatedly throughout this book in numerous applications, and as a building block for many theories.

In your study of economics, you will encounter many theories and some laws. Your study of both theories and laws will make great use of economic models. Models, as explained in the text, are sometimes used to illustrate theories (or laws) and sometimes to describe the connections between variables.

Thinking points

The relationships between hypotheses, theories, laws and models described here apply generally to all the sciences and social sciences based on the scientific method. Yet they may differ between disciplines in the ways they are used and interpreted. As you study economics, you may want to think about the following.

- How are theories and laws used in economics as compared with other disciplines? Do they play the same role? Are they derived in the same ways? Do they have the same meaning?

Test your understanding 1.6

- 1 Explain the social scientific method. What steps does it involve?
- 2 Why is it important to compare the predictions of a hypothesis with real-world outcomes?
- 3 How do models help economists in their work as social scientists?

Two assumptions in economic model-building *Ceteris paribus*

- ♦ Explain that economists must use the *ceteris paribus* assumption when developing economic models.

When we try to understand the relationship between two or more variables in the context of a hypothesis, or economic theory or model, we must assume that everything else, other than the variables we are studying, does not change. We do this by use of the *ceteris paribus* assumption: