CHAPTER 1

Organizations and efficiency

In this chapter, I will discuss several concepts and key results that play a central role in this book. I start in Section 1.1 by defining the efficiency of organizations and markets. In Section 1.2, we will study the neoclassical general equilibrium model. In this model, the fundamental theorem of welfare economics holds true: An efficient outcome emerges in a competitive equilibrium. I illustrate some of the lessons from the general equilibrium model in Section 1.3 by discussing perfect competition in isolated markets. I will show that perfectly competitive markets produce an efficient market outcome in equilibrium. In Section 1.4, we will see that inefficient market outcomes may emerge when the assumptions underlying the general equilibrium model are not satisfied. The resulting market failures seem highly relevant to organizations and markets in practice and motivate our analysis for the remainder of this book. Finally, Section 1.5 contains a case study on Apple Inc. that highlights several of the issues that we will study in this book.

1.1 Efficiency

In this book, we will judge the functioning of organizations and markets by their efficiency. In markets, people trade particular goods and services to enhance their own well-being. Individuals interact in organizations to satisfy their wants and their needs. Students become members of student associations to acquire valuable skills for their future career, to participate in sports, or to meet other students. University professors may want to teach interesting courses, engage in ground-breaking research, and earn a good salary. Firms form a research joint venture to share knowledge, to develop a new product, and to benefit from a joint patent.

Transactions of goods and services between individuals are the fundamental units of analysis in this book. In student associations, students offer services to fellow students, such as organizing debating tournaments, sports competitions, and dinner parties. University professors allocate courses, research facilities, and divide management tasks among themselves. Participants in a research joint venture share research responsibilities, management tasks, and the proceeds related to newly developed products. In the economy as a whole, workers offer their time and skills to firms, and firms distribute goods and services to consumers.

In this book, we will examine how successful organizations and markets are in establishing efficient transactions. We call an allocation of goods and services **efficient** (or Pareto optimal) if no reallocation of goods and services exists that makes somebody better off without making someone else worse off. An alternative way of evaluating organizations and markets is by measuring the total value they create. In fact, the concepts of value and efficiency are closely linked as the value maximization principle shows:

- **The value maximization principle**: An allocation of goods and services is efficient (only) if it maximizes the total value among the affected agents.

Let us consider an example from the car market to illustrate the concepts of 'efficiency' and 'value creation' as well as the value maximization principle. Suppose Alfa Benz sells a particular car brand for a price of 20 (thousand euros). Four potential buyers are interested in the product: Adèle, Bono, Cher, and Dido. Adèle's value for the car equals $v_A = 30$, while Bono, Cher, and Dido's are $v_B = 26$, $v_C = 22$, and $v_D = 18$ respectively. Figure 1.1 plots the data in an inverse demand function.

Figure 1.1 Inverse demand for Alfa Benz

How much value does this market generate? In economics, the usual term for value is **welfare**, which is the sum of consumer surplus and producer surplus. Let us start with **consumer surplus**, which is the net value gained by consumers. Adèle's surplus equals 10, i.e., the difference between her value ($v_A = 30$) and the price ($p = 20$). Similarly, Bono and Cher's surpluses are $v_B - p = 6$ and $v_C - p = 2$ respectively. What about Dido? Her surplus equals zero, because she will not buy a car as its price

($p = 20$) exceeds what she is willing to pay ($v_D = 18$). Consumer surplus is the sum of the surpluses of the four potential buyers:

$$CS = (v_A - p) + (v_B - p) + (v_C - p) = 10 + 6 + 2 = 18$$

Figure 1.2 plots consumer surplus for this example. Note that consumer surplus is equal to the surface enclosed by the price-axis, the inverse demand curve, and the line representing the product's price. **Producer surplus** generated in a market equals the sum of the profits of the firms that are active in the market. In our example, Alfa Benz is the only firm in the market. Producer surplus equals Alfa Benz' profits, which is the difference between the firm's revenue and its costs of producing the three cars it sells. Therefore, if the costs of producing each car are equal to $c = 16$, producer surplus equals

$$PS = \pi = Q(p - c) = 3 \times (20 - 16) = 12$$

Welfare is the sum of consumer surplus and producer surplus, i.e.,

$$W = CS + PS = 18 + 12 = 30$$

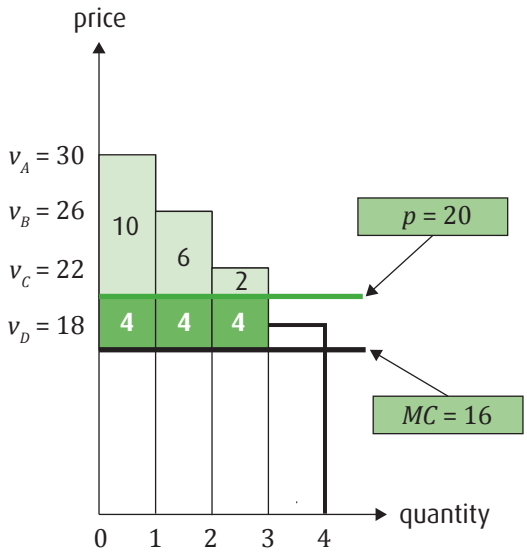

Figure 1.2 Welfare generated by Alfa Benz

Is the car market efficient, i.e., is welfare maximized? The answer is no. As you may recall from a Fundamentals of Microeconomics course, welfare is maximized when price equals marginal costs:

$$p = MC$$

The intuition is that a transaction between a seller and a buyer enhances welfare (only) if the buyer's additional utility from the transaction is higher than the production costs for the seller. A buyer buys an additional unit (only) if the marginal utility from this unit exceeds the price while the seller sells it (only) if the marginal costs of producing it are lower than the price. If the price is above marginal costs, some value-enhancing transactions do not take place because the buyer will not buy the units when his marginal utility lies below the price but above marginal costs. Too few units will be traded. Similarly, a price below marginal costs will lead to excessive trade because some units will be sold for which the buyer's marginal utility is lower than the seller's marginal costs. In other words, welfare is maximized at the marginal cost price.

In the car example, the price ($p = 20$) exceeds marginal costs ($MC = c = 16$). Note that the allocation resulting from a price of 20 is not efficient because after selling cars to Adèle, Bono, and Cher at this price, Alfa Benz can make both itself and Dido better off by selling Dido a car at a price of 17. Indeed, welfare is not maximized if the price equals 20. At a price equal to marginal costs ($p = 16$), even Dido will buy a car. Note that producer surplus equals zero so that welfare equals consumer surplus. It is readily verified that welfare is equal to

$$W = CS = (v_A - p) + (v_B - p) + (v_C - p) + (v_D - p) = 14 + 10 + 6 + 2 = 32$$

which is indeed higher than welfare at a price of 20.

1.2 The neoclassical general equilibrium model

A serious challenge to reaching an efficient allocation of goods and services is that it depends on information that may be scattered throughout the economy, including individual preferences, technological possibilities, and resource availability. How could a market, an organization or, more broadly, the economy as a whole, channel this information to achieve an efficient allocation? Two extreme possibilities are:

1. Individuals communicate their information to a central planner who makes all relevant decisions.
2. Individuals make independent decisions on the basis of prices of goods and services.

In practice, most organizations and economies use a mix of these two extremes.

The neoclassical general equilibrium model, developed by Nobel Prize Laureates Kenneth Arrow and Gérard Debreu, formalizes the idea that a system of prices can achieve an efficient allocation. The model analyzes an economy with many producers and consumers who may trade a great number of goods and services between them. Arrow and Debreu assume that each producer maximizes his own profits

while each consumer maximizes his utility at the prevailing prices of all goods and services in the economy.

The key result from the neoclassical general equilibrium model is the fundamental theorem of welfare economics:

- **The fundamental theorem of welfare economics**: An efficient allocation of goods emerges at a competitive equilibrium.

This result is remarkable for two reasons. First, producers and consumers only need to know the prices of goods and services to reach an efficient allocation: No central coordination of decision is required. Prices play the role of Adam Smith's 'invisible hand' by leading individuals to make decisions necessary for a coordinated and efficient recourse allocation. Second, producers' and consumers' behavior is in line with the interests of the entire economy despite all individuals only pursuing their narrow self-interest. In the words of Adam Smith:

> *"It is not from the benevolence of the butcher, the brewer, or the baker, that we can expect our dinner, but from their regard to their own interest."*

In a general equilibrium world, the role of a government is limited to the protection of property rights: No central planner is needed to gather and disseminate information to coordinate decisions on the economy and individual decision makers need not be forced to make decisions that are not in their own self-interest.

1.3 Perfect competition

In this section, I discuss the model of **perfect competition** to illustrate how prices can lead decision makers to efficient choices. The model focuses on a single market and relies on the following assumptions:

1. There are 'many' small buyers and sellers in the market: None of them can influence the market price.
2. A homogeneous product is traded on the market: There is no product differentiation.
3. No entry barriers: Firms can freely enter and exit the market.
4. Perfect information: All buyers and sellers have perfect knowledge of the prices of all sellers and every firm has access to the same production technology.

The market has a long-run equilibrium where the price equals both average costs and marginal costs:

$$p = AC = MC$$

Figure 1.3 indicates how the market reaches the long-run equilibrium from an initial situation where price exceeds average costs. The upper panel shows a potential market outcome in the short run. On the left, we see the cost structure of a typical firm in the market (recall that all firms have access to the same production technology so that each faces the same cost structure). The profit-maximizing quantity ensures that a firm's marginal revenue equals marginal costs. Because a firm cannot influence the market price, its marginal revenue is equal to the market clearing price, i.e., the price where supply equals demand. As a consequence, each firm produces a quantity such that price equals marginal costs. Note that an individual

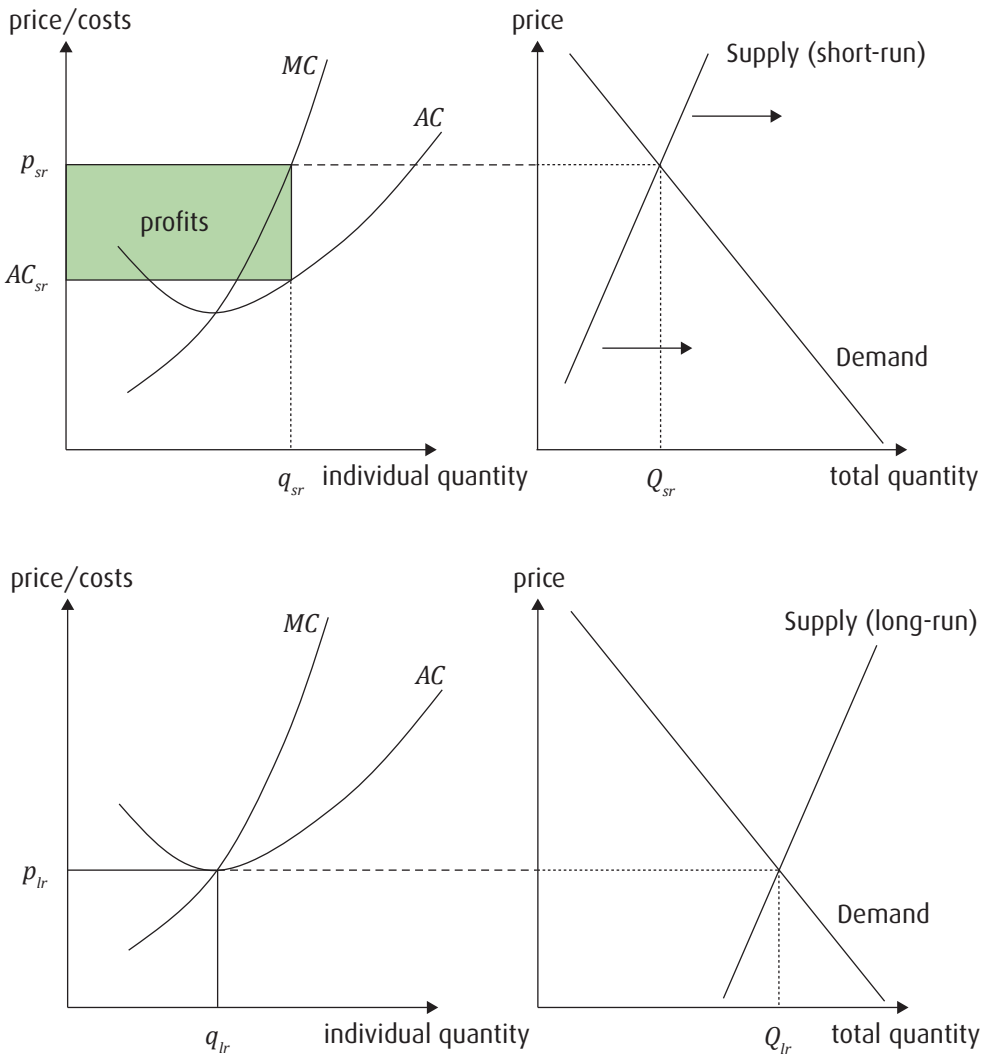

Figure 1.3 Towards equilibrium in a perfectly competitive market

firm makes a profit because the market price exceeds the firm's average costs. The profits will attract more firms into the industry up to the point where none of them makes a profit. As the right panel of Figure 1.3 indicates, supply will increase until quantity reaches the point where the average costs and marginal costs meet.

Observe that the equilibrium outcome in the perfect equilibrium model is efficient. As we discussed before, at the marginal cost price, the market establishes an efficient allocation, i.e, the market is allocatively efficient. The market is productively efficient as well, i.e., firms produce at the lowest feasible costs. The reason is that at the quantity level where the marginal costs equal average costs, average costs are minimized.

The model of perfect competition shows the invisible-hand role of prices in several ways. First of all, the price informs consumers about the quantity they should purchase to maximize their utilities. Second, the price informs the firms about the quantities each should produce to maximize profits. Third, the price indicates whether firms should stay in or enter the market (when the maximum profit at the current price is positive) or exit (when the maximum profit at the current price is negative). Finally, and most importantly, the price can guide consumers and firms to an efficient market outcome.

1.4 Market failures

In the ideal world of the neoclassical general equilibrium model, markets can produce an efficient outcome. In particular, markets can be efficient in three important ways. First of all, the market outcome is allocatively efficient; given the cost structure of producers, producers sell goods and services for which the consumer's value exceeds production costs. Second, goods and services are produced at the lowest possible cost: The market is productively efficient. Third, markets are dynamically efficient in that they establish an efficient balance between production and consumption over time. In a dynamically efficient economy, firms engage in both process innovation (they develop new production processes) and product innovation (they develop new products) up to the point where the marginal social benefits of those innovations are equal to their marginal costs.

However, if markets can work so well, two questions are raised: Why do we see governments intervene in markets? And why do so many transactions take place within firms (and not in markets)? The answer to both questions is that markets may be plagued by market failures if the assumptions underlying the general equilibrium model do not hold. In fact, most of the analysis in the remainder of this text is motivated by market failures. We distinguish between four potential sources of market failure: market power, information asymmetry, externalities, and transaction costs.

In the general equilibrium model, it is assumed that producers and consumers are price takers. However, if the number of producers (or consumers) in a particular market is low, they may be able to influence the market price, i.e., they have **market power**. In Chapter 3, we will see how a monopoly firm charges prices above marginal costs resulting in an inefficient market outcome. Similarly, in the case of oligopoly (Chapter 6), product differentiation (Chapter 9), and collusion between firms (Chapter 12), firms may be able to maintain prices above marginal costs. In Chapter 18, we discuss ways in which firms can establish market power by using aggressive business strategies that induce the exit or deter the entry of rival firms. As we will discuss in more detail in Chapter 3, the government may intervene in markets to curb market power using competition policy or economic regulation.

Information asymmetry is another source of market failure. Information asymmetry emerges when one party engaged in a transaction has more or better information than another. A decision maker may be tempted to act opportunistically if the other party cannot observe his actions. In Chapter 2, we will discuss the 'moral hazard problem' that is imminent if a 'principal' cannot observe how much effort an 'agent' working on her behalf expends. Potential solutions to the moral hazard problem include incentives contracts (Chapters 2, 5, and 8) and relational contracts (Chapter 11). We speak of 'adverse selection' if one party to a transaction is better informed about the quality or other characteristics of the traded product than another. In Chapter 13, we will examine the 'adverse selection problem' that may emerge in such settings, i.e., only low-quality goods are traded on the market. Two potential solutions to the adverse selection problem are screening and signaling. In Chapter 14, we will study screening and signaling devices employers and employees may employ to mitigate adverse selection problems in the labor market. Chapter 15 contains a discussion of price discrimination as a screening device in markets.

Externalities may also cause transactions to result in inefficient outcomes. In the case of negative externalities (such as air pollution) too much of the good is traded because the parties involved in the transaction do not take into account the negative consequences of their transaction to third parties. In Chapter 9, we will observe that too many firms may enter a market because they do not take into account that an incumbent firm's profits decrease because entrants steal business from the incumbents. Similarly, in the case of positive externalities, trading partners engage in too few transactions because they do not take into account that parties outside the trade benefit as well. A good example of a setting where positive externalities emerge is team production. All team members benefit from the effort provided by an individual member. As we will see in Chapter 5, team members may undersupply effort because they can free-ride on the efforts of others.

Finally, transactions may be plagued by **transaction costs**. There may be three

sources of transaction costs: coordination costs, information asymmetry, and imperfect commitment:

- **Coordination costs** refer to costs parties incur to complete the transaction. These include the costs trading partners incur to learn about each other's existence, to determine the price and the other terms of the transaction, and to come together to complete the transaction. For example, in markets, sellers may have to advertise their products to make potential buyers aware of their existence while buyers may face search costs to find a satisfactory product. Within firms, central management incurs costs to collect the relevant information from inside the organization to make strategic decisions and to communicate the decisions to the relevant players in the organization.
- As we saw earlier, transactions may be plagued by **information asymmetry**. In the case of moral hazard, a party may have to invest in a way to monitor another party to prevent him from acting opportunistically. Similarly, parties may have to implement costly screening and signaling mechanisms to mitigate adverse selection problems.
- Trading partners suffer from **imperfect commitment** if they cannot bind themselves to fulfill promises they would like to make before the transaction takes place. In Part 6, we will examine several settings where the lack of commitment could be costly to trading partners.

Nobel Prize Laureate Ronald Coase argues that transaction costs are the very reason why firms exist. He points out that for particular transactions, the transaction costs are lower within firms than in the market so that it makes perfect sense to organize them within firms. In Chapter 17, we will look in more detail at reasons why firms may prefer to make inputs themselves over buying them in the market.

1.5 Case study: Apple Inc.

At the time of writing this book, Apple Inc. is the second-largest publicly traded company in the world, by market capitalization. As we will see in this case study, Apple's journey in reaching this point is one of the great business success stories and illustrates many key concepts used in this book. Apple's history includes examples of market entry by new firms, but also shows how successful innovation can enable a firm to *create* a new market. It shows how competition and strategic behavior can take on many different forms and how patent 'war chests' can create barriers to entry. Apple is also a clear example of how management styles and employee relations can have far-reaching effects on a company's identity and on its fortunes.

As we know it today, Apple is a well-diversified company, but its history begins

in the computer market with a single product: the Apple I. Until the 1970s, the idea of a small computer for personal use seemed unfeasible. Computers were large, costly, and complicated systems mostly used by companies, universities, and government agencies. The market was dominated by IBM (International Business Machines), with a market share of about 80% during the 1960s. Several prototypes of small computers were launched during this period, but they were still too expensive to appeal to the consumer masses.

Apple Computer Company was the first company to foresee the potential of a market for personal computers, and the opportunity that it presented. Officially founded on April 1, 1976, by Steve Jobs, Steve Wozniak and Ronald Wayne, Apple Computer had a clear mission that reflected the founders belief – "one person – one computer" – to change the world by bringing computers to everyone. Indeed, a rather ambitious object for three young men (Jobs had not even graduated from university) who headquartered their company in their parents' garage.

However, the Apple I did not attain the desired results. It was only with the production of their second PC, the Apple II in 1977, that the company really took off. In six years following its foundation, Apple's earnings rose exponentially: from $793,000 to $76,714,000. This fast growth prompted the company to offer its shares on the stock exchange. It was a great success, and the IPO (initial public offering, i.e., stock market launch) was oversubscribed. At the beginning of the 1980s, Apple counted thousands of employees and established itself as one of the major players in the early stages of the personal computer market.

However, its competitors did not sit idly by. In 1981, IBM broke into the personal computer market with its first PC using Microsoft's software (called IBM PC). In three years, IBM was able to conquer 50% of the market share. The challenge between Apple and IBM involved their business models and their different technological standards (their operating systems, for example). On the one hand, Jobs' company focused on innovation by following a strict licensing and patent-regulated policy. Apple Computer was reluctant to give away any information regarding its hardware and software, not allowing third-party program writers to develop different features for Apple technology. On the other hand, IBM followed an 'open-architecture' model, giving the opportunity to other manufacturers to produce and sell peripheral components and compatible software without purchasing a license. IBM even diffused its PC circuit schematics and other engineering and programming information.

As a consequence, Apple products were qualitatively better than their competitors', but their price was widely above the industry average. The IBM open-architecture model created a sub-market devoted to the production of IBM PC's components. At the same time, though, it enabled other companies (such as Dell, Compaq and HP) to enter the market by cloning the IBM PC. The increase in competition implied a de-