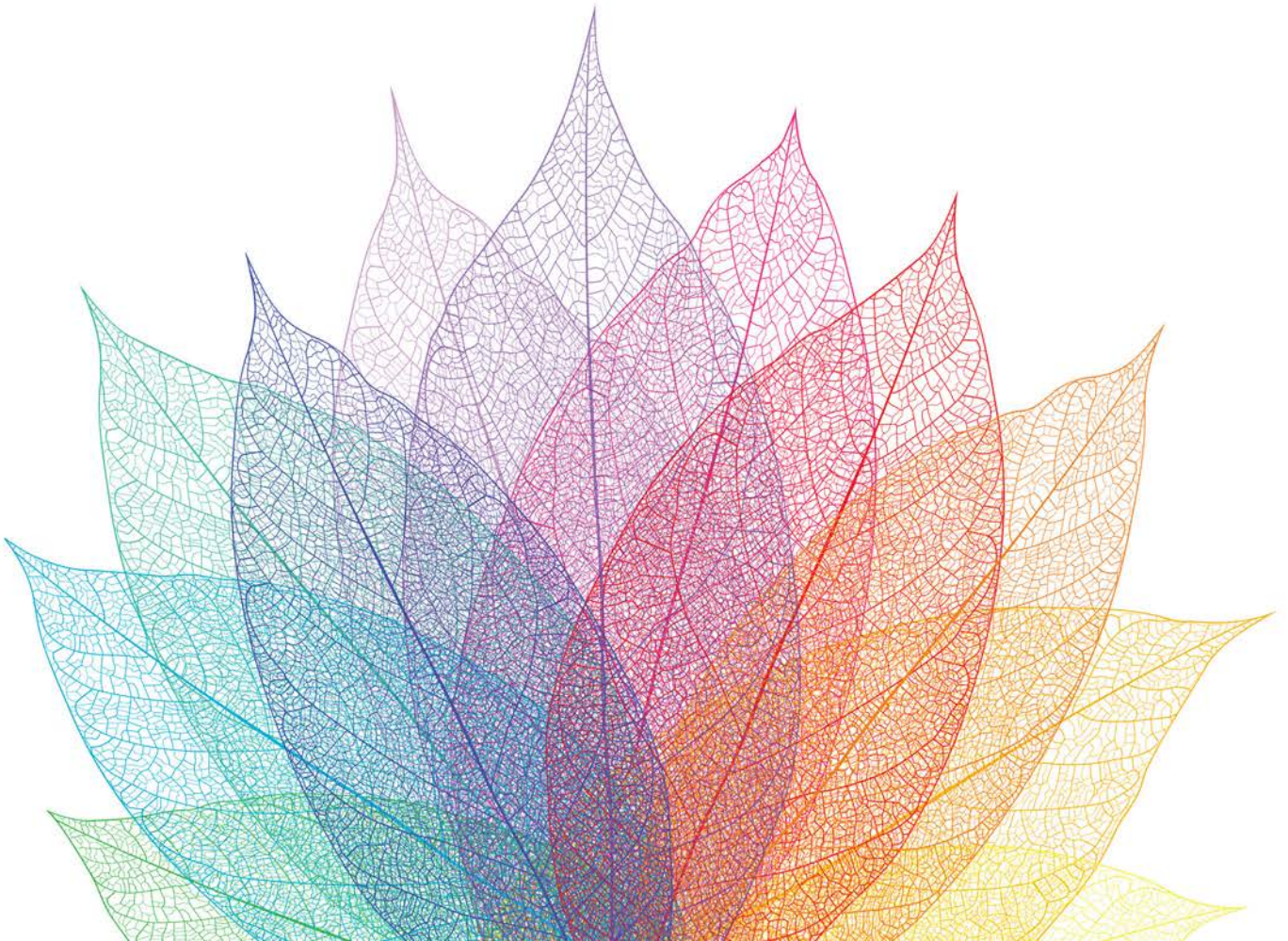


# INTERMEDIATE MICROECONOMICS

AN INTUITIVE APPROACH WITH CALCULUS

THOMAS J. NECHYBA





Thomas J. Nechyba

# INTERMEDIATE MICROECONOMICS

AN INTUITIVE APPROACH  
WITH CALCULUS

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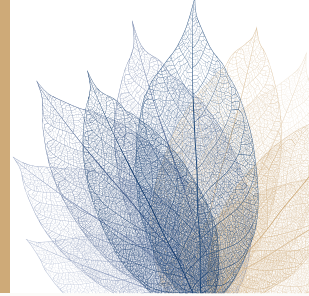
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# Preface

## To Students

Here are a few points on how best to use this text:

- 1 You may want to review parts of Chapter 0, which is available on the MindTap to revise some basics before proceeding to Chapter 2.
- 2 Attempt the *within-chapter exercises* as you read—and check your answers with those in the Study Guide. (Quasi-controlled experiments during the initial drafting of this text with students show that those who use within-chapter exercises and solutions, do considerably better on exams.)
- 3 Graphs with blue bars at the bottom can be unpacked directly within the MindTap Reader, and almost all graphs are available to view as animated and narrated videos that can be accessed through MindTap. While some of the video animations are long, you can skip ahead and use chapter markers to locate the part of the video you are most interested in.
- 4 Look for interesting applications in the *end-of-chapter exercises*, but know that some of these are designed to be challenging. Don't get frustrated if they don't make sense at first. It helps to work with others to solve these.
- 5 The book has an extensive Glossary and Index but develops definitions within a narrative rather than pulling them out within the text. Use the Glossary to remind yourself of the meaning of terms and the Index to find where the associated concepts are discussed in detail. Resist the temptation to memorize too much. The terms aren't as important as the concepts.

## To Instructors

This book attempts to build a framework around five primary goals that we believe any microeconomics course should accomplish:

- 1 It should present microeconomics not as a collection of unrelated models but *as a way of looking at the world*. People respond to incentives because they try to do the best they can given their circumstances. That's microeconomics in a nutshell—and everything—*everything*—flows from it.
- 2 It should persuade that microeconomics does not just change the way *we think* about the world—it also tells us a lot about *how and why the world works* and sometimes doesn't work.
- 3 It should not only get us to think more clearly about economics but also *to think more clearly in general*—without relying on memorization. Such *conceptual thinking skills* are the very skills that are most sought after and most rewarded in the modern world.
- 4 It should directly confront the fact that few of us can move from memorizing to conceptual thinking without *applying concepts directly*, but different students learn differently, and instructors need the *flexibility* to target material to *their* students' needs.
- 5 Finally, it should provide students with a *roadmap for further studies*—a sense of what the most compelling next courses might be given *their* interests.

Half the text builds up to the most fundamental result in all of economics—that self-interested individuals will—*under certain conditions and without intending to*—give rise to a spontaneous order that has great benefits for society. The second half probes these certain conditions and develops insights into how firms, governments and civil society can contribute to human welfare when markets by themselves fail. Future courses can then be seen as sub-fields that come to terms with these certain conditions.

While the material in the full text is more than enough for a two-semester sequence, the text offers a *variety of flexible paths for a one-semester course*. In each chapter, you can emphasize an intuitive A part or link it to a more mathematical B part; and, while the last part of the text relies heavily on game theory,

the underlying narrative can also be developed through a non-game theoretic approach. Substantive paths include some focused on *theory*, others focused on *policy*, and yet others focused on *business*, with all paths including core material as well as optional topics. Throughout, the models build in complexity, with applications woven into the narrative. They are then further developed in an extensive array of exercises that get students to apply concepts to *Everyday*, *Business* and *Policy* settings.

The Instructor's Manual provides more details on how you might use the various parts of the text and its accompanying tools.

While the student study guide includes answers to all odd numbered end-of-chapter exercises (in addition to answers to within-chapter exercises), answers to all end-of-chapter exercises are available to instructors.

### Acknowledgements

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# About the Author

**PROFESSOR THOMAS J. NECHYBA** who received his PhD from the University of Rochester, USA in 1994, joined the Duke faculty, USA in 1999 after spending five years on the faculty at Stanford University, USA. In addition to his activities in the USA, he has lectured internationally in Europe, Latin America and New Zealand. His teaching has been recognized with numerous awards including the Stanford Dean's Award for Distinguished Teaching (1996), the Southern Economic Association's Ken Elzinga Distinguished Teaching Award (2004) and the Duke University Scholar/Teacher of the Year Award (2007). Dr Nechyba is currently a Research Associate at the National Bureau of Economic Research and has served (or is serving) as Associate Editor for the *American Economic Review*, *International Tax and Public Finance* and the *Journal of Economic Literature*, among others. At Duke, he has previously served as Director of Undergraduate Studies and as Department Chair and currently directs the Economics Center for Teaching (EcoTeach) as well as Duke's Social Science Research Institute. Dr Nechyba's research on public finance, urban economics and the economics of education has been funded by agencies such as the National Science Foundation and has been published in journals such as the *American Economic Review*, the *Journal of Political Economy*, the *International Journal of Economics* and the *Journal of Public Economics*, among others.

## Adapting Author for Europe, Middle East and Africa

**ANDREW ASHWIN** has over 20 years' experience as a teacher of economics. He has an MBA from the University of Hull and a PhD in assessment and the notion of threshold concepts in economics from the University of Leicester. Andrew is an experienced author, writing a number of texts for students at different levels, and journal publications related to his PhD research. Andrew was Chair of Examiners for a major awarding body for business and economics in England and is a subject specialist consultant in economics for the UK regulator, Ofqual. Andrew has a keen interest in assessment and learning in economics and has received accreditation as a Chartered Assessor with the Chartered Institute of Educational Assessors. He has also edited the journal of the Economics, Business and Enterprise Association (EBEA).



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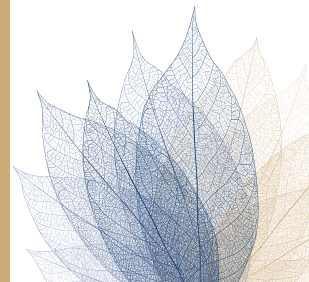
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# Chapter 1



## Introduction

Do safer cars necessarily result in fewer traffic deaths? Is it sensible to subsidize solar energy in an effort to reduce the reliance on fossil fuel energy? Would outlawing live Christmas trees help to reduce deforestation? Should we impose laws against ‘price gouging’? Is boycotting companies that use cheap labour abroad a good way to protest about working conditions in those countries? Should we tax the profits of monopolies?

Many people would instinctively answer ‘yes’ to each of these questions. Many economists would say ‘no’, or at least ‘not necessarily’. Why is that?

By and large, economists are an ideologically diverse group, distributed along the political spectrum much as the rest of the population. Economists do, however, look at the world through a somewhat different lens, a lens that presumes people respond to incentives and that these responses aggregate in ways that are often surprising, frequently humbling and sometimes quite stunning. What we think we know isn’t always so, and, as a result, our actions, particularly in the policy realm, often have ‘unintended’ consequences.

Through the lens of social science, economists see many instances of remarkable social order emerging from millions of seemingly unconnected choices in the marketplace, spontaneous cooperation among individuals on different ends of the globe, the kind of cooperation that propels societies out of the material poverty and despair that has characterized most of human history. At the same time, our lens clarifies when individual incentives run counter to the common good, when private interests unravel social cooperation in the absence of corrective non-market institutions. Markets have given rise to enormous wealth, but we also have to come to terms with issues such as economic inequality, the impact on the environment of human activity, unscrupulous business practices and racial discrimination.

1A

### What is Microeconomics?

We will define *microeconomics* as the *science* that investigates the *social consequences* of the interaction of *rational* beings that pursue their *perceived self-interest*. At first glance, this description of human beings as ‘rational’ and ‘self-interested’ may sound naive. After all, most people would not characterize their fellow citizens as always ‘rational’. It is useful to say a bit more about this definition.

#### 1A.1 Economics as a Science

Economics is not a science in the same way that physics or chemistry are science. Knowledge and understanding through science progresses through the formulation and testing of models that generate hypotheses, and in this sense, economics can be viewed as a science. Economists formulate models that



are rooted in economic theory and check to see whether the hypotheses that emerge are rejected by real-world observations. Some economists actually do perform experiments, but most look at data from the real world to see whether their predictions hold.

## 1A.2 Rationality and Self-Interest

Many economic models are based on an assumption that people are *rational* and in pursuit of their *perceived self-interest*. The term ‘rational’ is taken to mean that individuals seek to do the best they can given their circumstances, that is, they are deliberative in trying to achieve their goals. Those goals might include improving the welfare of others they care about, and they may include goals that make sense to them but don’t make sense to others. Someone who sacrifices personal consumption to improve their children’s well-being may be thought of as ‘unselfish’, but it may still be in the individual’s perceived self-interest if, in making their children happy, their own happiness is improved. That seems quite noble, but not everything that one individual finds worthwhile might be worthwhile in some deeper sense. The business person may seek to maximize their own profit when they could be saving starving children instead; the politician may seek to win elections when they could be making a worthwhile difference in people’s lives by doing something unpopular; the drug addict may seek to get their next fix when they might be better off checking into a rehab centre. Nevertheless, each of these individuals is directing their actions towards a goal they perceive to be worthwhile and in their own self-interest.

Self-interest is not necessarily the same as selfishness. The latter presumes you care only about yourself; the former leaves open the possibility that others may contribute to your perception of your own well-being. Often, selfishness and self-interest coincide, but not always. In economics, the term rational simply means that we pick the best available course of action to achieve our self-interested goal.

## 1A.3 Social Consequences, Pencils and Environmental Impact

Part of the goal of economics is understanding the *social consequences* of the interaction of rational, self-interested individual behaviour. We may model how an individual behaves under certain assumptions, but of greater interest is what happens when hundreds, thousands or even millions of rational, self-interested individuals pursue their individual goals *given that everyone else is doing the same*. Economists call the outcome of these interactions an *equilibrium*, and it is in this equilibrium that we find the social consequences of individual behaviour.

Nobel Prize winning economist, Milton Friedman, famously held up a pencil and made the initially preposterous claim that no one in the world knows how to make that pencil. This might seem to be a strange claim, but if we seriously think about the challenge of making a pencil *from scratch it sounds less strange*. One would have to know which trees to harvest for the wood, how to make the tools to harvest the trees, what chemicals to use to treat the wood once it is cut into the right shape, how to drill the hole to make room for the lead and how to make the tools to drill the hole. That does not begin to scratch the surface, because we also have to know everything about where to get the materials to eventually make the lead and how to make it and all the necessary tools required for that, how to create the paint and paintbrushes to coat the outside of the pencil, and so on. When you really think about it, tens of thousands of people somehow cooperated across all the continents in the world to make the pencil Friedman was holding, and few of those tens of thousands of people would be aware that they were participating in a process that would result in a pencil.

Economists are fascinated by the fact that pencils, and many other goods, are produced despite the fact that few individuals know how to produce them and despite the fact that no one is charged with coordinating all these people and materials into the production of pencils. Cooperation on such a massive scale can emerge from the bottom up without the individuals knowing that they are cooperating with one another. This cooperation can emerge purely from the rational, self-interested choices that individuals make along the way, each one trying to earn a living, to do the best they can given the circumstances. This is a *social consequence* of the interaction of rational, self-interested behaviour, one that is guided by the impersonal forces of market prices that tell individuals where to work, what to produce, whom to sell to, etc.

Not all social consequences of rational, self-interested behaviour are desirable. The same economic lens that explains how people cooperate to make pencils also highlights the impact of human activity on the environment, how relative as opposed to absolute poverty persists, how concentrated power distorts markets and how some goods might never get produced unless non-market institutions intervene. Understanding when we can rely on individual self-interest to give rise to cooperation – and when such self-interest impedes cooperation – is one of the key themes of this book and one of the central goals of microeconomics. With such an understanding, we can formulate ways of changing the circumstances in which decisions are made to bring those decisions more in line with social goals: to change the *social consequences* of rational, self-interested behaviour by *altering the incentives* people face along the way.

## 1A.4 Economics, Incentives and Economic Models

Economics can be seen as an exploration of the premise that *people respond to incentives* because they generally *attempt to do the best they can given their circumstances*. It is a premise that leads to a rich framework through which to analyze many small and large debates in the world in a logical and rigorous manner. However, much of this book is devoted to the building of economic models that, at least initially, seem to be starkly disconnected from reality. One criticism of these models is that they involve *simplistic* and *unrealistic* characterizations of what we are as human beings. In certain ways, this is correct. Nevertheless, the use of such models represents one method through which economists can make some sense of the underlying issues we are concerned about. In the process, we also get an unintended consequence of learning through economic models. We learn to think more conceptually, to move beyond memorization to ‘think in the subject’.

**1A.4.1 Economic Models and Simplicity** In the first section of this book we will assume consumers are individuals who rationally calculate the costs and benefits of different alternatives using a mechanical characterization of tastes as a guide. This is not a full characterization of all the complexity that underlies the human condition, and it omits some of the very aspects of our make-up that make us human.

Economics does not claim to paint a full picture of who we are as human beings. Economics tries to provide a framework for systematically studying aspects of human decision making that relate to our desire to pursue perceived self-interest in different institutional settings, and how such self-interested decision making affects society as a whole. Simplicity in models becomes a virtue as long as the models can predict well what we are trying to predict.

Economic models are constructed to strip away all the complexity, all the noise that gets in the way of an analysis of particular economic problems and leave us with the essence of individual decision making that matters for the questions at hand. They will not tell us whether there is a God or why we like to stare at the stars at night or why we fall in love. But they can be powerful tools that allow us to understand aspects of the world that would remain impenetrable without the use of simplified models. For this reason, resist the temptation of dismissing models – in economics or elsewhere – by suggesting that they are simplistic. A measuring tape is simplistic, but it is a useful tool to the carpenter who attempts to build a piece of furniture, much more useful than the more complex microscopic tools a neurosurgeon might use to do their work. In the same way, it is precisely because they are simple that many economic models become useful tools as we try to build an understanding of how individual decision making impacts the world.

**1A.4.2 Economic Models, Realism and Snooker Players** Another analogy by Milton Friedman illustrates a slightly different aspect of economic models. Think about snooker players on the professional circuit. These players are typically not expert physicists who can calculate the precise paths of snooker balls under different circumstances, using the latest knowledge of underlying equations that govern the behaviour of snooker balls. Suppose we wanted to arrive at a useful model that could predict the next move of each snooker player, and suppose it was suggested to you that we should model each snooker player as an expert physicist who can instantly access the latest mathematical complexities in physics to predict the best possible next move. The model is absurd in the sense that it is completely unrealistic; many of these players will not have any advanced grounding in physics or maths. It is likely, however, that the model would do pretty well at predicting the next move of the best snooker players, better than virtually any other model we could come up with.

Similarly, consider the problem of predicting the growth of a particular plant. Which branches will grow leaves this season and in which direction? One possible model would assume that the plant consciously calculates, using the latest knowledge of biologists and other scientists, how to distribute the nutrients it gains from the soil to various branches optimally, taking into consideration the path of the sun and thus the distribution of resulting sunlight, the rotation of the earth, etc. The model is once again absurd in the sense that we can be fairly certain that there is no conscious mind in the plant that is capable of accessing all the relevant facts and making the appropriate calculations. Nevertheless, a model that assumes the presence of such a mind within the plant may well be a useful model to help us predict how the plant will grow.

Models, regardless of what they aim to predict, do not have to be realistic. They can be, and it sometimes might help our understanding if they were. Equally, not all aspects of economic models need to be fully realistic. The consumer model we will look at in the next few chapters implies that individuals can map their tastes into complicated graphs or, alternatively, that they use multivariable calculus to analyze choice alternatives using mathematical functions of which few people are aware. This is absurd in the same way as it is absurd to assume that snooker players are expert physicists or plants are expert biologists. In the same way that these assumptions help us predict the next moves of snooker players and the next steps in the growth of a plant, our assumptions about consumers allow us to make predictions about their economic choices. Thus, just as it is hoped you will not dismiss models because of their simplicity, it is also hoped you will not dismiss them if they appear to be unrealistic in certain ways.

**1A.4.3 An Unintended Consequence of Learning Through Economic Models** Economists often point out unintended consequences, consequences that don't immediately come to mind when we contemplate doing something. The models we'll be using are specialized in some sense, but they are general in the sense that each model can be applied to many different real-world problems. Once you get really comfortable with the way economists model behaviour, it boils down to one single model, or at least one single conceptual approach. As you internalize this conceptual approach to thinking about the world, you will find that your conceptual thinking skills become much sharper, and that has implications that go far beyond economics. There is, thus, an unintended consequence of learning microeconomics.

The modern world expects more than good memorization skills from students. Those who succeed in the modern world have developed higher conceptual thinking skills that have virtually nothing to do with memorization.

What is important, therefore is to train your conceptual muscle, the muscle that allows you to progress beyond viewing each new situation you encounter as a new problem to be solved from scratch and permits you to learn from situations that share some features in common. The framework of economics enables you to develop skills that allow for the translation of knowledge across time and space.

## 1A.5 Predicting Versus Judging Behaviour and Social Outcomes

Aside from learning to think in the subject or think more conceptually, the real point of these models is to *predict* behaviour and to predict the social consequences of that behaviour. For the vast majority of economists, a model is good if it predicts well. The self-interested goals individuals pursue matter in the analysis because they help us predict how behaviour will change as circumstances change; to the economist interested in prediction, the deeper philosophical question of whether some goals are inherently more worthwhile than others, is irrelevant. What matters for predicting what you will do if the price of fuel increases, is how much fuel you consume as a result, not whether it is morally good or bad to consume fuel. Whether it might be good or bad to raise the price of fuel is a very different question, one that presumes some deeper philosophical views about how to *judge* what is good and bad.

Economists do, of course, have objective standards for what is ultimately in our best interest. As human beings, almost all of us, explicitly or implicitly, hold to such standards and wish that we and the rest of the world would abide by them more frequently. Most of us believe the drug addict would indeed be better off if they checked into a treatment centre, that the politician ought to care about more than the next election, and that the business person should care about starving children. Most economists, *in their role as economists*, are in the business of predicting how changing incentives will change the actual

behaviour of people who may have quite different ideas about what is worthwhile than the economist who is modelling them. What matters for their behaviour is what *they* think is worthwhile, not what the economist thinks *should be* worthwhile.

**1A.5.1 Positive Economics: How to Predict Real Outcomes** The branch of economics that concerns itself primarily with such predictions is known as *positive economics*, and it is the branch of economics that is in a real sense value-free. In the economist's pursuit to predict what will actually happen as incentives change, there is not the luxury of making value judgments about what people ought to be like; there is the taking of people's goals as given and attempting to analyze real behaviour that follows from these goals and the incentive structures within which people attempt to translate those goals to real outcomes. If you are a policy maker who is attempting to determine the best way to lower infant mortality or improve low-income housing or provide a more equitable distribution of educational opportunities, it is important to get the best *positive* economic analysis of each of the policy alternatives you are considering. It is important to know what the real impact of each policy will be before we attempt to choose the 'best' policies. The same is true if you are a business person pricing goods; you need to know how people will actually respond to different prices, not just how you would like them to respond.

**1A.5.2 Normative Economics: How to Judge Outcomes** *Normative economics* goes beyond a value-free analysis of what will happen as incentives change. Positive economics can provide predictions of what will happen as a result of various possible policy alternatives; normative economics uses tools that capture explicit value judgments about what outcomes are 'good' and what outcomes are 'bad' to determine which of the policies is the best for society. Normative economists thus draw on disciplines such as political philosophy to formalize mechanisms through which to translate particular values into policy recommendations based on a positive analysis of the likely impact of different incentives.

Much of this book concerns itself with positive rather than normative economics by attempting to build a framework through which we can predict the impact of different institutions on individual decision making. We will have to be careful along the way, however, because the positive models we develop are often used for policy analysis in ways that allow particular normative value judgments to slip in.

**1A.5.3 Efficiency: Positive or Normative?** You will notice the term *efficient* or *Pareto efficient* appears throughout the text, often with a normative connotation that efficiency is somehow a good thing. We will define a situation as efficient if there is no way, given the resources available, to change the situation so as to make some people better off without making anyone worse off. Within this definition, we find our value-free notion of better off and worse off; that is, we will consider someone to be better off if *they* think they are better off, and we will consider someone as worse off if *they* think themselves worse off. In that sense, the statement 'situation *x* is efficient' is a positive statement that could be restated to say there is no way to change things so that someone thinks they are better off without making someone else think they are worse off.

Given this definition of efficiency, you can see how one might tend to be concerned about *inefficiencies*. An *inefficient* situation is one where we can see how to make some people better off without making anyone else worse off. We should also be careful not to assume immediately that moving towards greater efficiency is always good in some bigger philosophical sense. A policy that increases the wealth of the rich by a lot while leaving the wealth of the poor unchanged may be a policy that moves us to greater efficiency, as is a policy that makes the poor a lot wealthier while leaving the wealth of the rich unchanged. It is likely that most of us, if pressed, will think one of these policies is better than the other. Some might think that the first policy, because it increases inequality, is actually bad even if it really doesn't make anyone worse off. Similarly, as we will see in Chapter 18, allowing a healthy poor person to sell their kidney to someone who needs it and can pay a lot for it may indeed make both of them better off, and yet there are many who would have moral concerns over such transactions. We will see other examples of this throughout the text.

## 1A.6 The Non-Dismal Science: Some Basic Lessons

Studying microeconomics has a way of changing how we think about ourselves and those we interact with and the implications for the larger world we occupy. Often economics stands accused of being a 'dismal

science’, a term that goes back to the 19th century when historian Thomas Carlyle described economics as ‘a dreary, desolate and, indeed, quite abject and distressing [science]; what we might call ... the dismal science’ in response to Thomas Malthus’s admittedly depressing and erroneous theories on population growth and resource use.

Perhaps people think that because we study how people respond to incentives, we are trying to make people selfish. Or perhaps it is because economists engaged in policy discussions often point out that there are trade-offs in life and that politicians too often promise something for nothing. It is also possible that economics provides a rather uplifting or non-dismal view of the world. This is something that can be seen in three very basic insights that run counter to predispositions that many of us share before we study economics.

**1A.6.1 Must There Be a Loser for Every Winner?** Psychologists suggest that we appear to be ‘built in a way that makes us think that whenever there is a winner, there must be a loser’. To the extent that this is true, it colours our view of the world. Economists have developed a fundamentally different mind-set because our study began with the study of voluntary trade where one party chooses to give up something in exchange for something the other party has to offer. In such trades, there is typically no loser; for example, if one person gives up €2 every day to buy a coffee from the campus coffee shop, they do so because it makes them better off since they could just stop doing it if they did not think it was worth it. Similarly, the campus coffee shop owner is better off because they value the cup of coffee at less than €2. They trade, and by trading the world has just become a better place because no one was hurt and both parties are better off. Internalizing the lesson that *there are many situations when everyone can win* is part of thinking like an economist. In fact, much of the unprecedented wealth that now exists in the world has arisen precisely because individuals continuously identify situations in which voluntary interactions make everyone better off. We will also see many situations that involve winners and losers, and situations when non-market institutions are needed to discipline voluntary interactions, but the mere presence of a winner does not imply the offsetting presence of a loser.

**1A.6.2 Can ‘Good’ People Behave ‘Badly’?** Psychologists also suggest that humans are built to attribute the nature of actions we observe to the inherent character of the person who is acting. When we see someone doing something that is bad, we tend to think that we are dealing with a bad person, and when we see someone doing something good, we tend to think that this implies we are dealing with a good person. No doubt there are bad people who do bad things because of their predispositions, and there are many good people who do good things for the same reason. The economist has another view to add to this: *Often people do what they do because of the incentives they face, not because of any inherent moral predisposition.* For example, if a country’s welfare system is designed so that when they find work, their welfare benefits are cut by €1 for every €1 that they earned in the labour market, it may result in individuals not seeing work as worthwhile. Do we imply from this that these individuals are ‘lazy’ or ‘work-shy’ or could the explanation be that they are facing perverse incentives that result in this behaviour? Internalizing this basic scepticism of attributing actions too quickly to moral predispositions sets us up to think about behaviour very differently. *Changing behaviour for the better suddenly does not necessarily require a remaking of the soul; sometimes all it takes is identifying some really bad incentives and changing those.*

**1A.6.3 Order: Spontaneous or Created?** Finally, there is a third way in which we seem to be built that stands contrary to how economists think. Whenever we see something that is working, something that is creating order in an otherwise disorderly setting, we tend to think that there must be *someone* that deliberately created the order. The more complex the order is, the more we tend to think that someone must be in charge of it all. Our study of markets will tell us a different story. Consider the complex order that is any major European city: millions of people interact with one another, getting food, going to work, finding a place to live, etc. If you think about it, it is an enormously complex order, even more complex than the order that gives rise to the unplanned existence of pencils. For instance, in many cities it is likely that there are only two or three days’ supply of food at any given point in time. Few people think about this and take it for granted that all sorts of food will always be available at any time we go to a shop. If the press were to

publish a large front page headline proclaiming ‘Only Two Days of Food Left in City!’ we might just see a panic, but that headline would be basically true on any given day.

There is no commissioner of food distribution who makes sure that food continuously flows into a city at the right place and at the right time. The complex order emerges from the individual actions of millions of people. *Under certain circumstances, order can thus emerge spontaneously and without a single planner*, and understanding when this is the case and when it is not, sets economists apart from others.

Saying that order can emerge spontaneously without someone designing it is not, as we will see, the same as saying that the spontaneously emerged order is good. In some cases, we will identify circumstances when this is the case, circumstances when individual incentives are aligned in such a way as to produce socially desirable outcomes. In other circumstances, however, we will raise serious doubts about the social effects of the spontaneous order of the marketplace and thus suggest non-market institutions that are required for this order to produce socially desirable outcomes. We will identify when individual incentives have to be ‘nudged’ by non-market institutions for the order that emerges spontaneously to be good in some sense.

## 1A.7 Parts A and B Chapter Structure and Flexibility

Each chapter in this book has two distinct yet closely connecting parts. Part A requires no mathematical sophistication, while part B usually generalizes the intuitions and graphical approach from the A parts using basic calculus, plus a few additional multivariable calculus tools that are developed as needed. The text in the B parts frequently references graphs and intuition from the A parts, and indications are given in the A parts as to how the mathematical B parts can help us generalize what we have learned. It is possible to focus solely on the A parts and leave the more mathematical treatment of the material for another time.

A side benefit of this structure lies in providing flexibility in relation to the type of course you are following. It may be that your course requires you to use only the A parts, providing you with a full intuitive treatment of microeconomics while also giving you a platform to explore the mathematical side of economics either on your own or in future modules. If your course is more mathematical, you may focus more on the B parts, but use the A parts as a supporting resource. In other cases, you may use both A and B parts for some topics but not for others where these parts are outlined in a lecture and followed up in more detail in seminars or tutorials. Whatever way you use this book, do not lose sight of the fact that all the material is rooted in the same underlying conceptual framework, a framework that is supported in a variety of ways not only by the material contained in the text but also by the associated digital resources available with this book.

**1A.7.1 Within-Chapter Exercises and the Study Guide** Within-chapter exercises are incorporated throughout the body of the text, and these are intended to get you to confront the concepts immediately rather than simply absorb them through reading. Experiments with students whereby in some years they are provided with the answers to within-chapter exercises so that they can immediately see whether they understand the relevant material, and in other years holding back and not providing the solutions, have yielded dramatic results. When students have access to the solutions to within-chapter exercises as they read the text, their performance on exams is far better. The Study Guide, therefore, has been written around solutions to exercises, giving not just the answer, but also the reasoning behind the answer. The hope is that you will read the chapter and do the exercises along the way. With the solutions available, you can immediately check yourself and focus on those concepts that are most challenging to you.

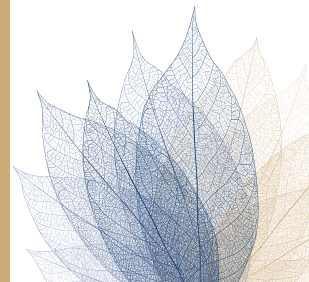
The nature of the within-chapter exercises mirrors the nature of each part of the chapters, with exercises in the A parts focusing on intuitive and graphical developments of concepts, and exercises in the B parts developing the mathematical techniques and linking them to intuitions. Some exercises are *conceptually* more demanding than others, and these are labelled (\*). Others are especially *computationally* demanding, and these are labelled (\*\*). You will find that the material may at first make sense as you read it, but that the exercises are not always as easy as you initially thought. This is because concepts such as those developed in this text can be understood at various levels, and doing these exercises as you read the text leads you to deeper levels of understanding than what you would gain from just reading the explanations within the text.

**1A.7.2 End-of-Chapter Exercises** The end-of-chapter exercises differ from the within-chapter exercises in that they take the material to an even deeper level, asking you to integrate several concepts you have learned and apply them to new settings. The same is true as we combine concepts within economic models. Just as the text is divided into A and B parts, these exercises have A and B parts, with the A parts not dependent on the B parts but the B parts often benefiting from an initially intuitive way of approaching the problem in the A parts. These exercises will also include different types of applications to real-world issues which require more engagement.

The aim of the exercises is to encourage a sufficiently deep understanding of concepts so that we cannot just apply them to examples we have seen, but also see them operating all around us and to new examples that you might be presented with in an assessment. The applications exercises aim to sharpen that conceptual level of understanding and help develop an understanding of microeconomics that is more than just the sum of its parts. To succeed at these questions, you have to be able to overcome the instinct that you should just know the answer as you read the question and develop the confidence that the question contains the ingredients to reason towards an answer. They are meant to be challenging – so don't be intimidated.

The advice to approaching these questions is to work in groups with other students, talking through the questions and helping each other out along the way. Much of the learning happens in this back-and-forth between students rather than just from reading textbooks or listening to lectures.

# PART I



## Utility-Maximizing Choice: Consumers, Workers and Savers

Imagine two people go to local supermarkets in their respective towns. Do you think they will come out with the same amount of milk in their baskets? Probably not—but why not?

If one ended up buying more milk, the obvious explanation is that they like milk more than the other person. We all have different likes and dislikes, and we behave differently in all sorts of ways because of that. Maybe their likes and dislikes are quite similar, and they behaved differently because they faced different *circumstances*. Person 2 might already have a refrigerator full of milk while person 1 has none; person 1 might make more money than person 2 and thus has more to spend on everything, including milk; or perhaps milk is expensive where person 1 lives but cheap where person 2 lives. Differences in their behaviour can thus emerge from two very distinct sources: different tastes and different circumstances.

We spend much of our life making choices—little choices about how much milk to buy and big choices about what career to train for, whom (if anyone) to marry, whether to borrow money to go to university, how much to save for retirement and so on. All these choices have one thing in common: They are shaped by our tastes on the one hand and our circumstances on the other. We try to do what is *best* given what is *possible* for us. What is possible is limited by a lot of factors such as our abilities, our income or wealth and the prices that we face in the marketplace. We call these limitations our *economic circumstances* or *constraints*. It is only once we know what is possible that we can ask *what is best*. The answer to that question will depend on our *tastes* or *preferences*. In terms of mathematical language, we choose by *optimizing subject to our constraints*.

This basic method of choosing applies to many different settings and lies at the core of how economists think about the behaviour we observe. *Consumers* choose the best combination of goods and services given their scarce resources and given the prices they face in shops. *Workers* choose where to work and how much to work given their level of skill and expertise and given the wages that employers pay. *Savers* make choices about how much to consume now and how much to put away for the future given their current and expected future resources and given the rates of return their investments can produce. The choices we make as consumers, workers and savers are different, but the underlying method of choosing the best option given what is possible is conceptually the same. For this reason, we will develop our model of consumer, worker and saver choices simultaneously because it really is the same model. In Chapter 2, we begin by modelling the economic circumstances or constraints faced by consumers.