

3rd Edition

JEFF BORLAND

CASE STUDIES AND APPLICATIONS

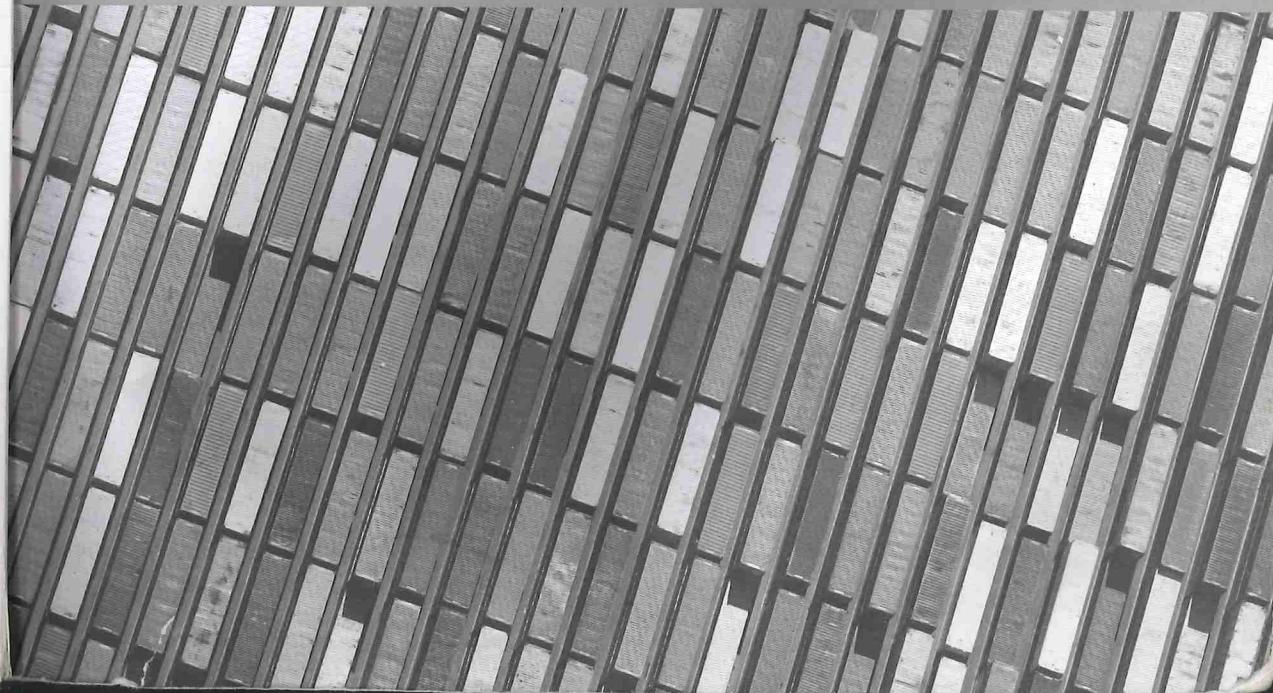
MICROECONOMICS



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Microeconomics: Case studies and applications
3rd Edition
Jeff Borland

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Preface to the third edition

This third edition of *Microeconomics: case studies and applications* is a substantial reworking of the second edition. First, it contains several new case studies which either cover important topics that were not addressed in the first edition of this book, such as long-run market supply (5.7), or which nicely illustrate an economic concept, such as using the demand/supply model to explain changes in the world oil price (2.4). Second, all the case studies have been reviewed and many have been updated with new examples. Third, I have taken the opportunity to introduce many new application-oriented questions into the 'Some questions to think about' sections.

Acknowledgements

First edition

The material in the book has come out of my seven years (so far) of teaching introductory microeconomics at the University of Melbourne. Getting to teach such bright and motivated students, and to work with tutors who are dedicated and clever, provided the inspiration for writing the case studies, and then for keeping on writing them. I can't imagine a more rewarding or enjoyable environment for teaching than that in the Economics and Commerce Faculty at the University of Melbourne.

Throughout my time teaching introductory microeconomics I'm especially grateful for being able to work with Nahid Khan. Her support and advice, and all-round professionalism in the role of tutorial coordinator, have been a huge part of the pleasure of teaching in the subject. I'm also grateful to Nahid for preparing the original drafts of all the diagrams for the book.

I've been fortunate to have had excellent reviewers who gave feedback on earlier versions of the book. Vivienne Groves read the first drafts of every case study. Her ideas for new case studies and for extra examples, her detailed editorial comments and her advice on organising the book went far beyond the feedback I expected to get, and have enabled me to improve the book in many ways. David Johnston, Stephanie Malon and Helen Mitchell also read the whole book at various stages of its preparation. Each of them went to great effort, making comments that have not only saved me from making several errors, but that significantly improved how the cases are written. At an early stage, Leng Lee read several case studies and gave me comments on writing style that were most useful. I'm grateful as well to colleagues who helped me out with specific examples and references: Stephen King, Andrew Leigh, Ian McDonald and Nikos Nikofarikis. Andrew Leigh also kindly supplied data for Figure 1.5.1 in Case study 1.5, while Russell Hillberry supplied the data for Figure 3.0.1.

Cengage Learning has been great to work with on this project. Particular thanks go to Liz Male for her enthusiasm for the project and for being so helpful in guiding the book to publication, to Caroline Hartley for taking up my original suggestion to turn the case material into a book, and to Leanne Poll and Tanya Simmons for their excellent work in editing the book.

Thinking back to my own days as a student, I'm always grateful to my parents, who provided the opportunity for me to study and fostered the love of learning that I hope comes out in the book.

My family, Trish, Tom and Louisa, are constantly encouraging, and their support has made it possible for me to complete a project that has been so time-consuming. An economist probably shouldn't say this, but they are priceless. Thanks guys!

Third edition

I am grateful for the comments and suggestions made by tutors and students in Introductory Microeconomics at the University of Melbourne in the time since the first edition was published. Their feedback has been most valuable in preparing this new edition.

Thanks to Michelle Aarons at Cengage Learning who has been a great supporter of the book, and to Stephanie Heriot, Natalie Orr and Greg Alford for their excellent work in editing this edition.

About the author

Jeff Borland is Truby Williams Professor in the Department of Economics at the University of Melbourne. He has been teaching microeconomics for 25 years. He is a past winner of the University of Melbourne's Ed Brown Teaching Award, and has received a Carrick Citation for Outstanding Contribution to Student Learning.

Introduction

Economics is nothing if it doesn't provide us with practical knowledge. The great value of economics is its relevance to the world around us, its capacity to illuminate how the economy and society work and to assist us in making better decisions. Should you buy a car or keep travelling by public transport? What are the best ways to protect the environment? What pricing strategy should your business use? How should you bid at an auction? All of these questions and many more can be answered using economics. So if you are going to learn economics, you should learn it in a way that will make it most valuable to you, a way that lets you apply it to answer questions just like these.

How can you do this? Well, economists who want to understand the economy and society develop theories which they apply to analyse the situation in which they're

interested. To do the same yourself, to be able to 'think like an economist', you need to understand the main concepts that are used in economics, and you have to be able to apply them. Most textbooks focus on teaching about the concepts. This is sensible, because it's where you need to start. But ultimately, for economics to be useful, you also have to know how to apply the concepts. That's where this book comes in. Its objective is to help you learn how to apply microeconomic concepts. It does this by example. In each case study you'll find a different application of a core concept or theory in microeconomics. The book begins with a case study (1.1) that shows how the concept of opportunity cost can be applied to measure how much it really costs you to go on a plane trip, and finishes with a case study (8.2) that examines the effectiveness of pay-for-performance schemes.

By showing how microeconomic concepts can be applied, each of the case studies will develop your skills in applying the concepts. You'll also find the applications reveal that there are two main reasons why economics can be valuable. First, it helps us to understand why the economy and society are the way they are. Case studies which apply economic concepts to explain movements in the Australian/United States exchange rate (2.5), why airlines sell different classes of tickets (5.10) and why superstars like Beyoncé earn so much (7.2), are a few examples. Second, using economic concepts can improve our decision making, whether in business or public policy. Examples that illustrate where economics can play this role include a description of how firms can reduce their costs and set prices to earn higher profits (5.3, 5.5 and 5.8) and evaluations of policies that governments can use to deal with problems such as road congestion, carbon emissions and promoting an appropriate level of conservation activity (4.2, 4.3 and 4.5).

A big lesson from the book is that you don't need to get a PhD in economics to be able to answer really important questions about the economy and society. As Herb Stein, adviser to several presidents of the United States, has remarked: 'Most of the economics that is usable for advising on public policy is about at the level of the introductory undergraduate course' (quoted in John McMillan, 2003, 'Market design: the policy uses of theory', *American Economic Review Papers and Proceedings*, vol. 93, p. 139). Likewise, all of the case studies and applications in this book are about important questions, and all of them draw exclusively on concepts that can be taught in an introductory microeconomics subject. So study hard to develop your skills in economics, because the pay-off can be huge.

In working through the book, you'll find that the case studies are organised into eight sections that cover different topics in microeconomics. Each section begins with an introduction, an overview about the case studies and how they relate to each other. In each case study there is a range of material to help you learn how to apply economics. The main material is the application of the economic concept. In addition, a 'Theory refresher' provides you with a quick way to revise a key concept or theory that is important for understanding the application in that case study; a set of 'Key lessons'

summarises the main points from the case study; 'Some questions to think about' gives you a way to test your understanding of the core concept and application; and 'Ideas for further reading' are reading suggestions on a topic you may have found particularly interesting.

This book is just one of many that are available today showing how economics can be applied. If, after reading the applications here, you feel you'd like to see more, there are several books I would recommend. Tim Harford's *The Undercover Economist* (2006, Oxford University Press) gives an engaging and insightful introduction to most of the key concepts in microeconomics, and to my mind is the pick of the bunch. Excellent books on markets have been written by John McMillan (*Reinventing the Bazaar*, 2002, W.W. Norton) and John Kay (*The Truth about Markets*, 2003, Allen Lane). In his 2007 book *The Economic Naturalist* (Basic Books), Robert Frank shows how microeconomics can be applied to answer many puzzling questions about the world. Tim Harford (*The Logic of Life*, 2008, Little, Brown and Co.), Steven Levitt and Stephen Dubner (*Freakonomics*, 2005, William Morrow) and Diana Coyle (*The Soulful Science*, 2007, Princeton University Press) all discuss the newest and most exciting research on microeconomics and the people who are doing it. Dan Hamermesh's book *Economics Is Everywhere* (2004, McGraw-Hill Irwin) includes hundreds of vignettes with accompanying questions that illustrate the variety of situations to which microeconomics can be applied. You can also hear about many interesting applications of microeconomics at EconTalk (www.econtalk.com), where Professor Russ Roberts of George Mason University interviews leading economists. Finally, for an Australian perspective on many important topics in microeconomics (and more), there are Andrew Leigh's highly entertaining *The Economics of Just About Everything* (2014, Allen & Unwin), Ross Gittins' books *Gittins' Guide to Economics* (2006, Allen & Unwin) and *Gittinomics* (2007, Allen & Unwin), as well as *Ozonomics* by Andrew Charlton (2007, Random House Australia).

Studying economics should be one of the most exciting and valuable experiences you have at university. I hope you find this book contributes to that experience and that it is helpful for learning about economics and for showing why economics is so relevant and important. If you'd like to share any ideas you have about the case studies and applications in the book, or other ideas about economics, please feel welcome to email me (jib@unimelb.edu.au). Good luck with your studies!

Notes to the lecturer

This book contains 48 case studies and applications of core concepts in microeconomics. It is intended to be used in teaching those core concepts, and to illustrate to students how the concepts can be applied to better understand an aspect of economic activity or to guide decision making in business or government. From my experience, showing applications of the concepts can play two roles in teaching

economics: first, there are some students for whom seeing the application is the best way for them to understand the concept; second, there are others who may have grasped the concept in the abstract but for whom the application is the way of seeing the relevance and importance of the idea. Of course, most textbooks include a number of applications. What distinguishes the applications in this book is their depth, the level of detail that is provided about each application, and the amount of explanation of how the application can be interpreted using the relevant microeconomic concept or theory.

Each case study presents a different application of a core concept or theory. The core concept that is applied in each case study is listed in the book's table of contents. As well as the main text, which presents the application of the core concept, each case study contains a range of extra material. A 'Theory refresher' section provides a quick way for students to revise a key concept or theory that is important for understanding the application in that case study. In most case studies, the theory refresher is on the core concept or theory being applied; the only exceptions come where a core concept has been applied in a previous case study and covered in the theory refresher in that case study. The table of contents lists the theory refresher for each case study. Also appearing in each case study is a set of 'Key lessons' that summarise the main points, 'Some questions to think about' and 'Ideas for further reading'.

The book can be used as a teaching resource in your microeconomics subject in a variety of ways:

- Each case study could provide the basis for a section of a lecture presenting a case study or application of the concept being taught in that lecture, with the relevant case study assigned as reading for the lecture.
- Individual case studies could be the main learning resource in tutorials, with students being assigned the text of the case study as prereading, and the 'Some questions to think about' section providing the basis for class discussion.
- Individual case studies and the theory refresher in each case study could be assigned as a way of revising core concepts taught in lectures.

This book has been written mainly with first-year microeconomics subjects in mind, but I hope that the variety and range of levels of the material will also make it a valuable resource for teaching second- and third-year subjects. There are almost certainly more case studies and applications in the book than could be covered in a single-semester subject. Indeed, the large number of cases is intended to give you flexibility in choosing topics and in how advanced you want the application of a concept to be. If, for example, you're not teaching a topic such as game theory or international trade, then it's easy to omit the cases on these topics. If you are looking for a straightforward application of a concept such as opportunity cost, you could choose Case study 1.1, whereas if you wanted an application of opportunity cost that requires a little more thought on the part of students, Case study 1.2 could be used. To illustrate how you could put together a package of applications to suit a particular subject, the following table gives a couple of suggested lists of case studies that provide basic and more

advanced treatments of core concepts relating to decision making and the theory of perfectly competitive markets.

Table 0.0.1 Examples of case studies you might choose for particular core concepts

CONCEPT	BASIC	ADVANCED
Opportunity cost	1.1	1.2
Marginal benefit/marginal cost	1.3	1.3
Incentives	1.4	1.5
Demand/supply	2.1	2.1
Comparative statics	2.3	2.5
Elasticity	2.4	2.6
Welfare analysis	2.7	2.8
Government regulation and taxation	2.9	2.10
The value of markets	2.11	2.11

One final note of explanation about the book. I think you'll find that, most of the time, the coverage of core concepts is very much like the coverage you would find in any introductory microeconomics textbook. The two exceptions are the sections on 'Theory of the firm and managerial economics' and 'Game theory'. The cases on the theory of the firm introduce a range of concepts – such as the 'make or buy' decision, market power and price discrimination – that are not usually covered (certainly not in detail) in most texts. I've found that by introducing these, along with the concepts – such as costs – that are covered in other textbooks, I'm able to provide students with a more comprehensive, engaging and coherent coverage of what economics can contribute to understanding business and other organisations. The introduction to the section on the theory of the firm describes how I see all this material fitting together. The applications of game theory in this book present the theory in a more formal way than most introductory microeconomics textbooks. I've found that students really take to the logic and intuitiveness of game theory and so have no difficulty covering some quite advanced material on this topic.

I hope you find the book a valuable resource. If you have any comments or ideas, please feel welcome to email me (jib@unimelb.edu.au). Happy teaching!



Scarcity, decision making, incentives and trade: an introduction to key concepts in economics

In the beginning there was scarcity. If economists had a sacred text, these would undoubtedly be the opening words, because it is scarcity that gives meaning to what economists do.

The central theme of economics is to study the decisions that individuals, organisations and societies make about how to use their available resources. These resources include time and skills, the natural environment, and financial and physical capital such as cash and property. There are many more potential uses for our resources than the available supply; or as an economist would say, resources are scarce.

Therefore, we need to make choices about how to allocate our resources between alternative uses. The choices we make about how to use our resources can have significant consequences for our wellbeing.

Take the example of your time. Every week you have a fixed number of hours in which you are trying to do a variety of activities – study, work, play sport, see friends and family, watch TV and, of course, sleep. You need to make choices about how to allocate your time between these activities, and this means trade-offs: one more hour working in your part-time job may mean one less hour to spend doing your economics assignment. Because time is scarce, you can't do everything you might like to do. At the same time, how you choose to spend your time is likely to affect your wellbeing. You earn an extra hour's wages from working for longer, but it may also mean a lower mark

in that economics subject at the end of the semester. Of course, one extra mark or one hour's wages may not affect you too much. But suppose you choose to work for one more hour each week over the whole year. Now you would be giving up 40 hours, or essentially a whole week, that could have been spent studying. Or think of other decisions about how to use your time, such as whether to study for another degree, or what job you are going to take. These are choices that will have much bigger consequences for your wellbeing.

Saying that we need to choose how to use our available resources raises an important question: How should we make these choices? The core assumption of economics is that decision makers use what is known as the benefit–cost principle to make choices. Decision makers compare the benefits and costs of taking an action, and will only choose to take the action if it makes them better off. In a situation where there are alternative actions, decision makers choose the action that, again on a comparison of benefits and costs, makes them best off.

The benefits of an action can be of many kinds. The benefit gained from spending time reading a novel or going to a concert may be the sense of enjoyment or relaxation you obtain. Your regular hour at the gym gives you the benefit of staying fit and healthy, and eating provides nourishment. These examples all suggest different types of benefit for a decision maker, but they have in common the idea of some satisfaction or positive value derived from the activity.

Costs are measured by economists in a particular way, using a concept called opportunity cost. The opportunity cost of an action is the resources used in taking that action valued in their next best alternative use. Case study 1.1 will introduce you to a variety of applications of opportunity cost that illustrate how it is calculated and how it differs from other notions of cost. Case study 1.2 demonstrates how using the concept of opportunity cost can help us to make better decisions about the economic activities in which society should engage. To make this point, we'll consider the example of the value of production by the agricultural sector in the United States. Opportunity cost implies that, in measuring productivity in agriculture, we need to include the environmental damage caused by pesticide use as part of the cost of resources used in agriculture. Adopting this approach, the case study shows there is a substantial impact on the estimated net value of agricultural production in the United States.

A decision maker who applies the benefit–cost principle will only take an action if the addition to benefits from that action is at least as great as the addition to opportunity costs. By using the approach known as marginal analysis – comparing the marginal addition to benefits and marginal addition to opportunity costs from an action – decision makers can be assured of always choosing actions that will make them as well-off as possible. In Case study 1.3, we apply marginal analysis, the rule of comparing the extra benefits and extra costs associated with taking an action, to show how a student completing high school can decide whether it is optimal to go to university. You'll be happy to know that, for an average student, the benefits of a university degree exceed the costs by a quite considerable amount.

So a decision maker who wants to make the best choice of action will compare the benefits and costs of alternative actions. This means that when the benefits or costs associated with those alternative actions change, the decision maker's optimal choice of action may also change. Higher benefits raise the likelihood that an action will be chosen, while higher costs make it less likely. This is called responding to incentives. The concept of incentives is central to the way that economists seek to understand human behaviour. Using just this one idea – that rational decision makers will want to change their choice of action when there are changes to the benefits and costs of the actions available to them – makes it possible to explain a vast amount of the behaviour and events we see happening around us every day.

Case study 1.4 provides several examples to illustrate decision makers responding to incentives. You'll see how incentives operate in many facets of our lives: in our decisions about how many hours to spend and how much effort to exert working in our jobs, and in decisions we make about how to spend our money. Case study 1.5 introduces another example of how incentives have affected behaviour – one that may surprise you. Using recent changes to government policies in Australia, it shows that even the dates on which births and deaths occur can on occasion be affected by financial incentives.

A common type of decision that individuals and organisations in a modern economy need to make is about being involved in trade. Rational buyers and sellers will only agree to trade when this makes them better off, and hence trade that occurs in an economy must be mutually beneficial. It follows that creating extra opportunities for voluntary trade between buyers and sellers will always improve wellbeing in society. Case study 1.6 illustrates this important idea through the example of facilitating kidney exchanges. In countries such as Australia and the United States, many more people need kidney transplants than there are kidneys currently available. Legal restrictions on trade in human organs mean that this shortage cannot be resolved by those needing donations being willing to pay higher prices. Instead, we will see in this case study how introducing the scope for 'trade' in kidneys – essentially between different kidney donors – can expand the number of kidney transplants that can be made and thus go some way to improving this situation.

Much of economics takes it as implicit that decision makers are rational – that they make choices that are consistent with making themselves better off. This is an idea that you may find hard to accept, and you are right to adopt a critical perspective when you see such an important assumption being made. To give you an opportunity to think about this issue in a little more detail, Case study 1.7 asks the question: Are decision makers really rational? By examining two important aspects of rationality – that decision makers should ignore sunk costs and that they can perfectly anticipate the future consequences of actions they take – we find that the answer is mixed. In some (perhaps many) regards, decision makers do appear to act rationally in their decision making. But rationality is not complete, and we are certainly able to find examples of decision making that depart from this principle.

CASE STUDY 1.1

WHAT DID THAT REALLY COST YOU?

How much did it cost you to buy your laptop? What about that new car you just purchased, or the holiday you have booked? Maybe you are thinking of answering these questions by quoting the price you paid to purchase each item. For an economist, this price is certainly a big part of the cost you will have paid. But it is not the only part. Economists argue that the right way to measure cost is using a concept known as opportunity cost; in this case, the value of all the resources you used in buying these items. Think again about the example of the laptop. Probably you spent several hours researching which model would suit you and where you could get the best price. The principle of opportunity cost says that you should include the value of that time you have spent doing research as part of the cost of buying the laptop.

THEORY REFRESHER

What is opportunity cost?

Economists measure costs using a concept called opportunity cost. The opportunity cost of an action is the resources used in taking that action valued in their next best alternative use. The opportunity cost of an action can be calculated in two steps: first, by making a list of all the resources that are used when that action is taken and hence that will not be available in the future for alternative use; and second, by estimating the value of each of those resources in their next best alternative use.

As an example, suppose I am running my own business. An important resource used in this activity is my time. The next best use of my time if I was not running my business might be working for another firm, and in this job I think I would earn \$100 000 per year. Therefore, the cost of my time spent running the business is \$100 000 per year. This amount of forgone earnings becomes part of the opportunity cost of operating my business.

The concept of opportunity cost differs from other notions of cost, such as accounting cost. For example, measures of the accounting cost of operating my business would usually not incorporate the cost of my time spent running the business.

An important aspect of the definition of opportunity cost is to understand that it excludes what are known as sunk costs. Sunk costs are costs incurred prior to

the time at which a decision is being made about whether to take some action. Continuing with the example of operating a business, suppose that I have previously bought a piece of specialist machinery for \$50 000 that would be worthless if I did not operate my business. This piece of machinery is a sunk cost and should not be included as part of the opportunity cost of operating my business. This is because the cost is already paid for, and nothing about this cost changes depending on whether I continue or cease operating my business today.

It is the problem of scarcity that explains why economists think opportunity cost is the appropriate measure of cost. Scarcity of resources implies that the real cost of an action to society is the resources that are used when that action is taken (and hence not available for alternative use). Therefore, to properly account for the costs of the action, all resources that are used need to be incorporated into the measure of cost.

In addition to searching for the best product and the best price, even when you know what you want to buy you may need to travel to a store to make the purchase. Of course, businesses are also aware of these costs. And in many markets, trying to reduce your time costs of shopping is an important way in which those businesses are competing to persuade you to buy from them.

A development company building student housing near the University of Wollongong had exactly this idea in mind when it integrated into the development a 'veritable fast food heaven' including stores such as Red Rooster, KFC and Pizza Hut. As a director of the company explained, 'Students want convenience and they want to live cheaply'. By including fast-food outlets in the apartment building, students' time costs of shopping are reduced, and hence demand by students to live in those apartments is increased. Using the same idea, the developer has incorporated 'other add-ons for time-poor students [that] include private internet lines in each bedroom ... in-house movies on demand ... two 20-metre lap pools and a tennis court' (Chandler 2002).

Even in France, long known for its emphasis on fine dining, the same force is at work. Worker demand for takeaway sandwiches in business districts has leapt in recent years, while local brasseries offering the traditional sit-down lunch have experienced a fall in customers. A major reason for this shift in demand is the lower opportunity costs of time spent buying and eating a sandwich. *The Economist* (2009) made this comment about the shift: 'It leaves them [workers buying lunch] time to do other things, like going shopping during their lunch hour'.

Offering the option to buy on the internet is another way in which businesses are trying to reduce your costs of shopping. Fifteen years ago, if you wanted to purchase a

plane ticket you would have had to visit a travel agent to investigate the available flight times and to buy the ticket. But today, due to internet sales, the period between deciding you want to take a plane trip and acquiring your ticket may be as short as five minutes. And it's not just air travel that can be bought on the internet – books, concert tickets, your groceries, cars and even houses are available online now. Businesses selling online are trying to attract you as a customer by reducing the amount of time you need to spend shopping and thus the cost of buying from them – see, for example, *The Economist* (2006a, 2006b) and United Kingdom Office of Fair Trading (2007). (Businesses also have other reasons for selling on the internet. By eliminating the need for retail outlets, their costs are reduced. Selling on the internet can also expand the market that is accessible to the business.)

There are many products for which it is reasonable to consider the costs of shopping for the product as being negligible. When you want to buy milk, bread or beer, you will know exactly what you want to buy, and for most of us it will only be a short trip to a store to buy that item. But the time costs associated with buying other products may be a substantial component of opportunity cost. At the University of Melbourne, the Commerce Student Society Ball is a very popular event. In fact, it's so popular that, as a newspaper article reported, 'students begin to queue the night before in order to snaffle a ticket' (Roginski 2006). Tickets to this event are not cheap, but even so, having to queue for at least 12 hours to get a ticket (not to mention sleeping outside) means that the costs of actually getting to buy a ticket represent a substantial portion of the opportunity cost for many students.

Another time cost associated with buying a product may be the time it takes to consume or use the product. When you make a plane trip, you will spend time flying from the departure point to your destination. There is also the time spent getting to and from airports as well as the time spent checking in and perhaps clearing customs that need to be taken into account. Think about the increased amount of time that must be spent in security screening prior to taking an air flight in many countries as a result of the terrorist attacks of 11 September 2001. A longer total amount of time taken to make a flight increases the opportunity cost of flying, and hence would be predicted to reduce demand for air travel and increase demand for other types of travel. Consistent with this argument, a jump of over 25 per cent in passengers on Eurostar trains between Britain and continental Europe was observed after tighter security was introduced to airports in the United Kingdom (*The Economist* 2006c).

For some products, it may be quite tough to estimate the value of the time we spend on activities such as shopping and consuming the products. In other situations, however, the cost of time can be very explicit. An example is the costs of smoking for Tasmanian Government workers. Concerned about the high numbers of workers leaving their offices to smoke in outside areas, in 2002 the government introduced a policy specifying that workers would have to clock in and out for smoking breaks (Allen 2002). Workers thinking about having an extra cigarette therefore need to include

in the opportunity cost of smoking the cost of forgone wages for time missing from work.

'Time is money' goes the old saying. Certainly this is correct when we want to calculate opportunity cost. When we spend time shopping for and consuming products, we are using a valuable resource. Hence, we need to include the cost of this time as part of our measure of the opportunity cost of buying that product.

KEY LESSONS

- Economists measure costs using a concept called opportunity cost. The opportunity cost of an action is the resources used when that action is taken valued in their next best alternative use.
- The monetary price you pay for a product is an important part of its opportunity cost. But since time is a scarce resource, the costs of time used in shopping for and consuming a product are also part of its opportunity cost. Examples are when we need to take time to compare potential suppliers to find the best price for a product, when we need to spend time queuing to buy a product, or when it takes time to consume or use a product.

SOME QUESTIONS TO THINK ABOUT

- 1 Make a list of all the resources that you would use taking a plane trip. How would you value each of these resources in their next best alternative uses?
- 2 Suppose you are trying to decide whether to accept a job offer to work in France. Would you include the cost of the French language lessons you have been taking over the past year as part of the opportunity cost of taking the job? What about the costs of having to pay out the remaining six months of the rental on your apartment in Melbourne in order to be let out of the lease?
- 3 In 2013 the Federal Government in Australia announced that companies with annual turnover of more than \$1 billion would shift to paying their taxes on a quarterly basis to a monthly basis (Yeates 2012).

Consider the following statement: 'The government's new tax payment plan does not change the total amount of tax big companies pay, just the timing. So the opportunity cost of paying tax is not affected by the new policy'. Do you agree with this statement? Explain your answer.

- 4 Sally Stockbroker has to decide whether to return to university to study for a Master of Business Administration (MBA). The MBA will take three years to complete. Sally knows that the information relevant to calculating opportunity cost is that: (a) MBA fees will cost \$20 000 per year; (b) her salary as a stockbroker in every future year of her working life would be \$80 000 per year if

Sally does not do an MBA; (c) during her time studying, Sally can work as a tutor at the university and earn \$10 000 per year; and (d) other costs of studying such as textbooks that Sally would not otherwise incur amount to \$5000 per year.

At present, Sally has not incurred any of these costs. What is the opportunity cost for Sally of doing an MBA?

- 5 An article in *The Age* described how Qantas had shelved a project to update its IT system for frequent flyers (O'Sullivan 2013). Qantas had already spent \$20 million on the project and its completion was forecast to cost another \$40 million.

What is the opportunity cost to Qantas of completing the IT project? What does this imply about Qantas's beliefs regarding the benefits it would obtain from completing the project?

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IDEAS FOR FURTHER READING

Introductory textbooks on microeconomics are useful for learning more about opportunity cost. Good places to start include chapter 1 of Joshua Gans, Stephen King and N. Greg Mankiw's *Principles of Microeconomics* (2015, 6th edn, Cengage Learning), chapter 2 of Michael Swann and William McEachern's *Microeconomics: a Contemporary Introduction* (2007, 3rd edn, Cengage Learning) and chapter 1 of Joshua Gans' *Core Economics for Managers* (2006, Cengage Learning).

CASE STUDY 1.2

OPPORTUNITY COST AND PRODUCTIVITY IN AGRICULTURE

Greenhouse gas emissions, the depletion of water reserves and the logging of rainforests are examples of environmental damage that can be caused by economic activities such as industry and farming. Dealing effectively with these types of environmental damage is essential for ensuring the continued survival of humankind.

Economists can assist in this task by helping society to make better choices when it comes to the economic activities in which it engages. Economists can do this by developing measures of the costs and benefits of those activities that incorporate their effects on the environment.

THEORY REFRESHER

What is productivity?

Economic models of production represent a process whereby a set of inputs are combined to produce output of a good or service. This production process can vary enormously for different industries, or even for different firms producing the same product. Economists measure the *productivity* of a firm or industry, or an economy, as the value of output of goods and services produced divided by the value of inputs used to produce that output. Measuring productivity is a useful tool that allows economists to assess whether the best use is being made of our scarce resources. A higher level of productivity means we are getting more output from our available resources, which is a better outcome from society's point of view.

The measurement of productivity nicely illustrates how economists can advise decision makers. It's often necessary to judge the value to society of alternative production activities. A common approach is to compare the levels of productivity in those activities. Productivity in each activity is usually measured by thinking of the inputs in production as labour that is supplied by workers, physical and financial capital such as the rental costs of machines and factories used, and intermediate inputs that will be used to make the final output. There are also, however, other resources that may be used in production that might not immediately come to mind. An example is where the production process causes damage to the environment. Suppose as a by-product of production that a resource such as a river or land area is no longer available for use, or

the quality of that resource is lowered. This environmental damage then constitutes a resource cost; that is, some resources are no longer available for use or are of lower quality because of the production activity. This is as much a cost to society as the cost of workers' time or using the owners' capital to operate the business.

Step back for a minute from what we have just said. If you think about it, you will see that in arguing for an 'environmentally sensitive' measure of productivity, we are really saying that we need a measure of productivity that is based on the concept of opportunity cost. A measure of productivity that incorporates a complete list of the resources used in production, such as changes to the natural environment, is a measure that incorporates the opportunity cost of production.

How much of a difference does it make to measures of productivity if we incorporate the costs of environmental damage caused by a production activity? A study of productivity in the agricultural sector in the United States between 1960 and 1996 was able to answer this question. A conventional measure of productivity was estimated that divided the value of output by the cost of inputs, including as inputs only capital, labour and flows of services from intermediate goods. This was compared with an alternative, environmentally sensitive measure of productivity. That measure included the cost to human health and aquatic life stemming from run-off and the leaching of pesticides used in agriculture, in addition to the same inputs as the conventional measure.

Figure 1.2.1 shows the evolution of both measures of productivity in US agriculture between 1960 and 1996. Both measures have been converted from their actual values

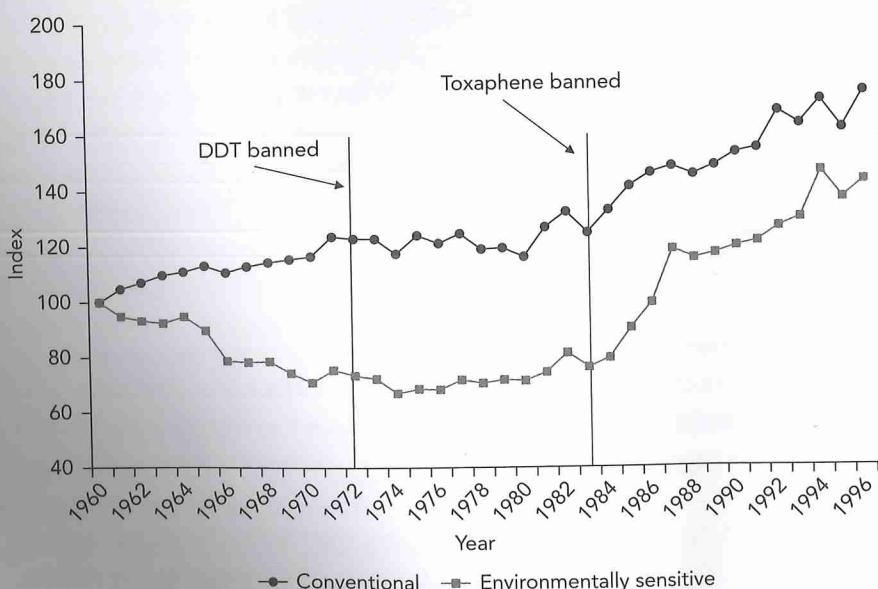


Figure 1.2.1 Indices of productivity, US crops and livestock, 1960 to 1996

Source: compiled from Ball et al. (2004), Table 2.

to equal 100 in 1960 so that it is easy to assess whether productivity rose or fell, and to compare the alternative measures. A movement in a series from, for example, 100 to 105 would mean that productivity had increased by 5 per cent. Generally, societies want to increase the productivity of economic activities over time. It is this growth in productivity – getting more output from a given amount of resources – that allows improvements in our material wellbeing.

Taking account of the environmental costs of the use of pesticides has a significant effect on conclusions about the value of agricultural activity in the United States.

Whereas the conventional measure shows average productivity growth of 1.5 per cent per annum between 1960 and 1996, the environmentally sensitive measure shows average growth of only about 1 per cent per annum. Hence, the environmental costs of pesticide use reduced the increase in productivity in agriculture in the United States that would otherwise have occurred by about one-third, a quite substantial magnitude.

It is also interesting to look at specific time periods in the study. Between 1960 and 1972, the conventional measure of productivity increased, but the environmentally sensitive measure fell by over 25 per cent. This implies that during this period, the amount of damage caused to the environment by pesticide use in agriculture was increasing very rapidly. In 1972, the US Government banned the pesticide DDT (dichlorodiphenyltrichloroethane). Afterwards, for the period to 1983, it can be seen that the conventional and environmentally sensitive productivity measures follow similar paths. This suggests that banning DDT stabilised the amount of environmental damage from pesticide use. Then, in 1983, the insecticide toxaphene was banned. From this time onwards, the environmentally sensitive measure of productivity increases more rapidly than the conventional measure, showing that environmental damage associated with pesticide use was falling. Hence, the actions of the US Government in banning DDT and toxaphene appear to have significantly improved productivity in agriculture measured in terms of the true resource costs of that activity. Notwithstanding this improvement, the gap that still existed between the alternative productivity measures in 1996 implies that the environmental cost from pesticide use remained higher in 1996 than it had been in 1960.

Analysis of productivity in US agriculture has revealed how incorporating the opportunity cost of production into the measurement of productivity can provide a powerful demonstration of the costs of environmental damage. Equally important, having such measures provides a rigorous basis for society to identify production activities that it can engage in to maximise the wellbeing of both current and future generations. Economists have a vital role to play in developing and applying these types of measures, and also in explaining and advocating why costs should always mean opportunity costs.

KEY LESSONS

- Productivity, the amount of output produced from available inputs, is a measure of the efficiency of resource use in an economy. An economist would argue that the appropriate way to measure productivity is to include as inputs all resources that are unavailable for alternative uses after production; that is, to incorporate the opportunity cost of production as the measure of inputs used.
- Using a measure of productivity that incorporates the opportunity cost of production, such as environmental damage, can offer a very different perspective compared with conventional measures. This is evident from calculating a measure of productivity in US agriculture that takes account of the resource cost of pesticide use.

SOME QUESTIONS TO THINK ABOUT

- 1 Can you think of other examples of economic activities that cause environmental damage where the value of that damage would need to be incorporated into the value of inputs used in production in order to construct a 'true' measure of the productivity of that activity?
- 2 Simon and Erica give up their jobs in the Economics Department to set up their own consulting firm. To set up the business, they must buy an office for \$50 000. Should they choose to cease operating their business at some future date, they know they will be able to sell the office for \$40 000. If they had not bought the office, they would have invested the money they spent on the office and earned an annual rate of interest of 10 per cent. They also need to hire a research assistant at a salary of \$50 000 per annum. In their first year of business, Simon and Erica expect to earn revenue of \$200 000. What is the total opportunity cost to Simon and Erica of setting up their consulting firm for one year?
- 3 A recent analysis of train level crossings in Melbourne found that they caused significant delays for motorists at peak time (Gordon 2015). For example, the crossing at Koornang Road in Carnegie was found to be closed for up to 87 minutes between 7 a.m. and 9 a.m.; and the crossing at Centre Road in Clayton for 82 minutes. How would you calculate the opportunity cost of time spent by motorists at the level crossings? How would you evaluate whether the Victorian Government is spending its funds wisely by committing \$299 million to eliminate four of the level crossings?

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IDEAS FOR FURTHER READING

A good introduction to the concept of productivity is provided by Robin Stonecash, Joshua Gans, Stephen King and N. Gregory Mankiw's *Principles of Macroeconomics* (2015, 6th edn, Cengage Learning, pp. 163–71). A slightly more technical introduction is provided in a 1998 paper by Mark Rogers titled *The Definition and Measurement of Productivity* (Melbourne Institute of Applied Economic and Social Research, working paper no. 9/98, http://melbourneinstitute.com/downloads/working_paper_series/wp1998n09.pdf, viewed 4 June 2012). An overview of developing environmentally sensitive measures of national output is provided in a 1996 paper by Kirk Hamilton and Ernst Lutz titled *Green National Accounts: Policy Uses and Empirical Experience* (World Bank, Environment Department, working paper no. 39, <http://documents.worldbank.org/curated/en/1996/07/441053/green-national-accounts-policy-uses-empirical-experience>, viewed 4 June 2012).

CASE STUDY 1.3

THE BENEFITS AND COSTS OF A UNIVERSITY DEGREE

Is it a good idea to be at university? Perhaps you have asked this question as you dragged yourself out of bed for a 9 a.m. lecture, or as you begin to battle through your first set of assignments and tests. While not denying that it can be painful to have to wake up too early, there is an even more fundamental way in which you might have thought about this question. You are going to spend several years of your life and probably a large amount of money acquiring a university degree (or perhaps degrees). Over that same time, you could have a full-time job, or use the funds you are spending to go to university in many other valuable ways. So how can you be sure that you are doing the right thing?

The decision about whether to attend university is really just another decision like those we make every day throughout our lives. There are benefits and costs to compare in order to make the best choice. Where the comparison reveals that the benefits of attending university exceed the costs, then the optimal decision is to go to university. But where costs are greater than the benefits, not attending will be optimal.

THEORY REFRESHER

Making an optimal decision

Every individual and every organisation in society has objectives that they would like to achieve. Therefore, they need to be sure that they are making decisions about how to use the resources available to them in a way that is optimal, that best contributes to achieving those objectives. This can be done by making choices using the benefit-cost principle; that is, based on a comparison of the benefits and costs of different uses of the resources.

The optimal choice of action for a decision maker will maximise the benefits they receive minus opportunity cost. This optimal choice can be determined using what is known as marginal analysis. Marginal analysis involves comparing the addition to benefits and the addition to opportunity costs of an action. These are often referred to respectively as the 'marginal benefit' and the 'marginal cost' of that action. The 'golden' rule for optimal decision making is that a decision maker should only take an action if the addition to benefits (marginal benefit) from that action is at least as great as the addition to costs (marginal cost).

Any decision can be made using this approach. One example is a 'yes/no' type of decision such as whether a mining firm should develop a new mine, whether a government should build a new bridge, or whether you should go to university. In these cases, marginal benefit is simply the benefit of doing the activity, and marginal cost is the opportunity cost of doing the activity.

A comparison of marginal benefit and marginal cost reveals whether it is optimal to take the action. A different example is decisions about the optimal level of an activity, such as the number of workers a firm should hire, or the amount of money you should invest in the shares of a particular company. For these decisions there is effectively a choice between many possible actions or levels of an activity. Marginal benefit and marginal cost now need to be calculated for each possible action; for example, the marginal benefit and marginal cost of hiring a first worker, a second worker, a third worker and so on. The optimal decision will be to choose to do an extra unit of an activity (such as hiring an extra worker) so long as marginal benefit from the extra unit is at least as great as marginal cost, but to choose not to do an extra unit of an activity when marginal cost is greater than marginal benefit.

A range of benefits and costs are associated with the decision to undertake a university degree. A primary source of these benefits and costs relates to labour market activity. During the period of study, you are likely to have to forgo earnings from being in the workforce. You may be able to work part-time, but not full-time as you would if you were not studying. This can be thought of as an opportunity cost of your time spent at university. Other monetary costs and benefits of attending university are more direct – the fees paid to undertake the degree and the monetary costs of student amenities fees, textbooks, transport and possibly housing, all of which may be offset to some degree by receiving a government student allowance. Following the period of study your extra qualification should mean that you will have higher earnings than otherwise, and it may also mean there is a higher likelihood of remaining employed throughout your life. In addition, there may also be non-monetary benefits of attending university, such as the enjoyment you get from studying and learning more about subject areas that interest you, or from making new friends. The benefits and costs of attending university are summarised in *Table 1.3.1*.

Having identified the main benefits and costs of attending university, it's now possible to apply the benefit-cost principle to work out whether attending university is optimal. Marginal benefit can be estimated as the total monetary benefits stemming from attending university, and marginal cost as the total monetary costs. There are quite a few studies that have done this exercise in relation to Australia, and all reach fairly similar conclusions.

Table 1.3.1 Benefits and costs of acquiring a university degree for a high school graduate

BENEFITS	COSTS
Increase in after-tax earnings from labour market activity	Forgone earnings from labour market activity during period of education
Higher probability of employment	Fees
Non-monetary benefits – intrinsic value of gain in knowledge, social activities and networks	Direct costs minus government student benefits

One study (Daly et al. 2011) examined the costs and benefits of undertaking a bachelor's degree for a student who was aged 18 years at the commencement of study. The length of degree (time spent studying) was assumed to be between three and five years, depending on the field of study. The forgone earnings during the period of university study were estimated as the average earnings of a high school graduate who did not attend university. The earnings gain after acquiring a university degree was estimated as the average earnings of university graduates at each age from 21 to 64 years minus average earnings for high school graduates over the same time period. It was assumed in the study that the university student was in a Commonwealth-supported (or government-funded) place, and that the required Higher Education Contribution Scheme (HECS) payments were made up-front.

The study's main finding was that, on average, students who are attending university have made the correct decision. Acquiring a bachelor's degree was found to add an average net amount to a graduate's lifetime earnings of about \$185 000 for females and \$340 000 for males (valued in 2015 dollars). This amounts to a gain of between \$4350 and \$8000 per annum for every year until retirement. Thinking in investment terms, the net gain can be interpreted as a rate of return on the initial investment of 12 per cent per annum for females and 15 per cent for males for every year spent working. It makes a university degree a very profitable investment indeed.

There are other things that can be said about the gains from acquiring a university degree. First, the gains from a university degree appear to vary quite widely by field of study and level of qualification. Estimated returns are relatively high for business and administration (good news if you are reading this case study while doing a business or commerce degree) and engineering, but lower for graduates in the fields of society and culture, and science. Second, HECS does appear to make quite a difference to the size of the gains from attending university. One study (Borland 2002), for example, found that removing HECS payments would increase the rate of return to an average student by about 30 per cent, and switching from up-front to deferred HECS payments increases the return to a university degree by about 15 per cent. Third, delaying the

completion of a degree can have a large negative effect on the gains from attending university. So the lesson is to study hard and pass all your subjects!

Thinking about whether to attend university is just one example of the many types of decisions that can (and an economist would argue should) be analysed using the benefit-cost principle. Whether to take a part-time job, what type of computer to buy, when to buy your first car – in every situation, the thing to remember is that making an optimal decision comes down to knowing your objectives and then doing your best to make a comparison of marginal benefit and marginal cost.

KEY LESSONS

- The 'golden' rule for optimal decision making is that a decision maker should only take an action if the addition to benefits (marginal benefit) from that action is at least as great as the addition to opportunity costs (marginal cost).
- An example of a decision to which this approach can be applied is whether a high school graduate should attend university to acquire a bachelor's degree.
- Analysis of the monetary costs and benefits of acquiring a bachelor's degree in Australia suggests that, on average, students are making the correct choice – benefits significantly outweigh costs. For example, there was an estimated gain of between \$4350 and \$8000 per annum in lifetime earnings for students commencing a bachelor's degree in 2006.

SOME QUESTIONS TO THINK ABOUT

- 1 You own an ice-cream stall at Sandy Beach. You can sell each ice-cream for \$2. With extra opening hours for your stall, you believe that you can increase your sales as shown in the table below. For each hour the stall is open, the opportunity cost of your time is \$15. For how many hours should you open your stall?

HOURS OF OPENING	TOTAL SALES OF ICE-CREAMS
0	0
1	20
2	35
3	45
4	50
5	50

- 2 Suppose you own a small funds-management company. You are trying to decide whether to hire an extra employee. How should you make this decision? What factors should you take into account?
- 3 An article in *The Economist* (2013) described how between 2010 and 2011 the cost of thefts of farm animals in Britain increased by 170 per cent. A major example cited is lambs. The price of lambs has risen in recent years compared to other commonly stolen items, such as DVD players. Modern farming makes sheep stealing fairly easy as they are often grazed in isolated fields far from the farmer's homestead. At the same time other rural thefts have declined. Thieves used to steal tractors to sell in Eastern Europe, but security on tractors has improved. Starting keys are now individualised to each tractor and engine immobilisers have been added.

Use the concepts of marginal benefit and marginal cost to explain:

- a Why thefts of lambs have increased
- b Why thefts of farm equipment have declined
- c Why August is the peak month for stealing lambs

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IDEAS FOR FURTHER READING

In addition to the studies by Anne Daly and co-authors, and by Jeff Borland, other recent studies of the benefits and costs of university education in Australia have been undertaken by Andrew Norton (2012, *Graduate Winners: Assessing the Public and Private Benefits of Higher Education*, www.grattan.edu/report/graduate-winners-assessing-the-public-and-private-benefits-of-higher-education.pdf, viewed 8 May 2015), Andrew Leigh (2008, 'Returns to education in Australia', *Economic Papers*, vol. 27, pp. 233–49) and Hui Wei (2010, *Measuring Economic Returns to Post-school Education in Australia: Evidence from the 1981–2006 Censuses*, Australian Bureau of Statistics,

research paper, cat. no. 1351.0.55.032). Another study by Anne Daly and Phil Lewis (2010, 'The private rate of return to an economics degree: an update', *Economic Papers*, vol. 29, pp. 353–64) looked specifically at the returns for economics degrees. A review of earlier studies of the gains from acquiring a university degree appears in Jeff Borland, Peter Dawkins, David Johnson and Ross Williams' 'Returns to investment in higher education' (2002, *Melbourne Economics of Higher Education Research Program Report No. 1*, Melbourne Institute of Applied Economic and Social Research).

CASE STUDY 1.4

HOW INCENTIVES MAKE THE WORLD GO ROUND

A famous saying from philosophy goes: 'I think. Therefore I am'. Perhaps the equivalent statement in economics might be: 'I act. Therefore I respond to incentives'. This statement captures two fundamental ideas. First, economics is all about the actions we choose, the way we decide to use the scarce resources that are available to us. Second, the economic model of decision making suggests that in choosing our actions we are likely to be responding to incentives, the balance of benefits and costs that different choices will provide.

THEORY REFRESHER

What are incentives?

A rational decision maker will choose whether to take an action, or the optimal level of an action, by taking into account the benefits and costs of the action. Specifically, the rule for optimal decision making is to do an activity or an extra unit of an activity where the marginal benefit is at least as great as the marginal cost, but to not do an activity where the marginal benefit is less than the marginal cost. Changes to the benefit or cost of doing an activity that affect the marginal benefit or marginal cost therefore may change the choice of action made by a decision maker. This is what is known as responding to incentives.

Situations in which decision makers respond to incentives are ubiquitous. In this case study we'll look at several examples that typically confront each of us as decision makers: the choice of how many hours we should work, the amount of effort we decide to exert in our jobs and what we spend our money on.

Governments like us to be out working. When we are not in the paid workforce, we are not contributing to the national output and, as well, it's likely we are receiving government benefits. Unsurprisingly, governments therefore prefer their workforce-age population to be working. In recent years, an important way in which governments have been seeking to induce us into work is by using financial incentives.

A major example of using financial incentives to promote work was the implementation of an Earned Income Tax Credit (EITC) in the United States in the 1980s. The EITC provides a credit against tax obligations to workers in low-income families. By introducing a tax credit that is only available for workers, the EITC raises the benefits of

being in the paid workforce relative to the costs of working, and hence increases the incentives to seek paid employment for those eligible for the tax credit.

Did the introduction of this greater incentive to work create more workers? The answer seems to be yes. One major study examined how the labour force participation rate of a group in the population who were eligible for the EITC, single women with children, increased on average by about three percentage points in comparison to a group that was not eligible to receive the EITC, single women without children (Eissa & Liebman 1996). For some groups, such as single women with children who had not completed high school, the effect on labour force participation was even greater, with the EITC being associated with an increase of six percentage points. These statistics suggest that the financial incentives provided by the EITC had a very strong effect on decisions to enter the workforce by those eligible for the tax credit.

Once we are at work, our employers like us to work hard. And, you guessed it, they want to give us incentives to put our 'hearts and souls' into our jobs. One way they can do this is by structuring our wages so that we get paid more when we work harder or more effectively. This is generally easy to do when the output of individual workers can be measured. This information makes it possible to pay workers on a piece-rate basis; that is, per unit of output produced. A variety of studies have shown that paying workers by piece rate can increase output per worker by up to 35 per cent compared with, for example, paying on the basis of the total hours worked (Lawler 1990, pp. 57–8).

An example of the power of piece rates comes from an analysis of the Safelite Glass Corporation, an installer of car windshields which in the mid-1990s switched from paying its workers an hourly wage to paying them on the basis of the number of windshields installed. Making this change was found to have increased output per worker by about 30 per cent, while payments to each worker increased by less than 10 per cent. Two-thirds of this improvement in output per worker came from greater output from the existing workforce, while the other third came from hiring more productive workers who were motivated to join the firm by the opportunity to be paid on a piece-rate basis (Lazear 1996).

Paying higher amounts per unit of output will provide stronger incentives to produce more output. Of course, the effect of paying according to the amount of output will depend on how much is paid for each unit of output produced. We can illustrate this using the example of tree planters in British Columbia in Canada. These workers are hired to plant new trees to reforest areas that have been harvested for timber, and payment for this task is by piece rate. In a study of how the quantity of trees planted in a day varies with the size of the piece rate, it was found that tree planters who are paid more per tree will plant more trees in a day. Moreover, the magnitude of the incentive effect is quite large. Increasing the piece rate per tree by 1 cent above 25 cents (in Canadian currency) is estimated to have increased the number of trees planted in a day by between 20 and 65, compared with an average number of trees planted per day of about 800 (Paarsch & Shearer 1999).

For those for whom sport is work, incentives also seem to matter. The Ukrainian world champion pole vaulter Sergei Bubka was at one stage in his career offered US\$30 000 for each time he could break the world outdoor or indoor record. It had been estimated that Bubka might be able to break either record by about 10 centimetres in a single attempt. In fact, he ended up breaking the world records on most occasions by just 1 centimetre – setting 17 new outdoor and 18 new indoor world records over his career (see Macho-Stadler & Perez-Castrillo 2001, p. 79). Perhaps the prize that Bubka was offered in part explains why he ultimately broke the world record by so much more than was expected, although wanting to do his best was no doubt also critical in this regard. When we consider why he broke the world record so many times, however, it seems likely that the incentives offered were all-important. Maybe Bubka could have broken the world record by 10 centimetres at a single event, but this would have meant getting US\$30 000 just once. By breaking the record 10 times to increase the world record height by 10 centimetres, he instead earned US\$300 000.

More generally, participants in many individual sports win prizes that depend on their finishing positions: first place gets more than second place, and so on. This is known as a tournament structure. Where payment is determined using a tournament structure, we would predict that the incentive to finish in higher places will depend on the size of the prize gap between those places, as well as on the amount of prize money. For example, where there is a larger prize difference between first and second places, a participant is more likely to mind whether they finish first or second than would be the case when first place gets the same prize as second place. A tournament where the absolute size of the prize for first place is higher should also provide a greater incentive to win. Studies of a variety of professional sports bear out these predictions, confirming that sportspeople do respond to incentives. Winning times in professional footraces and marathons have been found to be shorter where the size of prize money and the prize gaps are larger (see Szymanski 2003, pp. 1146–9). As well, a study of scores in the final two rounds of every PGA golf tournament played in the United States in 1984 found that having total prize money that was US\$100 000 higher (compared to median prize money of US\$400 000) lowered the average score of every player by one to one and a half strokes relative to a par score of around 72 strokes (Ehrenberg & Bognanno 1990).

We've earned our money at work, and we are thinking about spending it. How do we decide what to buy? Here, also, there is evidence that incentives matter. Changes to the opportunity cost of different choices do seem to affect what we decide to buy. As an example, between 1997 and 2000, the Australian Government introduced a variety of policy initiatives relating to private health insurance: a tax levy on high-income earners who did not have private insurance, a 30 per cent subsidy for private health insurance to reduce the cost of insurance, and a 'lifetime health cover' policy that meant that insurance companies could charge a higher price for insurance the older the age at which someone started buying insurance. Each of these policies had the effect of reducing the opportunity cost of having private health insurance, or increasing the

opportunity cost of not having that insurance, especially for high-income families. Incentives say that, as a result, we should have observed more Australians buying health insurance. Indeed, this is what happened. Between 1999 and 2001, the proportion of the Australian population with private health insurance jumped from 31 per cent to 45 per cent (Palangkaraya & Yong 2004).

KEY LESSONS

- In economic models, individuals and organisations make decisions based on the relative benefits and costs of alternative actions. When the benefits or costs of those alternative actions change, it is to be expected that rational decision makers will change the actions they choose. This is what we call responding to incentives.
- Examples where incentives have caused changes in behaviour are ubiquitous. Changes to the benefits and costs of seeking paid work, how hard we work in our jobs and different ways of spending our money can affect how we make each of these decisions.

SOME QUESTIONS TO THINK ABOUT

- 1 What are some examples of how your own behaviour is influenced by incentives?
- 2 In 1995 FIFA made a major change to the system for allocating points to soccer teams that would determine their finishing positions in league competitions such as the EPL and La Liga. Previously teams were awarded 2 points for winning a match, 1 point for a draw, and zero points for a loss. Subsequently teams winning a match were awarded 3 points, and the points for a draw and loss were unchanged.

How do you think that the rule change made by FIFA affected the incentives for attacking play and defensive play – and how might that effect have varied depending on the game score? Can you make a prediction of how the rule change would affect the distribution of final scores (for example, game is drawn versus one goal winning margin to a team)?

- 3 Do you think that monetary incentives are always successful in motivating behaviour? What might be some limitations or disadvantages of providing monetary incentives?
- 4 Recently, there has been much discussion about whether some part of teachers' pay should be related to performance. The Australian Government has proposed trialling a national pay system that would see teachers' pay vary according to student performance on tests, 'as a motivator to achieve specific results'

(Martin 2007). Can the idea of introducing performance pay be related to the idea of incentives? What do you think are the strengths and weaknesses of such a scheme?

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IDEAS FOR FURTHER READING

The best-seller *Freakonomics*, by University of Chicago economics professor Steven Levitt and *New York Times* columnist Stephen Dubner (2005, William Morrow), is all about incentives as seen through the lens of Levitt's own research. Tim Harford's book *The Logic of Life* (2008, Little, Brown and Co.) includes a wealth of examples illustrating how everyday events make sense when you understand the idea of incentives. Andrew Leigh's book *The Economics of Everything* (2014, Allen and Unwin) gives an Australian perspective on the role of incentives. Other books that include good discussions of incentives are Charles Whelan's *Naked Economics* (2002, W.W. Norton, especially chapter 2) and Stephen Landsburg's *The Armchair Economist* (1993, The Free Press, especially chapter 1). Canice Prendergast reviews the evidence concerning the effects of incentives on performance in the workplace in his 1993 article 'The provision of incentives in firms' (*Journal of Economic Literature*, vol. 37, pp. 7–63). A more recent brief review of performance-related pay is provided in an article in *The Economist* on 'Making pay work' (2013, 25 May, p. 70).

CASE STUDY 1.5

DO INCENTIVES REALLY MATTER: CAN ECONOMIC POLICY CHANGE THE TIMING OF BIRTHS AND DEATHS?

Maybe you are convinced, along with University of Chicago economist Steven Levitt, that 'incentives are the cornerstone of modern life' (Levitt & Dubner 2005, p. 13). You are willing to agree that many of the choices we make are influenced by comparing benefits and costs. Whether to go to university, how much time to spend studying versus at work in your part-time job, or whether to live at home or rent a house with friends are decisions that most of us make by thinking about the benefits and costs.

Surely, though, there must be limits to the influence of incentives. There must be some events that don't depend on a decision maker calculating benefits and costs. Like the timing of when we are born and die, for instance. No one could possibly think that these dates depend on incentives. Well, think again. Research by two Australian economists, Joshua Gans and Andrew Leigh, has examined whether the timing of births and deaths in Australia was affected by key government policy changes that altered the monetary benefits and costs associated with birth and death. Their remarkable finding is that the timing of births and deaths does appear to have responded to financial incentives!

THEORY REFRESHER

For a 'Theory refresher' on 'What are incentives?', see Case study 1.4.

In one study, Gans and Leigh (2006a) examined how the abolition of death duties in Australia on 1 July 1979 affected the timing of deaths. Previously, death duties had been imposed on about 10 per cent of the highest-value estates, and from these estates the government took on average 8 per cent of the value of the estate as a tax payment before the remainder was disbursed to beneficiaries. Abolishing death duties in theory created an incentive to 'shift' the timing of deaths on which death duties would have been payable to after the date of abolition on 1 July 1979. But of course we know that it's not possible to change the timing of deaths, don't we? Well, you might have thought so. Gans and Leigh's research, however, found otherwise. By comparing the incidence of deaths before and after 1 July 1979 with the same time interval around 1 July over the preceding 29 years, they were able to conclude that about 50 deaths in 1979 appeared

to have been 'shifted' from the week before (mainly the three days before) the policy change to the week after. While this may seem a small amount, it accounts for about 5 per cent of all deaths in the time interval studied. When it is recalled that, on average, only 10 per cent of the population were eligible to pay death duties, the implication is that up to one-half of the estates on which death duties should have been paid were able to avoid the tax by shifting the date of death to after the abolition of death duties. How could this 'shifting' have occurred? Gans and Leigh do not have any direct evidence to answer this question. They speculate that it may reflect deliberate misreporting of the date of death, or may reflect that it is possible for families or medical practitioners to vary the time of death within small time intervals.

In another study, Gans and Leigh (2006b) examined whether the timing of births in Australia was affected by the introduction of the 'baby bonus' on 1 July 2004. Under this policy, the Australian Government commenced making a payment of \$3000 to the family of any child born after 1 July 2004. The policy therefore created an incentive to 'shift' a birth that might otherwise have occurred before 1 July 2004 to after that date in order to receive the bonus.

Similar to their study of the timing of deaths, Gans and Leigh examined births in the time period one month before and one month after the introduction of the baby bonus and compared this with the timing of births in the same period over the preceding 29 years. They found that in 2004, over 1000 births appear to have been 'shifted' from the month before 1 July to after that date, mainly to dates in the week after the policy change. This represents over 10 per cent of all births in these months. *Figure 1.5.1* graphs the daily births for June and July 2004, where the decrease and increase in births prior to and after 1 July are clearly evident.

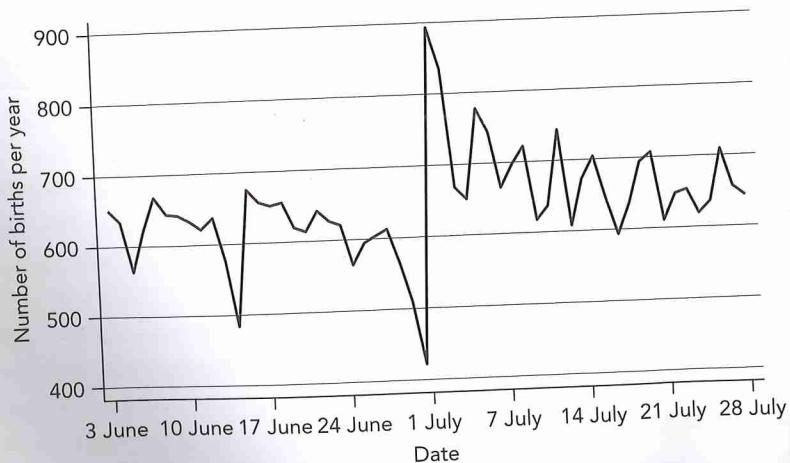


Figure 1.5.1 Timing of births by day in Australia – June to July 2004

Note: Chart shows daily births for June and July 2004, controlling for day-of-week effects.
Source: Gans & Leigh (2007b), Figure 5.

Gans and Leigh had a few ideas as to how the response in the timing of births to the change in incentives could have come about. Some important information is that the baby bonus policy was only announced a few months prior to its introduction; therefore, any incentive effect could not operate through a deliberate change to the timing of conception. Instead, Gans and Leigh showed that about half of the births that were shifted were delivered by Caesarean section, and about one-third were induced. Hence, potentially five-sixths of the changes in timing of births could be explained by changes in the dates on which obstetricians performed Caesareans or commenced inducing births compared with the timing in previous years. So where birth date was to some degree discretionary, mothers and families appear to have chosen to delay the timing in order to receive the new baby bonus.

The small amount of extra money that delays in the occurrence of births cost the government was of little consequence. Gans and Leigh (2007a) do, however, note concerns that delays in births and the concentration of births in a small period of time may have had adverse consequences for infant health and for the quality of hospital care that could be provided in that period.

The research of Joshua Gans and Andrew Leigh confirms the power of incentives to influence our behaviour. It also provides a lesson for governments about designing policies that are intended to affect behaviour in a particular way. Such policies will often have consequences that are unexpected. A highly valuable contribution that economists can make, therefore, is to always be thinking of and offering advice about the multiple ways in which incentives can work.

KEY LESSONS

- In economic models, individuals make decisions based on the relative benefits and costs of alternative actions. When the benefits or costs of different actions alter, rational decision makers will change the actions they choose. This is what we call responding to incentives.
- Research in Australia has shown that even the timing of births and deaths can respond to incentives – more specifically, to changes in government policy. For example, it appears that decision makers such as obstetricians have the capacity to change the timing of births within small intervals of time, and that this capacity has been used in response to changes in financial incentives that relate to the timing of births.
- Understanding and advising on the diverse ways in which new policies can affect incentives is an important role for economists.

SOME QUESTIONS TO THINK ABOUT

- 1 It has been reported that in some cities in Brazil there are large populations of rats that pose a significant public health problem. A proposed solution is to pay a bounty per kilogram of dead rats brought in to city authorities by members of the population of those cities. Would providing monetary incentives assist the government to solve the problem of excessive numbers of rats?
- 2 In many professional sporting competitions, new players are allocated to teams using a reverse-order draft. Teams with the worst records in the previous season are given priority in choosing from the set of new players available. Why do you think that sporting competitions introduced this method of allocating new players? Can you think of any perverse incentives that might arise from using the method?
- 3 There have been growing reports of 'cheating' during National Assessment Program – Literacy and Numeracy (NAPLAN) testing in Australia:

The father of a struggling year 7 student at Vermont Secondary College says his son was told he did not have to sit the NAPLAN tests – meaning the school would perform better on the MySchool website. The claim comes as education experts warn that 'high-stakes' tests, and the use of the results to create league tables, can force schools to hide problems and to manipulate data to improve their results ... The results of the national literacy and numeracy tests which are being held in years 3, 5, 7 and 9 ... are published on the MySchool website, which groups similar schools and allows parents to compare the results.

Source: Topsfield (2010).

- a What do you think education experts are suggesting when they say that the NAPLAN examinations are 'high-stakes' tests?
- b How might schools try to manipulate the NAPLAN results of their students?
- c Could you regard schools seeking to manipulate their students' test results as an effect on incentives that was unintended when the Australian Government introduced NAPLAN?

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IDEAS FOR FURTHER READING

Freakonomics, by Steven Levitt and Stephen Dubner (2005, William Morrow), and *The Logic of Life*, by Tim Harford (2008, Little, Brown and Co.), both include many great examples of how incentives affect behaviour. An excellent overview of Joshua Gans and Andrew Leigh's research is presented in their 2007 article 'Unusual days in births and deaths' (*Melbourne Review*, vol. 3, pp. 72–9).

Andrew Leigh discusses his research on the baby bonus in 'Designing effective microeconomic policies' (chapter 3 in Jan Libich, 2015, *Real-World Economics and Policy: Insights from Leading Australian Economists*, Cengage).