PART I

THE ESSENTIALS OF MICROECONOMICS

1. Is microeconomics ‘boring’ and ‘difficult’? 3
2. The ‘clever’ and ‘dumb’ consumer 39
3. The ‘black box’ competitor 86
4. Efficiency, partial equilibrium and prices 122
5. Efficiency, general equilibrium and equity 163
6. The ‘benefits’ of market intervention 201
7. Risk, information, insurance and uncertainty 235
8. Time, fundamental commodities, discounting and the economic analysis of knowledge creation 273
Is microeconomics ‘boring’ and ‘difficult’?

1.1 Introduction

Students often find microeconomic theory boring or difficult or both. In this chapter an explanation of these phenomena is offered. In providing an explanation it is hoped in the remainder of the chapters to reverse the negative connotations associated with this opening chapter title. Microeconomic theory can be both interesting and accessible. But access is not free. The price to be paid is work effort; not so much in terms of more reading, more note taking and more ‘highlighting’ but in terms of more thinking. The process of thinking seldom yields quick results and getting to the ‘promised land’ (of interest and ease) requires patience, perseverance and problem solving. However, it is possible to arrive at the ‘promised land’ and it is hoped that these pages facilitate the journey.

Einstein told the world that time and space were not fixed characteristics of the physical universe, but rather that they were relative to the position of the observer. If this message has become easy to accept for the apparently hard physical universe, it should be that much easier to accept for the social universe. The basic point is that what you get to see, or to believe, depends on where you stand. What you get to see, or believe, depends on the underlying framework in which you are trying to fit observations. In order to understand microeconomics you have to acquire an understanding of the underlying framework in which economists attempt to interpret the world. In following this line of thought, it is clear that economics is about acquiring a mental skill (rather than studying a specific set of topics, e.g. about the business world, the stock market, the balance of payments and issues that people in general tend to identify with the subject

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1. If evidence is required, and one early reviewer of this text thought it was, consider the following quotations: ‘The reason A-level economics is not attracting students is twofold: the syllabus has not kept up with developments such as game theory and asymmetric information, and is seen as boring, theoretical and difficult’ (La Manna 2003: 15, emphasis added).

Cole (1973: x) writes in the preface to his microeconomics theory text, ‘Anyone who has taught economic theory has, I am sure no false impressions about the popularity of the subject. Appraisals are plentiful: It doesn’t help people.’ ‘I can understand the words but not the graphs.’ ‘It tries to reduce human behaviour to quantitative terms.’ ‘I’ll never remember how to derive a demand curve.’ ‘How will it help me get a job?’ And, of course, ‘It’s boring.’ (emphasis added.)

More recently Varoufakis (1998: ix) in the preface to his book on the foundations of economics writes: ‘This book is the result of two related personal experiences. First came the experience of learning economics as a first year student at the University of Essex back in 1978. By golly it was boring!’ (Emphasis added.)
‘economics’). Many economists are interested in economics but not in the economy. Whilst this statement is offered as an eye-catching one, it is nevertheless the case that much of microeconomic theory does not connect very directly to ‘the economy’ as individuals commonly perceive it. In the next section the key features in the microeconomist’s view of the world are outlined as a way of substantiating the claims made above.

The style of textbooks varies. Here the intention is to provide material on microeconomics assuming the reader has successfully completed a foundational introductory first-year course in microeconomics. In trying to make the material more vivid the style adopted is akin to that of the dress-code ‘smart–casual’ – rather than ‘formal’. It is smart in that it is hoped to provide sufficient detailed analysis so that all post-foundation-level economics can be accessed with, or from, this text. It is casual in that some of the writing has a deliberate colloquial style (to stimulate interest); indeed, where mathematical analysis is employed, this is not taken to any great degree of refinement (second-order conditions are generally ignored). It is hoped that if you stick with the material presented here and pay the price of work effort, there is a great deal to be gained (but, of course, we also want to sell the text, so ‘caveat emptor’!).

1.2 ‘Boring boring economics!’

Why do some students find economics boring? The answer seems to lie, at least partly, in six characteristics that define the way in which students are invited to think about the world in which they live and make decisions.2

1.2.1 Build abstract models

Economists work by constructing economic models. The word ‘model’ signifies that something is not the ‘real thing’. Economic models are abstractions that are meant to be useful. The idea is that progress is made by the orderly loss of information surrounding any problem. The objective is to abstract only the key relationships to facilitate analysis. It is clear from this that good (or bad) economic theory cannot be about realism as such. Economic theorists are not upset when they are told that they are being unrealistic. What matters is whether the model can explain, predict or offer insights with the chosen abstractions that have been judged to be key. As has been observed on a number of occasions, a map of the world on a scale 1 to 1 is totally unhelpful because you are standing on it!

Millions of people each year travel successfully around the London Underground system by using the familiar colour-coded maps that are set out for them to work with. However, these maps bear little relationship to the actual geographical structure of the network of railways that the millions of people are successfully negotiating. The coloured circles and lines are an abstraction from geographical reality and prove very helpful to people who wish to travel around London. Abstraction is required to help make a problem or explanation tractable. No claim is made that economists ‘get it right’ initially – or (as models are typically refined as other economists use and adapt them) – eventually! Models that are too abstract will generally fail to offer insights into any significant topic and therefore will typically be ignored. Models that are not sufficiently abstract will simply describe an issue (essentially holding a mirror up to it) and will also generally fail to offer insights into any significant topic and, therefore, be ignored. The aim is to develop

2. This list reflects a reordering and development of McKenzie and Tullock (1981).
models that are planted in productive ground that ‘avoids the twin dangers of empty formalism and inconclusive anecdote’ (to borrow a phrase from Hahn and Matthews 1965: 112).

1.2.2 Opportunity cost

Opportunity cost is a central concept in virtually all discussions in economics. ‘Cost’ is one of the many words typically used in economics that has a common currency as well as a specific meaning within the subject. Opportunity cost arises because the world is characterised by scarce resources (usually collected under the headings land, labour and capital and called ‘the factors of production’). They are scarce relative to demand for the goods and services into which the resources can be converted via a process called ‘production’ (a process defined in terms of combining factors of production). The essential and fundamental point (not always recognised) is that it is impossible to have everything. If it is impossible to have everything, then choices must be made. Choices are forced and inevitable. Once a choice has been made, a cost will have necessarily been incurred. This cost is in terms of the value placed on the next-best forgone alternative at the time that a decision is made. This notion of the value placed on the next-best forgone alternative is what defines ‘opportunity cost’ for economists.

As this value is ultimately a conjecture (see Chapter 3), methods of identifying empirical proxies for that value are important to economic analysis. The way in which costs are identified and articulated when dealing with an economic issue should always come under careful scrutiny, as mistakes (by reference to economic theory or sleights of hand) can often be found. The reason economists seek ‘opportunity costs’ is that this represents the cost data that should influence choice. ‘Opportunity costs’ are often wildly at odds with visible conventional accounting data (or a list of explicit currency-denominated prices – as faced by an individual in everyday transactions). In microeconomics, the costs incurred by taking one course of action as opposed to another have a powerful impact on the course actually chosen. Other things being equal, least-cost solutions are sought as they minimise the need for sacrifice of other goods and services.

1.2.3 Rational actions

The world of microeconomics is characterised by rational actions. Individuals are acting with the objective of maximising their utility (or satisfaction). This is a strong statement and a strong postulate to adopt. It presupposes that:

(i) individuals know what they want, i.e. know what their preferences are;
(ii) they are able to rank all alternatives available to them in terms of their expected utility to them;
(iii) they can choose the combination that will succeed in maximising their utility.

It additionally presupposes that individuals are not moving along predetermined paths but can offset environmental, biological and sociological forces (which some would claim determine what they do). In microeconomic theory, individuals are viewed as making ‘real’ choices over their life.

The extent to which it is possible for them to affect the world around them will vary with intensity of preference (with respect to different goals) and their ability to command real resources. It is readily acknowledged that the world is one that is characterised by uncertainty, so that acting to maximise expected utility does not mean always succeeding in achieving that goal. Expectations can be wrong and rational individuals can lose by a choice, even though ex ante (looking forward) they have made the correct utility-maximising action (choice).
Furthermore, it is necessary to emphasise that economists, despite popular impression, are not obsessed with the material or (especially) the business world. The apparatus of microeconomic theory is just as valid for goods that are abstract as for those that are material. Indeed, a ‘good’ is any positive source of utility. Economics finds it relatively easy to deal with love, hate, altruism (see Chapter 15) and other abstract feelings. ‘Economics is about the things that people value’ (Williams 1978: 26). Whilst other academic disciplines may claim to deal with fundamental feelings in a deeper fashion, it remains the case that they are by no means excluded from microeconomics.

1.2.4 The individual

The individual is the basic unit of analysis in microeconomic theory. It is individuals who have preferences (utility functions), make choices over alternatives and take actions. It is best to avoid, wherever possible, using the word ‘society’ in microeconomics. If it is used, it is important to stress that it only signifies society as being the sum of all individuals. Society is nothing more, or less, than the collection of all individuals in the world of microeconomics.

As such, microeconomic theory is said to contain a non-organic view of society – society cannot be talked about and treated as if it is an actor, as if it is an organism or entity in itself. In contrast, sociology is a subject that is built around the notion of society as an organism, as an entity, as ‘a player’ to use a more modern term. But this is no part of microeconomics where, to repeat, society is simply the sum of all individuals. Moreover, words like ‘government’ simply mean the institutions through which individuals make collective choices. Government is not an actor, not an entity with its own goals. The use of the word ‘government’ is meant to be a shorthand way to convey the set of institutions through which individuals work and through which individuals make collective choices or decisions.

1.2.5 Neutral or amoral stance

There is no recipe in economics about what is ‘good’ or ‘bad’. Economists do not have a handle on any special truths about the nature of ‘life, the universe and everything’. There is no recipe in economics for making a good society (collection of all individuals). Economists tend to see themselves as following a rigorous, deductive logic and demonstrate a willingness to look into the face of the devil (perhaps when others shy away). For example, in Chapter 19 economic theories of suicide are discussed. To some (especially those who have in some way been touched by it), the process of theorising about suicide must look, at best, both unnecessary and tasteless. After all, it is clear what has happened – and does anyone need academic publication so badly that they have to make this their topic!

To the economist everything is on the agenda, to the extent that everything is about choices made in a world characterised by uncertainty and scarce resources. With this perspective in mind almost nothing lacks an economic dimension. In short, the discipline is about analysing how individuals behave. The focus is individual choice. The analysis is

3. The writer Houellebecq (2003: 280–1) in his novel Platform provides some support for the case made here but does commit the mistake of seeing economics as a very narrow business-based subject. Michel, the central character, ‘nurtured the theory that it was possible to decode the world... by reading the financial news and the stock prices’. And ‘therefore forced himself to read the Figaro financial section daily, supplemented by even more forbidding publications like Les Echos or La Tribune Desfosses. But, ‘Up to this point the only definite conclusion’ he ‘had categorically come to: economics was unspeakably boring’. (Emphasis added.)
of how changes in the economic signals, or incentives, confront and alter individual maximising behaviour.

1.2.6 Government or public-policy intervention

Government intervention is justified in neoclassical microeconomics in relation to so-called ‘market failure’ with the expectation that actual, as opposed to idealised, public policy can be expected to raise social welfare (see Chapters 5 and 6). Market failure comprises a series of arguments that suggest that universal perfect competition cannot always guarantee attractive results. When economists talk about attractive results, they have in mind a configuration of events that are described as ‘efficient’ and ‘equitable’. These key concepts are reviewed below. They are central to the substance of virtually all chapters in this text. The main point here is that the benchmark form of economic organisation in microeconomics is universal perfectly competitive markets. For many, this is what a neoclassical market economy ‘should’ comprise.

The above is a thumbnail caricature of the mental world inhabited by individuals who think as economists. None of these six characteristics proves uncontroversial. However, all are found, implicitly or explicitly, in microeconomic analysis. Some individuals readily identify with this type of thinking, whilst others have to work harder to practise it. Putting together the highlighted headings of the characteristics that make up subsections 1.2.2 to 1.2.6 may help this latter group as it provides the following first letters:

B = building abstract models;
O = opportunity cost;
R = rational actions;
I = individuals as the unit of account;
N = neutral or amoral stance;
G = government intervention being justified by reference to the significant failure of markets.

In short, microeconomics is B O R I N G! Whilst this is a contrived mnemonic, implicit in the first chapters of many microeconomic textbooks, it serves three purposes:

(i) First, to attempt to make clear that economists have a sense of how their subject is often perceived.
(ii) Second, to provide an aide-memoire to the economist’s view of the world.4
(iii) Third, to offer insight on the reasons students (and others) might have found microeconomics genuinely boring. (You might watch people’s eyes cloud over when you tell them you are an economist, shortly followed by their either making an excuse to leave you, or asking for tips about stocks and shares! – the message here is that neither response is justified when more is known about the subject.)

If the characteristics outlined are adopted then the subject is a ‘golden pillow’, because it never quite allows you to do what you intuitively think it ought to:

(i) You are never invited to air your personal prejudices. You are, in contrast, invited to follow the logic of, and think in the context of, the restrictive and constricting framework set out above. (Your personal prejudices are permitted if you have sufficient understanding and flair to set them within the restrictive framework – a skill this text will hopefully help you acquire.)

4. When the material of this book has been used in lectures there have been mixed results in terms of student scores but seldom have students failed to remember the ‘boring’ mnemonic.
(ii) Economics offers no account of where an individual’s preferences come from, rather preferences are exogenous (given outside the model or analysis). Of course, differences in preferences are what make people interesting – ‘it wouldn’t do for us all to be the same’ and ‘it takes all sorts to make a world’ are everyday sayings that capture this. Economists have no account of the source of unusual or obsessive interests or, indeed, what are seen as ordinary ones. Furthermore, for economic theory ‘to work’ it appears there is a general requirement that individuals have stable preferences. If, by contrast, individuals, governed by whim and emotion, act inconsistently, the apparatus of economic theory does not help analyse behaviour. Economists doubt both that individuals really are governed by whim and emotion and that a satisfactory account of observed behaviour can be found in simply assuming that preferences must have changed for such and such to be observed (Stigler and Becker 1977).

(iii) The world of microeconomics is one of voluntarism. The subject is about how individuals gain from decisions to trade, broadly defined. Rational people will only voluntarily accept a change (a trade) that increases their utility or, in the limit, does not decrease it. Once this step is made and accepted as a central tenet of analysis, it can provoke a critical, niggardly and deflating view of human action. The economist’s first reaction to any observed action is typically: ‘What’s in it for so and so?’, ‘What are they gaining by supporting that organisation?’, ‘They must be getting some kind of payback’, and so on. All that may seem noble about human behaviour seems to be reduced to a narrow instrumentalism and this can seem tiresome and incorrect.

(iv) Related to trade and gains to individuals is the nature of the changes conceived of in economics. By and large, changes are envisaged as small – some of individual A’s allocation of good X in exchange for some of individual B’s allocation of good Y. The dictum on the title page of Marshall’s (1891) great work Principles of Economics translates from the Latin to ‘nature makes no leaps’. In keeping with the dictum the foundations of much neoclassical (market) analysis developed in this work is conducted in marginal – ‘small change’ (derivative) – terms. For such an analysis to be valid the world has to be a smooth, continuous place – hence the importance of ‘no leaps’ and some knowledge of ‘slopes’ from mathematics. In contrast, excitement is generally about big changes, revolutions and discreteness. A world of discontinuous variables (‘leaps’) and discord is one that approximates the view of reality many individuals perceive – witness current problems with terrorism and civil wars, which are clearly not about small voluntary changes.

In short, the analysis may appear to present an unexciting and to some unbelievable representation of the world. After all, it is conflict, human destruction and the destruction of humans that is the stuff of daily news. Human history does not seem to be the record of a world characterised by small changes and continuity! The fact that economists often clothe themselves with Marshall’s dictum does not in some way make it a fundamentally correct view of the world.

(v) Related to (iv) is the use of mathematics and statistical techniques. If marginalist and maximising analysis is accepted then it lends itself to the use of calculus. As such, there is an entry fee to modern economics that not only includes studying the subject itself but also some mathematics as a necessary, if not sufficient, collateral input. To some critics the need for some maths is seen as unnecessary and as an excluding device. It gives the subject an uninviting feel to those not enamoured of mathematical technique. La Manna states the position forcefully: ‘Mainstream economists subject themselves to scientific tests throughout the research process, from properly stated theories, testing with sophisticated statistical techniques and peer-review according to the strictest criteria. This rigorous approach may be unpopular, but it is necessary’ (2003: 15).
(vi) Because it is a subject about abstraction and deduction, theory is transportable to any context involving individual choice. Hence, recent decades have seen so-called 'economics imperialism' on a large scale. For example, consider the application of economic theory to 'marriage', 'the family', 'racism' and 'the brain' – areas more traditionally thought to be the preserve of disciplines like psychology, sociology and social policy. While, to economists, this is a fruitful and natural extension of the framework, the fact that a very large number of economists are not directly focused on the formal economy comes as a surprise to many others (and can be resented where it seems to displace other subject disciplines).

There is a humorous, but insightful, interchange in an IEA (Institute of Economic Affairs) publication on the Economics of Politics (Buchanan et al. 1978: 88 and 92) between two professors of economics:

Prof.Y:
It is very interesting to see [Prof.] X turning into a professor of sociology. (p. 88)

Prof.X:
If I started to try to answer your question, I would become partly the sociologist Professor Y says I am, . . . I don’t mind that: we need some good sociologists. (p. 92)

As suggested by this interchange, within the social sciences, intellectual arrogance has been associated with economists.

(vii) Linking to (v) is the effect of model building in making the whole subject look entirely a technical exercise and therefore uncontroversial – another word for boring! There is some truth in the argument that, once you have set up a problem in a certain way, there evolves an accepted way to solve it and a unique set of results is generated. Students with coursework suspiciously close to a particular single source often comment, ‘Well, that’s the answer, isn’t it?’ and/or ‘The author explained it better than I could.’ If this occurs it is questionable that the coursework has been set appropriately, i.e. in a way that will invite critical analysis. The aim in the pages that follow is to avoid apparent arrogance and develop an appreciation that there may be more than one analysis, more than one answer.

The aim is to invite the reader to think: to manipulate analysis and attempt their assessment, rather than simply underline or highlight an answer. Historically, the so-called ‘social contract’ philosophers argued that individuals were entitled to own land if they worked – shared their physical labour – with it. The same is true of human capital (skills, knowledge): it only becomes yours if you are prepared to work with it.5

The ultimate aim is that readers find the content to the mnemonic B.O.R.I.N.G. INTERESTING! The hope is that claims that the subject is boring will be proved false. Time devoted to the discipline of economics can be both interesting and fruitful ‘but we would say that, wouldn’t we?’ (Note it is not claimed that it will be easy – it is work not leisure!)

Having established an underlying framework, microeconomics appears pre-set to a great extent. Once you start on a chosen route, the journey may seem rather mechanical. However, while there are all sorts of technical and analytical complexities involved in making the journey, the ‘big question’ is how to choose the route, i.e. how to view the world. Mainstream economic theory has so successfully charted routes that some economists

5. As a guide, the symptoms of beginning to acquire and own human capital are that your head starts to hurt and feel hot and concepts come into and go out of focus!
Part I The essentials of microeconomics

It was noted above that much of microeconomics has a mathematical base and this, for some students, is a source of difficulty. For this subset of students there is comfort – a small amount of technique can be made to go a long way. An initial investment of time and effort is required to master this ‘small amount of technique’. This centres, as the sub-heading suggests, on the properties of ‘rays’ and ‘tangents’.

Virtually all of the economics encountered in this text centres on two variables. For the moment the two variables are labelled Y and X. (Changing the labels to tell different ‘stories’ is part of the art of being a microeconomist.) Suppose the moment the two variables are labelled (ii) by choosing other points (i.e. the angle is smaller); therefore average Y, \(AY\), must be smaller than \(AY_1\) at the value of \(X\) given by 0-X; hence the location of \(AY_0\) below \(AY_1\) in part (b) of Figure 1.1. This value \(AY_0\) is also relevant for the point \(A_4\) on \(TY\) and hence it is also recorded above \(X_t\).

1.3 Visualising analytical relationships: rays of hope and tangential interests

Is there anything further that can be said? The answer is ‘yes’. By drawing in a ray (a line) from the origin (0) to the point \(A_1\), a triangle is completed and it can be seen that \(AY_1 = \text{distance } X_1-A_1\) (panel (b)) = distance \(X_1-A_1/\text{distance } 0-X_1 = \text{adjacent over hypotenuse and } \tan \theta = \text{opposite over adjacent}\) (panel (a)) = tan \(\theta_1\). For precision, if \(0Y_1 = £10\) and \(0X_1 = 4\) units then angle \(\theta_1\) would be 68° and tan 68° = 2.5. All this helps because it can be seen that:

(i) \(AY\) has the same value at \(A_1\) as \(A_1\) because tan \(\theta_1\) is common to both the triangles formed \(0,A_1,X_1\) and \(0,A_1,X_0\);

(ii) by choosing other points \(A_0\) and \(A_2\) qualitative information about the average can be secured. At \(A_0\) tan \(\theta_0\) becomes relevant with \(A_0,0\) being the opposite and 0-X the adjacent. By observation tan \(\theta_0 < \tan \theta_1\) (i.e. the angle is smaller); therefore average \(Y, AY_{0}\) must be smaller than \(AY_1\) at the value of \(X\) given by 0-X; hence the location of \(AY_0\) below \(AY_1\) in part (b) of Figure 1.1. This value \(AY_0\) is also relevant for the point \(A_4\) on \(TY\) and hence it is also recorded above \(X_t\).
Point $A_2$ has special significance. It arises if you imagine drawing in successively steeper rays $A_0, A_1$ and so on until the ray just touches $TY$. (Any steeper rays will not touch $TY$.) It remains true that the average value is:

$$\frac{\text{distance } A_2X_2}{\text{distance } 0X_2} = \frac{\text{Opposite}}{\text{Adjacent}} = \tan \theta_2$$  \hspace{1cm} (1.1)

but it also is the value of $\tan \theta$ that is the largest consistent with the ray touching the curve. It tells us the maximum average value of $Y$ occurs at a point vertically above $X_2$ in part (b) of Figure 1.1.

In summary, by looking at the angles of the rays formed by drawing them from the origin to the $TY$ curve, important qualitative information about the nature of $AY$ can be derived. It has successively higher values at $X_0, X_1$ and $X_2$ (which yields the maximum) and successively lower values beyond $X_2$ (witness $A_3'$ and $A_4'$ above $X_3$ and $X_4$ in part (b)). The $AY$ curve must, by deduction, look like the inverted-U illustrated in part (b). Note:

![Figure 1.1](image-url)
vertical distances $X_0-A_0$, $X_1-A_1$, $X_2-A_2$, $X_3-A_3$ and $X_4-A_4$ are the average values corresponding to $A_0$, $A_1$, $A_2$, $A_3$ and $A_4$ on $TY$ in part (a) of Figure 1.1). But, there is more.

Deducing important information on the marginal value of $Y$ ($MY$) is also possible. Here the concern is more subtle: how does $TY$ change in value as $X$ changes in value? It is a question about taking little 'steps'. Imagine taking equal steps along the $x$-axis. The marginal value is the height gain in $TY$, or loss in $TY$, as each successive step is taken. The equal steps are labelled $\Delta X_1$ to $\Delta X_6$ in Figure 1.2(a) and (b) and the changes in $TY$ $\Delta Y_1$ to $\Delta Y_4$ and $\Delta Y_6$. The heavily inked vertical lines indicate the $TY$ changes. It can be seen that for $\Delta X_1$, $\Delta X_2$ and $\Delta X_3$ the changes in $Y$ ($\Delta Y_1$, $\Delta Y_2$ and $\Delta Y_3$) are getting bigger (you are

![Figure 1.2 Tangents and marginal information](image-url)
moving up an increasingly steep hill). For $\Delta X_4$ the change in $Y$ has become small ($= \Delta Y_4$) and is less than $\Delta Y_1$ (the hill is becoming less steep). $\Delta Y_5$ is missing because the step $\Delta X_5$ involves no change in $TY$ (you are momentarily walking on the flat). For step $\Delta X_6$ ‘the road rises up to meet you’. You are going downhill and the change in $TY$ is negative (hence $-\Delta Y_6$). Using the discussion above, the $\Delta Y$s divided by the $\Delta X$s define $\tan \theta$ in the ‘little’ triangles in Figure 1.2(a). The angles get successively bigger, smaller, momentarily zero, and then reverse. This says the marginal value of $Y$ increases at an increasing rate, increases at a decreasing rate, falls to zero and becomes negative.

By making the steps in panel (a) as drawn, $TY$ is effectively being made a series of straight-line shapes (see panel (b)). To avoid this lumpiness, or chunkiness, imagine the steps being made very, very small. The curve in panel (b) of Figure 1.2 would, to all intents and purposes, look smooth – as does Figure 1.3(a) and the $\tan \theta$’s approximated.
by the slopes of tangents to the curve (\(T_i\), \(T_{2x}\), \(T_y\) and \(T_3\) located at \(X_1\) to \(X_5\) respectively). \(T_2\) is steeper than \(T_1\) and, therefore, the marginal value is rising and \(T_1\) at \(X_1\) is below \(T_2\) at \(X_2\) in height in Figure 1.3(b). Similarly, \(T_3\) at \(X_3\) is associated with a greater marginal value than \(T_2\) at \(X_2\). \(T_3\) is, however, special in that the tangent to the curve cuts the curve. This is known as a point of inflection and denotes that there is a change in the nature but not the direction of the slope taking place.

Whilst the slope of the curve remains positive up to \(T_3\), the rate at which it increases after \(T_3\) decreases and as an indication of this, the slope of \(T_4\) is less than the slope of \(T_3\). Before \(T_3\) the rate of increase increases. Note that \(T_4\) is parallel to \(T_2\), indicating the marginal value at \(X_4\) is the same as at \(X_2\) (see \(T_2\) and \(T_4\) in 1.3(b)). \(T_5\) is as steep a tangent as can be drawn to \(TY\) (and hence is a maximum value for \(MY\)). It is located above \(X_3\) (before that \(MY\) is rising, and after it falling). \(T_5\) is a tangent that is flat, indicating momentarily no slope and thus the marginal value at \(T_5\) is zero. Beyond \(T_5\) the tangents to the curve would have negative slopes like \(T_6\) (going downhill) making it clear that the marginal values are negative beyond \(T_5\) (see the location of \(T_5\) in Figure 1.3(b)).

Figure 1.3(b) plots all this qualitative information about the marginal value of \(TY\) labelled \(MY\) and makes clear the information that is available from inspection of \(TY\) in Figure 1.3(a). It is possible to describe \(\Delta TY\) as \(X\) changes by very small amounts (\(\Delta X\)) by looking at what happens to the tangents to the curve.

With this discussion, it is possible to view Figure 1.3(a) and note that:

(i) If successive tangents are steeper (greater positive slopes) \(TY\) is rising at an increasing rate and \(MY\) is rising and positive;
(ii) If successive tangents are less steep (falling positive slopes) \(TY\) is rising at a decreasing rate and \(MY\) is falling but positive;
(iii) If a tangent is horizontal (a ‘flat’ slope) \(TY\) is stationary and \(MY\) is zero which means no changes in \(TY\);
(iv) If tangents fall away (negative slopes) then \(TY\) is falling but as illustrated remaining positive then \(MY\) is negative (you would be below the \(x\)-axis in Figure 1.3(b)).

What is being described here is a visual way of interpreting the first derivative of the function that describes \(TY\). Whilst differentiation is more elegant and precise those with little or no mathematics can go a long way with the two visual rules developed above. To know about:

(a) the average value – look at angles formed by successive rays from the origin to the curve;
(b) the marginal value – look at the slopes of successive tangents to the curve.

Figure 1.4 allows relationships between marginal and average values to be isolated. Above \(X_2\), the tangent to the curve \(T_m\) cuts the curve and therefore \(MY\) is at a maximum. At \(X_2\), the angle formed by the ray \(0-A_m\) is \(\theta_m\) and, being less than the angle formed by \(T_m\) on the \(x\)-axis (namely \(\theta_g\)), the average value is less than the marginal value at \(X_2\). The ray \(0-A_m\) indicates the maximum value \(AY\) can take. Given this, the peak of \(AY\) is above \(X_2\) in Figure 1.4(b).

There is, however, an important further piece of information. The tangent to \(TY\) at \(A_m\) is \(T_1\) and is coincident with \(0-A_m\); they both form the angle \(\theta_m\) on the \(x\)-axis, indicating a common tan \(\theta\) value. That is, the marginal and maximum average value coincide above \(X_2\). Given it has been established that the margin exceeds the average before \(X_2\), the shape of \(TY\) means that \(MY\) cuts \(AY\) from above at \(AY\)’s maximum value. Note: ray \(0-A_2\) forms the same angle \(\theta_g\) as ray \(0-A_1\) and, therefore, the average value above \(X_1\) must be the same at \(X_2\) and is given by distance \(0-A_2\) in Figure 1.4(b).

To some, all this may look a bit ‘fiddly’? Unfortunately, for those who would prefer a more ‘free-form’ approach there is no choice (once \(TY\) is set, the shapes of \(AY\) and \(MY\) are also set – in this case as inverted ‘Us’ cutting each other in a precise relationship). It must
be emphasised that it is the shape of $TY$ that matters (different $TY$s mean different $AY$s and $MY$s, as will be clear in later chapters) and, in some respects, microeconomic theory can be reduced to the logic of relationships dictated by different shapes. Hence, it is crucial to draw any figures as accurately as information allows, not as a matter of ‘fussiness’ but rather because things can appear to be ‘true’ that cannot be ‘true’ if the figure is drawn inaccurately (and vice versa). ‘Impossibly’ drawn illustrations shout to economics examiners that the candidate does not know what they are doing!

With command over the above arguments it is possible to derive some precise implications about average and marginal values from different-shaped totals and put them to ‘work’ on key microeconomic concepts.

Having established the notion of averages and marginals, it is easy to use them to revise the notion of elasticity. The elasticity of variable $X$ with respect to variable $Y$ (often

Figure 1.4
Combining average and marginal information
labelled \( \varepsilon \) (epsilon) – Greek lower-case E) is defined as the proportionate change in \( X \) when there is a proportionate change in \( Y \). It can be written as:

\[
\varepsilon = \frac{\% \Delta X}{\% \Delta Y} = \frac{\Delta X/X}{\Delta Y/Y} = \frac{\Delta X.Y}{\Delta Y.X} = \frac{1}{\text{Marginal value}} \times \text{Average value}
\]

and this can also be described as \( \frac{1}{\text{Slope}} \times \text{Ray (tan of angle formed)} \)

Elasticity is measured at a point on any curve. Observant readers will note that here we are reversing or ‘inversing’ the \( Y = f(X) \) to take the form \( X = f(Y) \). (This is because Marshall (1891) saw a demand curve as recording Quantity as a function of Price but actually plotted the ‘inverse’ – Price as a function of Quantity, making Quantity the independent variable, an unnecessary but conventionally adopted complication. There are some exceptions but these are not usually made by economists, e.g. Lea, Tarpy and Webley (1987)).

The series of equalities in equation (1.2) makes it clear that it is possible to deduce information about elasticity by looking at the inverse of the slope of a curve multiplied by ‘ray’ information, i.e. the inverse of the marginal value multiplied by the average value. Whilst the desire is to evaluate the sensitivity of variable \( X \) to variable \( Y \) proportionate (%) changes have to be considered as this results in a real or dimensionless number as the answer, i.e. the elasticity value is independent of the units in which \( X \) and \( Y \) are measured. The result is independent of whether, say, \( Y \) is measured in pence or in pounds. This is clearly an attractive property.

### 1.3.1 Constant elasticity cases

Using Figures 1.5(a) to 1.5(d), allows the interpretation of elasticity values. In Figure 1.5(a) the lines labelled \( L_1 \) to \( L_3 \) all emanate from the origin and, as such, a ray from the origin to the curve will be coincident with the line everywhere and only one angle can be formed, i.e. the average has a constant value. Drawing a tangent to the curve also is coincident with the line because it is a straight line. This indicates that the marginal value is also a constant and, given that the slope of the tangent is the same as that of the ray, the marginal and average values are the same for each line. Substitution of those values into equation (1.2) would always lead them to cancel out and the equation to collapse to +1.

Surprisingly, \( L_4 \) and \( L_6 \) all have elasticities of +1 and equal marginal and average values. Note: \( L_1 \) would have higher equal marginal and average values than \( L_2 \) and \( L_3 \) than \( L_4 \) as the angles formed by the ray (and tangent) fall in size as you move from curve \( L_1 \) to \( L_2 \) and \( L_4 \).

Line \( L_4 \) in Figure 1.5(b) is vertical and although it exhibits many average values the tangent to the curve is very steep, i.e. infinitely steep. Now 1 divided by a very, very large number is extremely small – and in the limit is zero. Once a zero is placed in equation (1.2) the result will always be zero and a curve like \( L_4 \) has zero elasticity wherever it is located along the x-axis.

Figure 1.5(c) is the first ‘curve’ to be an actual curve. The curve drawn is a rectangular hyperbola which has the property that, for any x-value y-value combination on the curve, x times y has the same constant value (curves further from the origin have higher constant values). As the curve slopes down to the right (downhill) it has a negative slope and the elasticity value is everywhere –1.

In contrast, \( L_6 \) has zero slope (if tangents are drawn to the curve they are all coincident with the curve and are horizontal). Drawing in the rays would suggest falling average values as \( X \) values increase but always a positive, if small, angle would be formed. However, looking at equation (1.2) indicates that 1 divided by the marginal value would
be 1 divided by zero. This is strictly undefined but 1 divided by an extremely small number is a number that approaches infinity and the elasticity value therefore also approaches infinity. A curve such as \( L_6 \) is said to be infinitely elastic.

### 1.3.2 Varying elasticity cases

In Figure 1.5, curves \( L_1 \) to \( L_6 \) are unusual in that each exhibits a constant elasticity throughout its shape. What of varying elasticity?

In Figure 1.6(a) \( L_7 \) and \( L_8 \) are parallel, indicating constant and identical positive (uphill) slopes (tangents to the curve are coincident with the curve and form the same angle, \( \theta_0 \), with the horizontal). However, as indicated by the dashed rays to \( L_7 \) the average value falls everywhere and given the angles formed have values that are greater than the marginal value \( \tan \theta_0 \). Hence 1 divided by the marginal value times the average value must always be less than +1 and such a curve is described as inelastic. It can be seen that the values fall towards zero as the value of \( x \) where the elasticity is evaluated increases.

For \( L_8 \) the average value always rises (see dashed rays to \( L_8 \)) and exceed the constant marginal value \( \tan \theta_0 \) and, therefore, the elasticity value exceeds +1 everywhere and rises as the \( x \) value where it is considered increases.

Curve \( L_9 \) in Figure 1.6(b) features a straight line extensively used in introductory microeconomic analysis and despite its constant negative (downhill) slope exhibits all elasticity values between zero and (minus) infinity. This surprising fact can be established by noting that 1 divided by the slope is a negative constant and, therefore, it is the average value that will be influential in varying the elasticity value. Now, at point 1 the value of \( Y \) is zero and therefore \( Y \) divided by \( X \) is zero and the equation (1.2) goes to zero.
overall. At point 2 the value of $X$ is zero and $Y$ divided by $X$ is infinite and so the elasticity value at point 2 is infinite. Point 3 divides the curve into its elastic and inelastic sections; at point 3 the elasticity value is $-1$. For a straight-line curve this occurs at the point above half the value of the $x$-intercept precisely. The inverse of the slope at point 3 is distance 4-1 divided by 4-3 whereas the average value is given by 4-3 divided by 0-4. The multiplication of the terms will equal 1 when distance 0-4 equals distance 4-1. Therefore, the curve is elastic (elasticity values greater in absolute value than $-1$) above point 3 and inelastic (elasticity values lower in absolute value than $-1$) below point 3. Enough has been said to indicate how much can be gleaned from diagrams concerning elasticity values using just ray and tangency information derived from inspection alone. There is one further useful step.

### 1.3.3 Elasticities of substitution

A natural way to extend the concept of an elasticity is to describe the extent of the curvature of a curve via the elasticity of substitution ($\sigma$, sigma, Greek lower-case $s$) which is obtained by dividing the proportionate or percentage change in the slope by the proportionate or percentage change in the ray to two points on a given curve. That is, it divides the percentage change in marginal values by the percentage change in average
values and, in doing so, also yields a real positive number, i.e. one that is independent of the units of measurement. It is measured by comparing two points on a curve as the definition suggests:

\[
\frac{\%\Delta \text{ in ray}}{\%\Delta \text{ in slope}} = \frac{\%\Delta \theta}{\%\Delta T} = \frac{\Delta \theta / \theta}{\Delta T / T} \tag{1.3}
\]

Figures 1.7 (a) to (c) serve to illustrate some polar cases in the context of indifference curves, isoquants and social welfare functions. Recall from introductory microeconomics...
indifference curves are two-dimensional representations of (equal-utility) elements in a preference map, isoquants are two-dimensional representations of (equal-output) elements in a production function and social welfare curves are two-dimensional representations of (equal-social-welfare) elements in a social welfare function with each curve, as indicated in the brackets, representing a constant level of utility, output or social welfare. (These concepts are revised and further elaborated later.) The lettering of the axes indicates interpretation differences. If $Y$ and $X$ are goods (outputs) then $I_0$ and $I_1$ would be indifference curves. If $(K)$ and $(L)$ stand for capital and labour inputs respectively, then $(Q_K)$ and $(Q_L)$ would be isoquants. $[U_I]$ and $[U_J]$ are (ordinal) utility levels for individuals 1 and 2 so that $[W_I]$ and $[W_J]$ are combinations of utilities that are judged to offer equal social welfare along a given curve.

In Figure 1.7(a) goods $Y$ and $X$, inputs $(K)$ and $(L)$ or $[U_I]$ and $[U_J]$ are perfect substitutes at a ratio determined by the angle $\theta_0$, (formed by the tangent to the curve) whose tan value is the slope of each $U_i$ $(Q)$ or $[W]$. As illustrated, the angle is $26.5^\circ$ and the slope $\frac{1}{2}$. This value does not change with a straight line – the tangent is coincident with the curve. The rays, however, do change as you consider, say, points 1 and 2. Angle $\theta_1$ is greater than angle $\theta_0$ and therefore the value of the ratio $Y/X$ (or $(K/L)$ or $[U_i/U_j]$) rises between points 2 and 1. Given equation (1.3) the % $\Delta$ in the slope is zero and therefore the value of the elasticity of substitution can be treated as infinite, as you are dividing a number by a zero. With straight-line ‘curves’ $\sigma = \infty$.

In Figure 1.7(b) goods $Y$ and $X$, inputs $(K)$ and $(L)$ or $[U_I]$ and $[U_J]$ are perfect complements at a ratio determined by the angle $\theta$ whose tan value is the slope of the ray to the corners of each $U_i$ $(Q)$ or $[W]$. As illustrated, the angle is $45^\circ$ and the slope $+1$. This value does not change with a set of right-angled curves, as the ray cutting the corners is the only relevant one. To stray from, say, point 1 to point 2 involves more good $X$ ($(L)$ or $[U_J]$) without any increase in utility (or output or social welfare) and is therefore inefficient. The tangents to the corners, however, do change as you consider, say, angles $\theta_1$ and $\theta_2$ but this turns out not to matter. Given equation (1.3) the % $\Delta$ in the ray is zero and therefore the value of the elasticity of substitution is zero as you are dividing zero by a number. With right-angled line ‘curves’ $\sigma = 0$. These two polar cases establish that the value of $\sigma$ lies between zero and infinity for convex to the origin curves.

In Figure 1.7(c) goods $Y$ and $X$, inputs $(K)$ and $(L)$ or $[U_I]$ and $[U_J]$ are substitutes at a rate determined by the changes in the angles labelled $\theta$ between points 1 and 2. As illustrated, the angles move completely in harmony with each other. This is a third special case. The special case is that of a rectangular hyperbola. If the % $\Delta$ in the ray is exactly equal to the % $\Delta$ in the slope then the equation (1.3) will always take the value 1. With rectangular hyperbola ‘curves’ $\sigma = 1$.

Using these special cases is useful in at least two respects:

(i) First, intuition suggests that the flatter the curve the closer are the elements on the axes to being perfect substitutes and therefore the $\sigma$ approaches $\infty$.

(ii) Second, a point about determinacy was made in the previous section. It is always attractive to at least begin with a precise answer to a question, especially if you think that looks more ‘scientific’. Adopting special cases leads to determinacy and, by looking at extremes, it is always possible to narrow the range of outcomes possible and, at the same time, shed light on the more general cases. Many of the later chapters will make use of the ‘shapes’ introduced here.

There is a graphical exercise that allows the determination of the elasticity of substitution over the range of a given curve. Consider Figure 1.8 and, although the illustration is general, to lose some lettering and gain clarity assume that it is an indifference curve over goods $Y$ and $X$. Recall the definition above:
Chapter 1 Is microeconomics ‘boring’ and ‘difficult’?

1.4 It’s all in the interpretation

Table 1.1 brings some of the basic concepts of economics introduced above together with frequently encountered diagram illustrations. The point emphasised is that a given shape does not lend itself to a straightforward interpretation across the concepts of slope,
Part I
The essentials of microeconomics

22

elasticity and elasticity of substitution. Students, for example, frequently think a negatively sloped straight-line ‘curve’ (column (d)) has a constant elasticity throughout its length. Careful attention to Section 1.6 should enable the connection of concepts and ‘shapes’ made in the table to be made without recourse to maths texts. Such connections are central to much of the analysis in later chapters as economics is an academic discipline, unlike many others, that has placed very considerable reliance on the use of diagrammatic analysis and proofs. This is not to suggest that a more rigorous mathematical approach would not be helpful or superior but rather that the simple careful observation of a diagram allows a great deal to be deduced directly.

Armed with a methodological perspective to employ and some visual quantitative skills, it is time to revise the basic concept employed in microeconomics, namely the utility-maximising rational actor.

Table 1.1 Same old ‘shapes’ but different stories

<table>
<thead>
<tr>
<th>Column</th>
<th>‘Shape’</th>
<th>Description</th>
<th>Mathematical form</th>
<th>Slope = dY/dX =</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
<td>Horizontal line</td>
<td>Y = a</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>(b)</td>
<td>Rectangular hyperbola</td>
<td>Y = aX^−1</td>
<td>−aX^2</td>
<td></td>
</tr>
<tr>
<td>(c)</td>
<td>Vertical line</td>
<td>X = a</td>
<td>∞</td>
<td></td>
</tr>
<tr>
<td>(d)</td>
<td>Negatively sloped straight line</td>
<td>Y = a - bX</td>
<td>−b</td>
<td></td>
</tr>
</tbody>
</table>

Elasticity of X with respect to Y = \varepsilon = \frac{\text{Slope}}{\text{Average value}}

Slope = \frac{\Delta Y}{\Delta X}

Elasticity of substitution between X and Y between two points = \sigma = \frac{\% \Delta ray}{\% \Delta slope}

Combining shapes in columns (a) and (c) σ = 0

Perfect complements

完美的补品

Perfect substitutes

Perfect complements

% Δ ray = 0 as inefficient to move away from a corner

% Δ ray = % Δ slope

% Δ slope = 0

% Δ ray = 0 as inefficient to move away from a corner

% Δ ray = % Δ slope

% Δ slope = 0
1.5 Rationality as utility maximisation

The R and I in B-O-R-I-N-G were for ‘Rational action’ and ‘Individual’ respectively, with rationality described as an individual acting with purpose to maximise their utility or satisfaction. The full meaning of ‘rational’ behaviour in economics will be examined in later chapters but here it is worth emphasising that ‘rational’ behaviour may be far from ‘obvious’ and far from a ‘natural’ interpretation of how individuals make decisions and act.

Consider the following quotation from Hegel (cited in Knox 1952: 230): ‘The rational is the highroad where everyone travels, where no one is conspicuous.’ This quotation from Hegel suggests that what is rational is simply what everyone does. If the vast majority do this in such and such circumstances, then if an individual is seen to do it when such and such circumstances arise they are regarded as acting rationally. This ties the notion in with what is called ‘social constructionism’, which in this context would suggest that all individuals are inculcated (taught by repetition) into rational behaviour by being born into and taking part in a particular society (collection of individuals). From this viewpoint rational behaviour is a convention specific to particular societies or cultures. In short, there are then many ‘rationalities’.

In microeconomics ‘rational’ behaviour is considered in more specific terms (for further discussion see Section 7.4.1). In microeconomics the starting point is to view rational behaviour as choices that are consistent with an individual’s preferred course of action. Their preferred course of action is that which maximises their utility or satisfaction. The history of the notion of utility is associated with the indifference curve or utility map as a two-dimensional pictorial representation of individual preferences.

The mechanics of indifference maps were developed by Edgeworth (1881) – a famous figure in the history of economics. Whilst the mechanics have survived, Edgeworth’s conception of utility generally has not. He envisaged that, with scientific progress, the level of happiness an individual was enjoying would be measurable in a cardinal fashion (like weight and height). Someone who grows from 1 to 2 metres tall is twice as tall as they were and someone who is 2.4 metres tall is twice as tall as someone else who is 1.2 metres tall. This means that height is measured on a cardinal scale that is comparable between people. The same scale ‘fits all’. Or, to be more precise, the scale means the same when applied to all individuals. While height is measured in metres on a metric scale, Edgeworth coined the units, utils, for the day when measurement of an individual’s level of utility became possible. If utility were measurable in this way many problems in economics would become easy (especially distributional ones which relate to equity). In these circumstances, individual A could, say, be measured to be four times as happy as individual B and action might be taken to make individual B half as happy as individual A. As it is, no one now believes that utility will ever become measurable in this cardinal fashion and therefore interpersonal (comparing individual A with B) comparisons of utility or satisfaction are ruled out. It is impossible to tell if the richest person in the world is happier than the poorest one as utility is a subjective experience that, by definition, only the individuals themselves can know about. In effect you can only have knowledge about yourself.

Given this, microeconomics is forced to work with a less strong and less informative notion of utility called ‘ordinal utility’. This relies on the idea that, when faced with choices, individuals know what they prefer, i.e. they can rank all options available to them but cannot say precisely how much they prefer their first choice over their second or their second over their third etc. Fortunately, much fruitful analysis can be founded on this weaker conception of utility (as embodied in indifference curves or maps – as representations of individual preferences). Whilst preferences can be defined over individual goods, typically analysis works with combinations of goods called ‘bundles’ or ‘baskets’.
Hirshleifer and Riley (1992) refer to utility from consequences (as opposed to individual utility over actions – see Chapter 6 below). Here an individual, $A$, is viewed as being in a two-good world – good $X$ and good $Y$ (as demonstrated in Chapter 2 this is not as restrictive as it first seems and allows the analysis to proceed in two dimensions). A basket or bundle (or ‘consequence’) (labelled $A_1$, $A_2$ etc. to indicate that the bundles are numbered 1, 2, etc. and the choices of a given individual $A$ are being considered) can be defined. It is defined by a statement of how much of good $X$ it contains per period ($Q_X/t$) and how much of good $Y$ it contains per period ($Q_Y/t$).

### 1.5.1 Developing ordinal indifference curves

Indifference maps are derived from by adopting and employing a series of assumptions or axioms. These are listed below:

(i) **Completeness** says that an individual confronted with two baskets of goods $A_1$ and $A_2$ can always say one of the following three things:
   
   (a) they prefer $A_1$ to $A_2$ (written as $A_1 > A_2$);
   
   (b) they prefer $A_2$ to $A_1$ (written as $A_1 < A_2$);
   
   (c) they are indifferent between $A_1$ and $A_2$ (written as $A_1 \sim A_2$).

   (Note the $>$ and $<$ signs do not mean greater than and less than – after all, if you are not fond of bananas you might prefer 1 apple to 4 bananas).

(ii) **Consistency or transitivity** says that if basket of goods $A_1$ is preferred to basket of goods $A_2$ and basket of goods $A_2$ is preferred to basket of goods $A_3$ then it must be the case that basket of goods $A_1$ is preferred to basket of goods $A_3$. Not all relationships are transitive. For example, sporting relationships may not be. Bundle of players ‘Man U’ may be able to beat bundle of players ‘Liverpool = $A_2$’ and bundle of players ‘Liverpool = $A_2$’ beat bundle of players ‘Arsenal = $A_3$’ but bundle of players ‘Arsenal = $A_3$’ may be able to beat bundle of players ‘Man U = $A_1$’.

(iii) **Non-satiation** says that if you wish to discuss items that are goods (positive sources of utility) then more is always preferred, i.e. you never get tired of more units per period of something that is a good to you. Of course, there are also ‘bads’ (negative utility sources) of which you prefer fewer units per period (more units lower your utility). There are also ‘neutrals’, where more units per period neither raise nor lower your utility. Different items are goods, bads or neutrals to different individuals. (For the moment goods are discussed, other preference relationships are accommodated in Chapter 2.)

(iv) **Continuity or substitutability** says that if two baskets of goods ($A_1$ and $A_2$) contain the same amount of two goods $X$ and $Y$ then $A_1 \sim A_2$ (individuals must treat identical baskets as identical$^6$). If one more unit of $X$ is added to $A_1$ then if non-satiation applies $A_1 > A_2$. As the name of this axiom suggests, if more $Y$ is put into $A_2$ a point will come when the individual will be indifferent between $A_1$ and $A_2$ again. Once this point is reached, one more unit of $Y$ added to $A_2$ will cause the individual to reverse preference so that $A_1 < A_2$. The goods have been traded off against one another, in that they have been substituted as sources of utility (so that there is continuity of preference). If one good is always preferred to another whatever the quantities involved,

---

6. The axiom that deals with ‘identicals’ in preference orderings is reflexivity. Here bundle $A_1 \geq A_1$ means $A_1$ must be preferred or indifferent to itself. As $A_1$ can be moved to either side of the ‘preferred or indifferent to’ sign, then $A_1$ is indifferent to itself. The attraction of this is that all bundles must belong to an indifference set – at minimum the one containing itself. Together completeness, transitivity and reflexivity guarantee any bundle can be put into one, and only one, indifference set.
the ordering is said to be lexicographic (a description based on library orderings – with books with authors’ names beginning with A always coming before the Bs etc. within each classification).

(v) Utility maximisation is the final axiom. It is required that the rational economic actor will always seek the highest utility possible in any choice situation. Recall, however, that it is utility as they perceive it that matters – individuals as the best judges of their own welfare – not as any other individual sees it.

The purpose of adopting axioms is to see what follows deductively or logically from them. The five axioms above allow theorists to deduce a great deal about the shape of an indifference curve and the associated map. What does an indifference curve between two goods $X$ and $Y$ look like?

Suppose in Figure 1.9 an individual is endowed with a bundle $A_1$ containing 6 units of $Y$ and 8 units of $X$ per period at point labelled $A_1$, this will offer them a given level of (subjective) utility. Points of indifference cannot be to the north-east (north and east) of point $A_1$. A bundle like $A_2$ involves 7 units of $Y$ and 9 units of $X$ and must offer higher utility because it contains more of both goods. Furthermore, points that involve the same quantity of good $Y$ ($X$) and more $X$ ($Y$) must be preferred. By the reversal of the same argument all points to the south-west (south and west) must be inferior. This indicates that points of indifference to point $A_1$ must lie to the north-west or south-east and indifference curves must be negatively sloped.

If $Y$ ($X$) is always preferred, the lexicographical ordering case, then no points indifferent to point $A_1$ can be located (other points will be preferred or inferior). That is, points to the north (east) and north-east contain more $Y$ ($X$) and must be preferred and points to the south (west) and south-west contain less $Y$ ($X$) and must be inferior. The axiom of continuity matters if an indifference curve is to be located.

A second characteristic is that indifference curves cannot intersect. If they did it would violate the axiom of transitivity and non-satiation. In Figure 1.10 consider point $A_1$, and, in line with the above reasoning, assume that point $A_2$ to the north-west is on the same indifference curve, offering the individual the same level of ordinal utility. If indifference curves could cross it is feasible that the bundle defined at $A_3$ to the south-east offers a point of indifference to bundle $A_2$. However, if $A_1$ is indifferent to $A_2$ and $A_2$ indifferent to $A_3$, the axiom of transitivity says that bundle $A_1$ is also indifferent to bundle $A_3$. But this cannot be the case as bundle $A_3$ contains more of both good $Y$ (4 units compared to 3 units per period) and good $X$ (11 units compared to 9 units per period) and must be preferred on non-satiation. In this way, intersecting indifference curves can be ruled out as being inconsistent with the axioms described above.
The axiom of completeness means that all points defining bundles in Y-X space are ranked, in that they must be on one indifference curve or another. This amounts to saying that indifference curves are everywhere dense, there are no gaps and conceptually (if not physically) it is always possible to draw a third indifference curve in the gap between any two that have been illustrated.

The fourth and final characteristic developed here does not flow from the axioms but is consistent with intuition and observed behaviour. Indifference curves for goods are convex to the origin. Consider Figure 1.11 and let good X be equal slices of bread and good Y grams of cheese and consider making marginal changes to the allocation of goods. At bundle $A_1$ the individual has 2 slices of bread and 46 grams of cheese. The allocation of cheese is relatively plentiful to the allocation of bread, and to find a point of indifference to bundle $A_1$ involving the substitution of one more slice of bread for less cheese might involve the willing sacrifice of 8 grams of cheese (bundle $A_2$ in Figure 1.11). At bundle $A_2$ the individual depicted has 8 slices of bread and 7 grams of cheese and to move to a point of indifference involving the substitution of one more slice of bread the individual may only be prepared to give up one gram of the now relatively scarce cheese (bundle $A_4$). If this reasoning is correct, the indifference curve must be bowed, or convex,
to the origin, as illustrated. This is a statement about the slope of indifference curves. Using the visual technique described above to see what is happening to the slope it is necessary to draw in successive tangents to the curve (two, \( t_1 \) and \( t_2 \), are illustrated). This indicates first that, as the tangents are downward-sloping, the curve is negatively sloped (downhill). Second, as the tangents flatten, the curve is becoming less and less steep (i.e. the slope is less and less negative). In economic terms the curve illustrated exhibits a diminishing marginal rate of substitution between goods \( X \) and \( Y \) – the more \( X \) you have per period the less \( Y \) it is possible to give up and still enjoy the same level of utility in your view.

The individual chooses the most desirable goods bundle according to their preference ordering. This is typically represented as a utility function (with a label for every possible commodity bundle and numbers to represent the preference ordering, the higher numbers indicating most preferred). In Figure 1.12 an indifference map between two goods for a given individual is illustrated. What meaning can be inferred from this map? Consider the ray \( 0-R \), which is monotonically increasing (no ‘downs’) indicating, given it is goods that are being considered, that utility is rising along it (hence \( I_0 \), \( I_1 \) and \( I_2 \)). Any bundle on the same indifference curve \( (I_0) \) must be assigned the same number, e.g. bundles \( A_1 \), \( A_2 \) and \( A_3 \) are all assigned 6 to indicate indifference. Any bundles offering higher utility, \( A_5 > A_4 > A_3 \) because they successively are bundles with more of both goods, must be assigned a higher number, e.g. 14 for \( I_1 \) and 17 for \( I_2 \). Now any equation that preserves the preference ordering of the bundles along that ray will do to describe utility – there is no significance to the numbers in themselves. Hence, labels \( I_0, I_1 \) and \( I_2 \) can do exactly the same work as \( I_6, I_{14} \) and \( I_{17} \) as no precise meaning can be attached to the numbers. All that is being said is that utility is the same for an individual along a given indifference curve and is higher for indifference curves further away from the origin, hence the arrows showing directions of preference.\(^7\) This is what it means to say the utility function is ordinal. In the figure utility is defined over consequences in certain situations, so that deciding on an action means deciding on a consequence. If some scale of cardinal numbers is attached as preference labels to bundles, or consequences, any positive monotonic transformation leads to the same preference ordering, e.g. given the labels \( I_0, I_{14} \) and \( I_{17} \), adding 6 to each, subtracting 2 from each, multiplying each by 20 etc. leaves the

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\(^7\) In some analyses indifference curves are labelled in the order of their use in a piece of analysis on the implicit assumption that everyone knows that for goods curves further from the origin that are preferred. This practice is not followed here.
preference ordering unchanged. That is to say, if $U$ is a satisfactory function for choices under certainty then so is $U_i = f(U)$ as long as the first derivative $f'(U)$ of the function $f$ used to transform $U$ is positive.

**MORE FORMAL SECTION**

In terms of algebra, the utility function is depicted as follows:

$$U = U(Y,X) \quad (1.5)$$

[Utility depends on the quantities of $Y$ and $X$ per period]

The total differential (see Appendix 1) provides a linear approximation of what happens to $U$ (utility) as small changes, $dY$ and $dX$, are made to the quantities of $Y$ and $X$ per period respectively. Now, more $Y$ ($X$) raises utility by an amount that is the marginal utility of $Y$ ($X$), $\partial U/\partial Y$ ($\partial U/\partial X$). By definition, total utility cannot change along an indifference curve and hence the value of the total differential is constrained to be zero. In symbols:

$$dU = \partial U/\partial Y \, dY + \partial U/\partial X \, dX = 0 \quad (1.6)$$

and, by rearranging,

$$dY/dX = -\partial U/\partial X / \partial U/\partial Y \quad (1.7)$$

or

$$-dY/dX = \partial U/\partial X / \partial U/\partial Y = MRS_{xy} \quad (1.7a)$$

This says that the negative of the slope of an indifference curve (the marginal rate of substitution between $X$ and $Y$) equates with the ratio of the marginal utility of $X$ to the marginal utility of $Y$.

Thus far a pictorial way of representing individuals’ preferences has been developed. It must be emphasised that the economist has no control over the preferences individuals have but just the ability to work with them when they have been told what they are – hence, in the absence of precise knowledge of an individual’s preferences, much of theory is about exploring the properties of different cases. But what has all this to do with rationality?

To a large extent, economic rationality is simply acting consistently with respect to preferences (in order to maximise subjective utility). Economic irrationality is choosing a bundle, or consequence, that is inferior in utility terms to another that you were able to choose, i.e. not being on the highest indifference curve you could attain. Further, note the discussion so far is only about individuals’ preferences – individuals looking at the menu of life, ranking alternative combinations as sources of utility to them in the absence of any consideration of income, prices, legal regulations, etc.

### 1.5.2 Utility maximisation with costless information in a riskless world

In many situations it is reasonable to assume that individuals know all the relevant pieces of information so that the situation is effectively one of certainty. These situations are the classic illustrations of introductory microeconomics. An individual is assumed to know their income ($I$) the prices of goods $X$ and $Y$ ($P_X$ and $P_Y$) and their utility function over goods $X$ and $Y$ represented as $U(X,Y)$. The first three pieces of information allow the formation of the budget constraint:
Chapter 1  Is microeconomics ‘boring’ and ‘difficult’?

I = Px X + PyY

which simply says that on the budget constraint the price of X times the quantity of X (labelled X) plus the price of Y times the quantity of Y sums to equal income. It is easy to plot this information on a figure in the form:

Y = I/Py - (Px/Py) X

The y-axis intercept occurs where X = 0 and is in general I/Py; however, if Y is the good, money - with a price of 1 (the price of £1 is £1) - the y-axis intercept (which obtains when X = 0) records income (point 4 in Figure 1.13 – the justification for this is further explored in Chapter 2). The x-axis intercept occurs when Y = 0 so that I/Py = (Px/Py) X and X = I/Px (the maximum number of units of good X per period that can be bought if all of income is devoted to X and its price is Px – point 5 in Figure 1.13). The slope of the budget constraint can be seen to be −Px/Py (up divided by along I/Py divided by I/Px, or more formally, dY/dX = −Px/Py).

The location of the budget constraint prevents the individual having consumption plans that cannot be obtained. The best the individual can feasibly do is to be on the constraint. But where? This is where the knowledge of your own utility function comes in. The properties of indifference maps between two goods have been discussed above and are reflected in the three indifference curves illustrated in Figure 1.13. To settle at points other than point 1 on I1 (e.g. points 2 and 3) involves lower utility (I0) than can be feasibly obtained (points on I2 offer more utility but are infeasible, being outside the budget constraint line 4-5). Therefore, the utility maximiser chooses x* of good X and reserves y* of income for other uses. (Note that distance y*-4 indicates the amount of income spent on good X.) At point 1 the slopes of the indifference curve and the budget constraint are equal so it must be the case that: \( MRS_{xy} = -P_x/P_y \) when utility is maximised. Also, as \( MRS_{xy} = -MU_x/MU_y \), a utility maximiser must arrange expenditures such that the last penny spent on each good offers the same utility. If one good offered more utility from the marginal penny then total utility cannot be maximised and some rearrangement of expenditures is warranted. This condition can be formulated as \( MU_x/P_x = MU_y/P_y \).

Simply by inspection of the so-called static consumer equilibrium in Figure 1.13 it is easy to see what factors determine the quantity of X chosen per period by an economically rational individual: the price of good X (Px), income (I), the price of good Y (Py), preferences or tastes (T) and the objective (O) attributed to an individual, i.e. the general arguments in the demand function of an individual should be:

\[ Q_x = f(P_x, I, P_y, T, O). \]
MORE FORMAL SECTION

All of the above can be captured in a more sophisticated and concise manner using the Lagrangian multiplier technique as follows:

$$\text{Max } L = U(X,Y) + \lambda (I - P_X X - P_Y Y)$$  \hspace{1cm} (1.11)

The first-order conditions for a maximum are found by taking the partial derivatives with respect to \(X\), \(Y\) and \(\lambda\) and setting them equal to zero.\(^8\) This yields:

$$\frac{\partial L}{\partial X} = \frac{\partial U}{\partial X} - \lambda P_X = 0 \quad (1.12)$$

$$\frac{\partial L}{\partial Y} = \frac{\partial U}{\partial Y} - \lambda P_Y = 0 \quad (1.13)$$

$$\frac{\partial L}{\partial \lambda} = I - P_X X - P_Y Y = 0 \quad (1.14)$$

Rearranging (1.12) and (1.13) gives

$$\frac{\partial U}{\partial X} / P_X = \lambda = \frac{\partial U}{\partial Y} / P_Y \quad (1.15)$$

$$\frac{\partial U}{\partial X} / \partial U / \partial Y = MU_X / MU_Y = P_X / P_Y \quad (1.16)$$

which is the result identified in a more intuitive fashion above. The undetermined (uncomputed) multiplier \(\lambda\) can be interpreted as the shadow price on the budget constraint. As \(\lambda\) represents the extra utility at the margin from a one unit (£1) change in the (budget) constraint it can be interpreted as the marginal utility of income. At the optimum it can be seen as a prediction for a utility maximiser that the ratio of the marginal utility of a good to its own price will be constant for all goods and equal to \(\lambda\). Whilst this presentation of the utility-maximising individual is standard, how secure are the foundations on which the presentation stands? Or, put another way: how secure is the process of the supply of knowledge that underlies a presentation like this and the very many others in subsequent chapters?

1.5.3 Duality and optimisation

One of the most quoted economics authors of the 1970s and 1980s is Diewert (e.g. 1974) whose name, amongst others, is associated with the introduction of duality results in many areas of economics. It recognises that optimising results can be obtained in two ways. The primal approach attempts to explicitly solve the optimisation problem using the direct objective function. The dual approach is a method of obtaining the same optimising results from applying partial differentiation to the indirect objective function. The natural question arises as to why we should bother with the dual if it simply gives the same results. The answer lies in a number of possible gains. The first is that it may be an easier or more convenient way of obtaining results. Second, the indirect functions often involve variables that are easier to get at empirically (e.g. prices, incomes and quantities as opposed to utility). Third, duality often provides functions and specifications of an economic problem suitable for applied econometric work. Finally, there is elegance about the dual approach that commends it in itself. Basically the structure of the thinking is:

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\(^8\) Note the Lagrangian could have been set up:

$$\text{Max } L = U(X,Y) - \lambda (P_X X + P_Y Y - I)$$ and the same results would have been established.
with the trick being the ability to appropriately specify the indirect function. In the present context of utility maximisation the primal Lagrangian approach has already been illustrated above. Below an ‘easy numbers’ example from Nicholson (1995) is repeated to demonstrate what is involved in the context of a specific numerical example. (For a more recent concise treatment of duality see Turkington (2007, Chapter 7.) Remember that the objective is utility maximisation.

**Analysis**

**Theory steps:**

*PRIMAL* (explicitly solve a direct optimisation problem)

Maximise $U(X,Y)$

Subject to $P_x X + P_y Y = I$

(solve with Lagrange)

*DUAL* (obtain the same results from partial differentiation of the indirect objective function)

Indirect Utility Function

$U^* = V(P_x, P_y, I)$

Use Roy’s identity

$X = dx(P_x, P_y, I) = -\frac{\partial V}{\partial P_x} \frac{\partial}{\partial I}$

**Roy’s identity:** defines the optimal demand for a good ($X$ above) as the negative of the ratio of the partial derivatives of the indirect utility function ($V$) with respect to the price of that particular good ($P_x$) and with respect to income ($I$).

**Application steps**

Duality and the Cobb–Douglas function example

**PRIMAL**

Max $U(X,Y) = X^{0.5}Y^{0.5}$

subject to $I = P_x X + P_y Y$

(assume: income $I = 2$; $P_x = 0.25$ and $P_y = 1$)

Lagrangian

$L = X^{0.5}Y^{0.5} + \lambda (2 - 1Y - 0.25X)$

For first-order conditions set partials $= 0$

**DUAL-INDIRECT UTILITY FUNCTION**

$U^* = U(X^*, Y^*)$

(using expressions for $X^*$ and $Y^*$)

$U^* = \left(\frac{1}{4}P_x\right)^{0.5} (I/2P_y)^{0.5}$

Lagrangian

$L = X^{0.5}Y^{0.5} + \lambda (2 - 1Y - 0.25X)$

For first-order conditions set partials $= 0$

Use Roy’s identity to give Marshallian demands (note money income is held constant)
Part I  
The essentials of microeconomics

\[ \frac{\partial L}{\partial X} = 0.5 X^{0.5} Y^{-0.5} - 0.25 \lambda = 0 \]  
(1.17) \[ X^* = \frac{\partial V/\partial P_x}{\partial V/\partial I} \]

\[ \frac{\partial L}{\partial Y} = 0.5 X^{0.5} Y^{0.5} - \lambda = 0 \]  
(1.18) \[ X^* = \frac{I/4 P_x^{1.5} P_y^{0.5}}{1/4 P_x^{0.5} P_y^{0.5}} = \frac{I}{2P_y} \]

\[ \frac{\partial L}{\partial \lambda} = 2 - 1Y - 0.25X = 0 \]  
From (1.17)  
\[ X^* = 2/(2 \times 0.25) = 4 \]

From (1.18)  
\[ 0.5 X^{0.5} Y^{0.5} = \lambda \]  
(1.18') \[ Y^* = \frac{I}{2P_y} = \frac{2}{(2 \times 1)} = 1 \]

Divide (1.17) by (1.18')  
\[ 0.5 X^{0.5} Y^{0.5} = \lambda \]  
\[ 0.5 X^{0.5} Y^{0.5} = \frac{0.25}{\lambda} = \frac{1}{4} = \frac{Y}{X} \]

\[ X = 4Y \]

Substitute for X in the budget constraint  
\[ 2 = 0.25 \cdot 4Y + 1Y \]
\[ 2 = 2Y \]
\[ Y^* = 1 = I/2P_y \]

Substitute for Y* in the budget constraint  
\[ 2 = 0.25 \cdot X + 1 \]
\[ X^* = 4 = I/2P_x \]

Direct utility \[ U^* = (4)^{0.5}(1)^{0.5} = 2 \]

It should be evident that, if the analysis had begun with the \( V(P_x, P_y, I) \), indirect utility function, a simpler procedure is facilitated. It is also worth considering the utility-maximising quantities if income and prices are changed in the same proportion. Above when \( I = 2, P_x = 0.25 \) and \( P_y = 1 \) the utility-maximising quantities are \( X^* = 4 \) and \( Y^* = 1 \) from the expressions \( X^* = I/2P_x \) and \( Y^* = I/2P_y \). Now double all prices and income so \( I = 4, P_x = 0.5 \) and \( P_y = 2 \). By substitution, \( X^* \) now equals \( 4/(2 \times 0.5) = 4 \) and \( Y^* = 4/(2 \times 2) = 1 \). That is, the utility-maximising quantities remain unchanged. This is an important result as it indicates demand functions are homogeneous of degree zero in prices and incomes, so that if all prices and incomes are changed in the same proportion the quantity demanded is unchanged. As inflation is a rise in the general price level, including factor prices (income), it can have no impact on real choices and inflation is not a worry for microeconomic theory (and hence does not feature in micro texts). Further, note that the variables involved in the dual approach are empirically observable being income, price of good \( X \), price of good \( Y \), quantity purchased of good \( X \) and quantity purchased of good \( Y \), raising the prospect that with these data and the assumption of utility-maximising behaviour, the underlying utility function can be obtained by working backwards. Hence, the direction of the arrow (upwards from indirect function to
underlying direct function above). This exercise is illustrated with respect to a production function in Chapter 3 Appendix. For a discussion and application of duality in many contexts see Cornes (1992).

1.6 Challenge: is the economic methodology plausible?

Section 1.2 on ‘Boring, boring economics!’ has insights for economic methodology. In an introductory economics course, individuals are generally told, feel implicitly or read explicitly about the methodology of economics. Thousands of students will have used Begg, Fischer and Dornbusch’s (1991 and later editions) best-selling text and they will have read in Chapter 2 about the interconnections between models and facts in economic relationships. Facts or data are seen to be important because, first, they suggest relationships economists should explore and, second, data are used to ‘test’ economic hypotheses. Economic models are the product of theorising, which to be more than mere speculation must generate implications or hypotheses that relate to the ‘knowable world’ in a form such that they could be shown to be false. In this essentially logical positivist framework conventional or well-received economic theories are those that have successfully survived many attempts to falsify them. Economists are careful to not describe these theories as true; they are simply as yet unfalsified. This has a neat and attractive appeal and underlies the notion of economics as a science. However, despite this attraction many would challenge this picture of economics as a science. The point is not so much that economics is not science; rather that science is unscientific in that it does not conform to the picture commonly painted. Here, however, it is economics that is the focus. How does the body of information or stock of knowledge called microeconomics recorded in this text come to be?

One answer is provided by Samuels (1991). Samuels suggests that there are two types of people in the world: those, the majority, who demand determinacy and closedness and the minority who can tolerate ambiguity and open-endedness. The majority have a demand for certain knowledge. They want policy to be based in knowledge that is correct rather than false; they want the creation and amendment of social institutions to be based on true beliefs; and they find living in a world of uncertainty (radical indeterminacy) produces angst. Samuels, however argues that, whether individuals like it or not, certain knowledge cannot be supplied. He does this by investigating:

(i) The process of certain knowledge supply;
(ii) The possibilities of certain knowledge supply.

1.6.1 The process of certain knowledge supply

As regards the process of certain knowledge supply, as noted above, to date most readers will have completed courses in economics that explicitly, or implicitly, have ‘facts’, ‘hard statistics’ and (as yet) unfalsified theory. This knowledge comes from evidence about the past, e.g. fossils, coins, writings, records. However, this evidence has both chance elements (what does not get destroyed, what gets discovered) and systematic bias (e.g. the evidence that survives is likely to be the record of the powerful, relatively educated, ‘top’ people). Second, there is the question of the interpretation of evidence. Nothing comes ready interpreted and interpretation will also have a chance element in that it depends on the personal characteristics of the interpreter. Even the most ahistorical of people must tap into their personal experience and the folklore of those around them, argues Samuels. Further systematic bias will also be present in that many interpreters want to tell ‘specific’ stories. For example, Tullock (1971) examines the economics of revolutions and notes the popular view is that they are about the ‘good’ replacing the ‘bad’ (which
he sees as being unsustainable). If this is so, the question becomes: why has history given people this cosy picture? Elements in his answer are that: historians rely on the memoirs of the leaders of revolutions; the only effect of revolutions on historians themselves is if there are positive legacies from the past – a gain; literature about ‘come and join’ the revolution will be set in terms of ‘higher motives’ rather than base self-serving ones.

Tullock’s review of the evidence on revolutions leads him to the view that they are about the rich displacing the very rich at the top of a state and not much more. In short, interpretations of the same events vary considerably.

Third, there is the question of whose ideas or whose ‘schools of thought’ get the limelight. In the present context it is about asking who gets to be in the economic journals and how is ‘what they are saying’ shaped. Here Samuels questions the notion of objectivity in the process. Armstrong (1982) provides evidence. He reports the ‘letterhead effect’ in which Peters and Ceci (1982) resubmitted twelve articles already published within the last three years in prestigious psychology journals. The resubmissions to the very journals that had published the articles had the same content but now apparently came from fictitious authors at a ‘no-reputation’ institution. Of these, three were discovered, eight rejected (none, on the grounds they said nothing new)! The ‘filing cabinet effect’ states that it is easier to get published material supportive of existing positions than material to the contrary. The implication is that ‘out there’ in thousands of separate filing cabinets is a mound of rejected articles that apparently have ‘wrong data’, ‘wrong transformations’, ‘wrong theory’, etc.

Next, there is the issue of replicability or, less grandly, ‘checking’. Seldom is work replicated in social sciences; therefore everyone must be wary not to accept chance results. A Journal of Money, Credit and Banking project (see Dewald, Thursby and Anderson 1986) found that many of the published empirical results could not be reproduced and that for a small number of contributions to the journal, all of a sudden, no data could be found to check! For economists, it seems appropriate to note that the self-interest motive was observed to apply in that the errors found tended to favour the authors’ views.

Allied worries were: that referees varied in their view of the competence of individuals; that there was no incentive to work on important topics and evidence that complexity and obsfuscation were seen as superior to clear writing and judged better. Armstrong also reports an interesting experiment carried out by Naftulin, Ware and Donnelly (1973) in which Dr Fox (a clue in the name!), an actor, gave three almost senseless lectures to three audiences (including academics) followed by periods of questions. The lectures were generally assessed by listeners to be good or very good! Such results cast doubt on the validity of quality of individuals’ critical abilities and highlight their limitations.

Finally, there is the question of ‘who wins’. With access to limelight political, historical and social factors some ideas and schools of thought are deemed winners, whilst others are marginalised. That is, academic disciplines change but not, unfortunately, as a process through which good ideas replace bad ideas as you close in on the truth. As pointed out by Samuelson (1985), Max Planck the Nobel physicist noted that no one seemed to change their mind in the face of new theories and experiments but rather people who believed one thing died, to be replaced by people who believed something else.

The message of this subsection is very clear and is that the notions of ‘hard facts’ and economic theory ‘testing’ look very fragile and doubtful the closer you get to them. Enacting the La Manna description of economics contained in his quotation on p. 00 above is a very difficult task.

1.6.2 The possibilities for certain knowledge supply

The possibilities for certain knowledge supply are heavily circumscribed by developments in epistemology (which concerns the nature and validity of knowledge) and discourse analysis. The meaning that is given to (economic) theories and statements involve the
creation and deployment of language which itself is a social construct. Both lead to the notion of the ‘social construction’ of economic reality. With regard to the nature of economic knowledge enough has been said above to convince many that there is no objective, confirmable and replicable definition of reality and therefore there must be a willingness to accept open-endedness and methodological pluralism.

Considering discourse, theory suggests that what we all get to accept as knowledge makes sense only in the context of your underlying beginning position, i.e. it is paradigm-specific. What individuals get to ‘see’ in economic theory is limited by the assumptions required to produce results that are equilibrium, optimal and determinate. It must be emphasised that this line of reasoning is not that anything will do, but rather in Samuels’s view, the injunction to locate and understand the grounds on which something is accepted as knowledge. Samuels writes about the credentials of your knowledge. Even having ‘credentials’ for your knowledge does not determine the meaning it has. Neoclassicism, Marxism etc. are intellectual constructs partly built through language. Economics, in general, is a discursive system through which you get to see and interpret the economic model. The problem is that there are many discursive systems possible – economists are telling ‘one story’ among many that may be possible.

The importance of these notions about knowledge and language is that unlike the natural world, the economy is a social construction – what individuals think and believe shapes what is there. If this is accepted, economic reality is the product of and NOT the check on human thought or theorising. The so-called facts of situations are the empirical outcrop of the accepted theory and are not independent entities; people are born into and inculcated into the ways of a society that they take to be real and, by taking part in that society, shape what the next generation takes to be real.

These are powerful, and to some disturbing, thoughts. The punch line of Samuels’s article is that (as students of economic knowledge) individuals have to:

(i) accept open-endedness and ambiguity, because the alternative looks implausible;
(ii) realise that what is taken as knowledge is paradigm-specific and that there are many other stories that could be told;
(iii) accept that saying something is explainable means you can discuss it in a given paradigm.

The message is to be very uncertain about anything you think is certain, as ‘doubt grows with knowledge’ (Goethe, quoted in Hemenway 1988: 11).

The line of reasoning developed in this section is a call to be more vigilant about the nature of economic reasoning and evidence, not less. Individuals must be very aware of the fragility of what is being read and develop a critical facility. What makes a piece of theory work? Are the assumptions simplifying or determining? How is it being constructed? Why is it seen as accepted? And so on. To foster this process, each chapter contains material that challenges the dominant view in the same way that this section itself challenges the typical picture given to introductory students of facts, economic theory and methodology. In this section the breadth of economics is also indicated as the discussion has moved from arithmetical principles (which in the light of this section must also be viewed as social constructions that individuals, via inculcation at a young age, have become the ‘certain and correct’ principles of manipulation) to questions about the nature of knowledge and its construction.

1.7 Summary

This chapter has covered a variety of crucial and fundamental areas ranging through the perspective of microeconomics, some visual arithmetic techniques, utility maximisation and methodology. Readers are recommended to spend some time mastering the material
here as these apparently disparate considerations are the foundations of neoclassical microeconomics. Difficulties in understanding later material and/or interpretations made will, almost certainly, trace back to this chapter. In the remaining chapters signposts back to this chapter will be provided so that, if the intellectual construct you are hopefully building shows signs of crumbling, foundational repair work can be made.

The objective in later chapters will be to emphasise that ‘nothing is set in stone’. For all mainstream interpretations of theory and its construction, there are always ‘wrinkles’ to be found. More important, by far, however, is the knowledge that there are always ‘doubters’ internal and external to the discipline, trying to reinterpret it, modify it, discredit it or, more ambitiously, replace it. It is this dissent that lends dynamism to the subject and prevents the writing of further textbooks being unnecessary!

In the first part of the chapter the economists’ view of the world was captured in the mnemonic BORING. Like it or not, this mnemonic is helpful when focusing on how mainstream microeconomics is constructed but the central message in this book is that these building blocks can be applied to offer INTERESTING insight when focusing on decisions that are taken from day to day.

One reason for the tag BORING was claimed to be the mathematical content of microeconomics. A substantive section of this chapter outlined some basic visual arithmetic techniques that allow the distinction between total, marginal and average values to be easily made. Also, the general concepts of elasticity and elasticity of substitution were revised and graphically simplified as a necessary prerequisite to the subsequent INTERESTING chapters.

The key concepts of rationality and utility maximisation were explored as they are central to virtually all economic discussions. The word ‘constructed’ was chosen carefully in the previous paragraph as the discussion of methodology introduced social constructionism. It is difficult to envisage that microeconomics unlike, say Mount Everest, would exist without people and it is people, their thoughts and inculcated values that determine what gets to be recognised as mainstream microeconomic theory. At root then, the foundations of microeconomics may well be less secure than some people, including some economists, recognise. This is in no way to attack or denigrate the subject but rather to try to offer a deeper insight. Recall the claim that is not that economics is not like science, it is that science is not like science in that, for many, especially sociologists of science, science is also a social construction.

This contribution was presented in this chapter as the first of many ‘challenges’ to be found in this text. The purpose of the ‘challenges’ is to get readers to be both aware and critical of the material presented here. Much of it is not obvious and books describing economics as the science of common sense do everyone a disservice in that they underestimate the contribution of the major economic theorists and often put students on the wrong track. Virtually all the major results of microeconomic theory are counterintuitive. Students who have not done their revision tend to write that the ideal form of economic organisation is a large single firm providing each good (monopoly), not that the ideal situation is one of duplication with many firms providing identical goods in circumstances where they feel powerless to affect the world around them (perfect competition).9 Similarly much common sense takes people to protectionism and what is good for producers and not free trade, the microeconomic prescription (see Chapter 17).

9. It is similar to a scene in the first Planet of the Apes film where the Charlton Heston character explains to the friendly ape that to get more output they must keep the best produce for next year’s seed. The ape laughs a great deal at this ‘eat the worst and bury the best’ strategy because historically they always reasoned that that it was better to eat the best and plant the worst to produce next year’s crop – common sense had taken the apes the wrong way.
Appendix 1 The total differential

Given a function \( Y = f(X) \) there is a way to approximate the change in \( Y \), \( \Delta Y \), when \( X \) is changed by a small amount, \( \Delta X \) (the smaller \( \Delta X \) the better the approximation). Consider Figure 1.14. \( X_1 \) and \( Y_1 \) is the initial point on the curve and the actual changes in \( X \) and \( Y \) are marked \( \Delta X \) and \( \Delta Y \). Putting a tangent \( T \) to the curve at point \( X_1 \) suggests distance \( V \) approximates \( \Delta Y \) so that \( V = \text{Slope of } T \times \Delta X \) or \( V = \frac{dY}{dX} \text{ evaluated at } X_1 \times \Delta X \).

To put it in 'large change' terms, if the slope of \( T \) was +3 and \( \Delta X = +2 \), then \( V = +6 \).

More precisely:

\[
\Delta Y = \frac{dY}{dX} \cdot \Delta X.
\]

This approximation is known as the differential of \( Y \).

In this text the typical function has two independent variables. That is, they take the form \( Y = f(Z, X) \). By extension of the argument just made, a linear approximation of the change in \( Y \) that arises as \( Z \) and \( X \) are both changed by small amounts will be given by:

\[
\Delta Y = \frac{dY}{dZ} \cdot \Delta Z + \frac{dY}{dX} \cdot \Delta X
\]

Tidying this up to a neater presentation as the changes are assumed to become smaller:

\[
dY = \frac{\partial Y}{\partial Z} \cdot dZ + \frac{\partial Y}{\partial X} \cdot dX
\]

where \( \frac{\partial Y}{\partial Z} \) is the partial derivative of \( Y \) with respect to \( Z \) and \( \frac{\partial Y}{\partial X} \) is the partial derivative of \( Y \) with respect to \( X \). An interesting result obtains if \( dY \) is constrained to be zero. That is, if:

\[
dY = \frac{\partial Y}{\partial Z} \cdot dZ + \frac{\partial Y}{\partial X} \cdot dX = 0,
\]

then \( \frac{dZ}{dX} = -\frac{\partial Y/\partial X}{\partial Y/\partial Z} \).

The slope of a curve between \( Z \) and \( X \) (when the value of the dependent variable, here \( Y \), is not allowed to change) is then equal to the negative of the ratio of the partial derivatives of the independent variables, a result that clearly has application to indifference curves, isoquants and social welfare curves. As will be amply demonstrated below, the partial derivatives of the independent variables have a natural economic interpretation as marginal utilities, marginal products and marginal welfare changes.
References


