Part I

Introduction

Part I (Chapters 1 and 2) examines the nature, scope and methods of managerial economics and the theory of the firm. Chapter 1 is therefore concerned with explaining why managerial economics is important and useful as an area of study, how it relates to other disciplines, what its core areas are and the methods of analysis that it uses. Chapter 2 examines the basic profit-maximizing model of behaviour, and its underlying assumptions, and then proceeds to relax these assumptions to develop a more complex but realistic model of firms’ behaviour. The focus is on the individual and the nature of transactions, with an emphasis on agency theory. These two chapters introduce the framework of parameters and analysis that is developed throughout the remainder of the text.
1 Nature, Scope and Methods of Managerial Economics

Objectives

• To introduce and define managerial economics.
• To outline the types of issue that are addressed by managerial economics.
• To explain how managerial economics is related to other disciplines in business, such as marketing and finance.
• To identify the main subject areas in managerial economics, explain how they are related to each other and describe how they are organized and presented in the text.
• To explain the methods used in the development of scientific theories and show their relevance to managerial economics.
• To explain how economic theory is presented from a pedagogical viewpoint, and how this relates to the organization and presentation of the material in the text.

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1.1 Introduction

What is managerial economics about? What kind of issues does it deal with? How can it help us make better decisions, in business or elsewhere? These are fundamental questions that any student may ask when first approaching the subject. The previous edition of this book began with a case related to global warming, and this issue is even more important now than it was 15 years ago. However, because of the complexity and the wide range of decision-making aspects involved, it is considered preferable to discuss this case at the end of the book, in the chapter on government policy, once students have a much better grasp of various economic principles.

It is therefore useful to start with a case that all students can relate to, without a great deal of background knowledge in terms of economic theory, and they will have learned something about from the mass media: autonomous vehicles. In particular, this case involves the following issues: the evolution of new ‘ecosystems’, meaning groupings of related industries; the role of technological developments in artificial intelligence (AI); the role of development of renewable energy sources; the role of the car in city centres, particularly after the impact of covid; the implications for climate change; and the different perspectives and objectives of different decision-makers among consumers, producers and government.

These questions are all specifically addressed at the end of the chapter, but they illustrate many of the most important issues that are relevant in managerial economics in general.
Case Study 1.1 Autonomous Vehicles – the Creation of New Ecosystems

The era of autonomous vehicles (AVs) began inauspiciously in 2004, with a competition organized by DARPA, the main US military-research agency. It required driverless vehicles to complete a 150-mile off-road course; none of the 12 starters finished the course, the longest distance covered being a mere 7.4 miles before the vehicle became stuck and then caught fire. The next year five out of 23 participants completed a course of 132 miles, and by 2007 six out of 11 participants completed a much more challenging task of coping with a simulated urban driving environment, with road signs, traffic signals and other vehicles. This rapid improvement in performance encouraged a flurry of investment by firms such as Google, Uber and Tesla, as well as a bunch of start-ups. The first prototype driverless cars appeared on US roads in 2012, and they have covered millions of miles since then. Although significant improvements are still required before fully autonomous vehicles are a feasible prospect, the investment bank UBS has forecast that by 2035 80 per cent of people will be using robotaxis, driverless vehicles for hire, in cities.

The technical problems to be overcome are still considerable. There are three main tasks such vehicles need to perform: perception, prediction and policy. First, AVs have to be able to sense the environment around them and identify the nature of relevant objects, such as road signs, pedestrians, other vehicles, plastic bags blowing across the road, potholes and snow. Machines are generally bad at doing this compared with humans, but artificial intelligence applications involving machine learning, and multiple sensors combining data, are making rapid progress in this area.

The second task involves prediction. This means anticipating what will happen in the next few seconds and determining how to respond. Some clues are easy to interpret, such as traffic lights and indicators of other vehicles, but others are more problematic, particularly when they are infrequent, such as broken-down vehicles or fallen trees.

The third task is actually the easiest from a technical point of view, since it means constructing systems for translating decisions into action. Machines can do this much more quickly than humans, so a decision to brake can be implemented in less than a millisecond, a thousand times more rapidly than with humans. Similar considerations apply to changes of direction.

Different types of AV can perform these tasks to different degrees, so there is currently no clear distinction between conventional vehicles and AVs. The Society of Automotive Engineers has defined four different levels of autonomy, ranging from level 1, which includes very basic features such as cruise control, to level 4, which is fully autonomous in certain environments, requiring no driver intervention. The intermediate levels require full driver attention, and some in the industry claim that they may actually increase the risk of accidents, since they may lull the driver into a false sense of security.

The technical demands of AV development have important consequences for the economics of the developing industry. These implications can be seen most clearly when we consider that the future of transportation will see the merging of three current industries: autonomous or driverless vehicles; ride-hailing; and electric vehicles. The most obvious cost implication is the large cost of the initial research, development and investment, coupled with the additional cost per vehicle of equipping it with the necessary hardware and software. It has been estimated that for a level-4 AV this additional cost will be at least as much as the rest of the vehicle. As of the beginning of 2018, the cost of ride-hailing in developed countries is an average of about $2.50 per mile, compared with an average cost of $1.20 per mile for owning a car, including incidental costs of insurance, maintenance and depreciation. However, the driver accounts for about 60 per cent of the cost of...
Case Study 1.1 (cont.)

ride-hailing, and UBS has estimated that automation, competition and electrification will reduce the cost of ride-hailing by about 70 per cent, to about $0.70 per mile. This would hugely tilt the economic balance in favour of ride-hailing, for urban dwellers at least, enabling a typical driver covering 10,000 miles a year to save $5,000 a year. There will be other advantages to ride-hailing also: there would be no need to look for parking, or remain sober, and one could perform other activities while being driven, or simply relax. For those living outside towns and cities the advantages of robotaxis will be less clear-cut, but the high initial cost of purchasing an AV may still encourage them to hire.

The digitization of transportation has important implications for the structure of industry in general. Distinctions between industries will become much more blurred, so it may become more meaningful to talk about ‘ecosystems’ of industries rather than specific well-defined industries. As mentioned above, personal transportation is seeing a merging of at least three fields, although the development work on AVs involves both hardware and software, which themselves are different fields. Some of the current relationships between firms in the AV ecosystem are shown in Figure 1.1.

However, the picture here is a very dynamic one, with a large number of mergers and acquisitions (M&As) occurring over the last few years. There is already a great contest between carmakers, technology giants, start-ups and ride-hailing companies to dominate this emerging ecosystem. The carmakers are proficient at mass manufacturing, but are less knowledgeable about complex software. The tech firms know about AI and machine learning, but not making cars. The ride-hailing firms, on the other hand, have the advantage that their apps are installed on millions of users’ phones, providing the obvious connection with customers.

![Figure 1.1 AV ecosystem](image-url)
Case Study 1.1 (cont.)

These changes also have important implications for business models and strategy. AV makers will be selling rides rather than cars. The market potential will be hugely expanded. The automobile market is currently valued at around $2 trillion annually on a worldwide basis, but Morgan Stanley bank estimates that the personal transportation market is worth around $10 trillion annually. The main customers, particularly in the near future, will be other firms that offer ride-hailing services, rather than the general public, for whom the price may be prohibitive. Although there will be a significant reduction in the number of cars on the road, those that will be used will constantly be in demand. At present a typical car is used for only 5 per cent of the time. The implication here is that manufacturers will need to replace cars more frequently, and therefore the total volume of car output may not fall. For firms offering ride-hailing services, such as Uber, pricing strategies may also change, so that, instead of pay-as-you-go schemes, customers may be offered monthly plans similar to their phone services, with a mix of fixed and variable charges.

It is not only the ecosystems within industry that are changing. At a broader level, the ecosystem of the planet as a whole will experience a profound shift, in some ways similar to the shift that occurred in the twentieth century when the automobile replaced the horse-drawn carriage. Justin Erlich, head of policy for AVs at Uber, has stated: ‘If the 20th century was about cars giving us independence, the 21st will be about autonomous vehicles giving us independence from cars.’

Numerous huge advantages follow from this shift. The consultancy firm BCG estimates that by 2030 a quarter of the passenger-miles travelled on US roads will be in shared, self-driving electric vehicles, reducing the number of cars on city streets by 60 per cent, emissions by 80 per cent and road accidents by 90 per cent. Currently about 1.25 million people are killed in road accidents worldwide every year, and a further 20 to 50 million injured, according to the World Health Organization (WHO). Most of these are in developing countries, but even in the United States the figures are alarming, with around 650,000 deaths since 2000 – more than the total number of US deaths caused by all the wars in the twentieth century. The numbers have also been rising since 2014, possibly caused by increasing mobile phone usage. As far as a fall in emissions is concerned, this relates both to particulates, which cause heart and lung disease, and to greenhouse gases, which cause climate change. A further advantage of AVs will be the huge time savings for drivers; BCG has estimated that in the United States 30 billion hours per year are spent driving. It has also been estimated that, with the right infrastructure in place, AVs could account for 50 per cent of all miles driven in the United States by 2040, with savings of $850 billion annually.

However, in spite of obvious advantages of AVs, there are some lessons to be learned from the earlier twentieth-century shift from horseless carriages to cars. This also resulted in some big advantages, reducing costs and improving sanitation by eliminating horse manure from urban centres. However, there were many unforeseen consequences. Car manufacturers were slow to respond to the implications in terms of the design of vehicles, which for many years still resembled carriages. Makers of AVs will no longer have constraints in terms of providing
Case Study 1.1 (cont.)

steering wheels, pedals or conventional gauges. On the other hand, they may well have to draw a distinction between vehicles for family use and those intended for shared use among strangers, who require more personal space and maybe different seating arrangements.

In terms of environmental improvement, the overall effect of AVs on emissions will depend on how the electricity grid is powered, bearing in mind that the majority of AVs will be electric. UBS estimates that demand for electricity in Europe will increase by 20 to 30 per cent by 2050, and this will require a substantial investment in new infrastructure for both producing and distributing electricity. Currently, renewable sources of energy provide only a small fraction of total electricity supply; this was a mere 20 per cent in the United States in 2020. Furthermore, large-scale investment in transportation infrastructure will be required in order for AVs to operate successfully. Not only will many roads have to be upgraded in quality but also there will need to be investment in vehicle-to-infrastructure (V2I) systems, such as sensors in roads and street signs. New parking and waiting systems will also be needed in order to improve traffic flow and allocate kerb space, with smart parking meters. This necessary investment also raises funding issues. Public sector revenues, from fuel tax, parking and licences, will fall, leaving a big gap to be filled from somewhere. The private sector may be involved here, depending on how infrastructure is funded.

There are also concerns among the general public regarding security, both in the sense of physical safety and in terms of cyber-security. These concerns are reflected in the finding from a 2017 poll by the Pew Research Center that 56 per cent of people in the United States claimed they would never use a driverless vehicle. There is a danger of hacking potential, which could undermine personal privacy if a passenger’s itinerary history is revealed. Issues of legal liability are also raised in the case of malfunction; AV makers may blame hardware or software makers for ultimately causing mechanical problems and accidents. There will thus be important implications for regulators, as well as for urban planning and for labour markets.

One important issue concerns the establishment of a set of universal standards and rules, based essentially on objective mathematical criteria, that apply to all traffic situations, such as lane-changing or pulling out into traffic. If a national agency, such as the NHTSA, which is the federal car safety regulator in the United States, can construct such a framework, this would serve to reduce uncertainty in determining liability and, ultimately, reduce litigation cases. Thus, if an AV obeys the rules the manufacturer is not held liable, whereas if an accident is caused by a sensor failure or software glitch then this would represent a breach of the rules and the company would be liable. A problem here is the ever-changing aspects of technology, so it may be premature to write such a set of rules in stone at too early a stage.

Another important issue for regulators concerns the determination of the level of safety required for autonomous vehicles. The problem in this case is that arguments are driven by emotion rather than logic. AVs have already killed people, both drivers and pedestrians, and, irrationally, people tend to find this more abhorrent than when people are killed by human drivers. Thus, we want to hold AVs to a higher safety level than human drivers. This is the kind of situation in which economic principles are
The case study above also raises some important general questions.

1. What is the nature of a business model?
2. What is the nature of an ecosystem?
3. How do firms make a profit, and what makes some firms more successful at achieving this than others?
4. What is the nature of incentives, and how do they affect the behaviour of firms, governments and individuals?
5. What is the nature of information, and what is its role in an economic system?
6. What is the role of government in an economic system?
7. Do people always act ‘rationally’? If not, how should firms and government respond to this?
8. How should the success of a policy be evaluated?
Many people are unaware of the breadth of issue that is amenable to the analysis of managerial economics. In particular, they sometimes regard managerial economists as being apologists for greedy capitalists, who do not take quality of life into consideration, or the long-term interests of the public. They may view markets with suspicion and doubt their ability to allocate resources efficiently, causing, for example, rents in some areas to be too high and alcohol prices in some shops to be too low. They may fear deregulation, seeing it as leading to the exploitation of consumers by monopolists. They may believe that it is impossible in principle to put a money value on human life, health or safety. They may believe that governments should not be swayed by narrow economic interests and analysis and have a duty to exercise ethical principles that otherwise would not be considered, such as the impact of policies on the environment and mental health.

Much of the sentiment involved is based on an ignorance of the issues involved, a misuse of statistical information and a lack of understanding of economic analysis, its relevance and application. One major objective of this book is to explain not just the methodology of managerial economics but also the breadth of its application, and to illustrate that it can have a lot to say about a very wide range of issues. These relate not just to the case study above but also to issues of huge global importance, such as addressing climate change and the covid pandemic. All the case studies in the text have been selected with this objective in mind; for example, the following situations and issues are discussed: corporate failure at Carillion; the demand for higher education; demand for products that damage our health, such as cigarettes and alcohol; the success of tech companies such as Apple, Amazon and Netflix; the decline of high street retailers; the digitization of the health services and finance industries; the impact of Brexit; and the regulation of energy utilities.

1.2 Definition and Relationships with Other Disciplines

1.2.1 Definition

So what is managerial economics? Many different definitions have been given but most of them involve the application of economic theory and methods to business decision-making. As such, it can be seen as a means to an end by managers, in terms of finding the most efficient way of allocating their scarce resources and reaching their objectives. However, the definition above might seem to be a little narrow in scope when applied to an issue such as global warming. This situation involves governments, non-profit objectives, non-monetary costs and benefits, international negotiations and a very long-term time perspective, with an associated high degree of uncertainty. Therefore, it needs to be clarified that managerial economics can still be applied in such situations. The term ‘business’ must be defined very broadly in this context: it applies to any situation in which there is a transaction between two or more parties. Of course, this widens the scope of the concept beyond the bounds that many people find comfortable: it includes taking someone on a date, playing a game with one’s children in the park, going to confession in a church, asking a friend to help out at work,