The hardest choices facing the public sector involve trade-offs, in particular, trade-offs between increased efficiency and a more equitable distribution of income. Chapter 7 provides a conceptual framework for thinking about these trade-offs, some tools that are used by governments in attempting to quantify them, and an analysis of the circumstances in which one can have both more efficiency and more equity.

3

MARKET EFFICIENCY

FOCUS QUESTIONS

1. What do economists mean when they say the economy is efficient?
2. What conditions have to be satisfied if markets are to be efficient?
3. What role does competition play in ensuring efficiency?

In most modern industrial economies, primary reliance for the production and distribution of goods lies in the private rather than the public sector. One of the most enduring tenets of economics holds that this form of economic organization leads to an efficient allocation of resources—but if private markets are efficient, why should there be an economic role for government? To answer this question, a precise understanding of the meaning of economic efficiency is needed. That is the aim of this chapter. The next chapter will consider why private markets may fail to achieve efficient outcomes and how government may respond to these market failures.

THE INVISIBLE HAND OF COMPETITIVE MARKETS

In 1776, Adam Smith, in *The Wealth of Nations*—the first major work of modern economics—argued that competition would lead the individual

in the pursuit of his or her private interests (profits) to pursue the public interest, as if by an **invisible hand**:

> [H]e intends only his own gain, and he is in this, as in many other cases, led by an invisible hand to promote an end which was no part of his intention. Nor is it always the worse for the society that it was no part of it. By pursuing his own interest he frequently promotes that of the society more effectually than when he really intends to promote it.[1]

The significance of Smith's insight is clarified by a look at the views about the role of government commonly held prior to Smith. There was widespread belief that achieving the best interests of the public (however that might be defined) required an active government. This view was particularly associated with the mercantilist school of the seventeenth and eighteenth centuries, which argued that government should promote industry and trade. Indeed, many European governments had actively promoted the establishment of colonies, and the mercantilists provided a rationale for this.

Some countries (or some citizens within them) had benefited greatly from the active role taken by their government, but other countries, whose governments had been much more passive, had also prospered. And some countries with strong, active governments had not prospered, as their resources were squandered on wars or on a variety of unsuccessful public ventures.

In the face of these seemingly contradictory experiences, Smith addressed himself to the question: Can society ensure that those entrusted with governing actually pursue the public interest? Experience had shown that although at times the policies governments pursued seemed consistent with the public good, at other times, the policies pursued could not by any reasonable stretch of the imagination be reconciled with the public good. Rather, those in the position of governing sometimes seemed to pursue their private interests at the expense of the public interest. Moreover, even well-intentioned leaders often led their countries astray. Smith argued that it was not necessary to rely on government or on any moral sentiments to do good. The public interest, he maintained, is served when each individual simply does what is in his or her own self-interest. Self-interest, Smith argued, is a much more persistent characteristic of human nature than a concern to do good, and therefore provides a more reliable basis for the organization of society. Moreover, individuals are more likely to ascertain with some accuracy what is in their own self-interest than they are to determine what is in the public interest.

[1] Adam Smith, *The Wealth of Nations* (New York: Modern Library, 1937); originally published in 1776.

The intuition behind Smith's insight is simple: if there is some commodity or service that individuals value but that is not currently being produced, then they will be willing to pay something for it. Entrepreneurs, in their search for profits, are always looking for such opportunities. If the value of a certain commodity to a consumer exceeds the cost of production, there is a potential for profit, and an entrepreneur will produce the commodity. Similarly, if there is a cheaper way of producing a commodity than that which is presently employed, an entrepreneur who discovers this cheaper method will be able to undercut competing firms and make a profit. The search for profits on the part of enterprises is thus a search for more efficient ways of production, and for new commodities that better serve the needs of consumers.

In this view, no government committee needs to decide whether a commodity should or should not be produced. It will be produced if it meets the market test—that is, if what individuals are willing to pay exceeds the costs of production. Nor does any government oversight committee need to check whether a particular firm is producing efficiently: competition will drive out inefficient producers.

There is widespread consensus among economists that competitive forces do lead to a high degree of efficiency, and that competition does provide an important spur to innovation. However, over the past two hundred years, economists have come to recognize that in some important instances the market does not work as perfectly as the more ardent supporters of the free market suggest. Economies have gone through periods of massive unemployment and idle resources; the Great Depression of the 1930s left many who wanted work unemployed; pollution has choked many of our larger cities; and urban decay has set in on others.

WELFARE ECONOMICS AND PARETO EFFICIENCY

Welfare economics is the branch of economics that focuses on what were termed *normative issues* in Chapter 1. The most fundamental normative issue for welfare economics is the economy's organization—what should be produced, how it should be produced, for whom, and who should make these decisions. In Chapter 1, we noted that the United States and most other economies today are *mixed*, with some decisions made by the government but most left up to the myriad firms and households. But there are many "mixes." How are we to evaluate the alternatives? Most economists embrace a criterion called **Pareto efficiency**, named after the great Italian economist

ON THE PROWL FOR PARETO IMPROVEMENTS

Although finding Pareto improvements is difficult, economists are constantly on the lookout for such opportunities. Two recent proposals illustrate some of the problems that may be encountered.

One proposal concerned offshore oil wells. The federal government leases the land to oil companies in return for a royalty, usually around 16 percent. The oil companies compete for these leases in competitive auctions; the lease goes to the firm offering the highest bid. As oil wells get old, the cost of extraction increases, often to the point at which, with the royalty taken into account, it pays to shut down the well. If the price of oil is $20 a barrel, for instance, and there is a 16 percent royalty, it pays to shut down the well when the cost of extraction exceeds $16.80 ($16.80 plus the $3.20 royalty equals the $20 received). This seems inefficient, as the value of the oil ($20) exceeds the cost of production. Hence, there have been proposals to eliminate royalties on old wells and to allow the oil companies to pay a fixed up-front fee. The government is no worse off (because if the well is shut down it receives no revenue), and, provided the fee is set low enough, the oil company is better off (because if the well is shut down it receives nothing). The oil companies have resisted the proposal: they prefer that the government simply eliminate royalties. Although the proposal is a Pareto improvement over the status quo, they would prefer to garner for themselves more of the potential gains from the increased economic efficiency.

A second proposal involved allowing private companies to construct improved turbines at hydroelectric sites, increasing the energy output. They would be allowed to sell the electricity at market prices. Hydroelectric energy is particularly attractive, since it generates no pollution. There would be no adverse environmental impacts, as the developments would occur only at sites already being used. This too appeared to be a Pareto improvement: economic efficiency would be increased as cheaper hydroelectric power replaced power relying on fossil fuels; the benefits of the improved efficiency would be shared among consumers, investors, and the government; and future generations would be better off as a result of the more favorable environmental impacts. This proposal was opposed by utility companies that currently got electricity from these dams at below-market prices. Although the proposal did not alter the current level of preferential treatment, they were worried that once the principle that electricity from hydroelectric sites could be sold at market prices was established, their preferential treatment would be threatened. Even though the proposal as framed was a Pareto improvement, the utilities saw the long-run consequences of the proposal as a gain in efficiency at the expense of their future welfare.

and sociologist Vilfredo Pareto (1848–1923). Resource allocations that have the property that no one can be made better off without someone being made worse off are said to be *Pareto efficient*, or *Pareto optimal*. Pareto efficiency is what economists normally mean when they talk about efficiency.

Assume, for instance, that the government is contemplating building a bridge. Those who wish to use the bridge are willing to pay more than enough

in tolls to cover the costs of construction and maintenance. The construction of this bridge is likely to be a **Pareto improvement**; that is, a change that makes some individuals better off without making anyone worse off. We say "likely" because there are always others who might be adversely affected by the construction of the bridge. For example, if the bridge changes the traffic flow, some stores might find that their business is decreased, and they are worse off; or an entire neighborhood may be affected by the noise of bridge traffic and the shadows cast by the bridge superstructure.

Frequently, on summer days or at rush hour, large backups develop at tollbooths on toll roads and bridges. If tolls were raised at those times and the proceeds used to finance additional tollbooths or more peak-time toll collectors, everyone might be better off. People would prefer to pay a slightly higher price in return for less waiting. Even this change might not be a Pareto improvement, though: among those waiting in line may be some unemployed individuals who are relatively not concerned about the waste of time but who are concerned about spending more money on tolls.

Economists are always on the lookout for Pareto improvements. The belief that any such improvements should be instituted is referred to as the **Pareto principle**.

"Packages" of changes together may constitute a Pareto improvement, when each change alone might not. Thus, although reducing the tariff on steel would not be a Pareto improvement (because steel producers would be worse off), it might be possible to reduce the tariff on steel, increase income taxes slightly, and use the proceeds to finance a subsidy to the steel industry. Such a combination of changes might make everyone in the country better off, and make those abroad—the foreign exporters of steel—also better off.

PARETO EFFICIENCY AND INDIVIDUALISM

The criterion of Pareto efficiency has an important property that requires comment. It is *individualistic*, in two senses. First, it is concerned only with each individual's welfare, not with the relative well-being of different individuals. It is not concerned explicitly with inequality. Thus, a change that made the rich much better off but left the poor unaffected would still be a Pareto improvement. Some people, however, think that increasing the gap between the rich and the poor is undesirable. They believe that it gives rise, for instance, to undesirable social tensions. Less developed countries often go through periods of rapid growth during which all major segments of society become better off but the income of the rich grows more rapidly than that of the poor. To assess these changes, is it enough simply to say that everyone is better off? There is no agreement on the answer to this question.

Second, it is each individual's perception of his or her own welfare that counts. This is consistent with the general principle of **consumer sovereignty**, which holds that individuals are the best judges of their own needs and wants; that is, of what is in their own best interests.

THE FUNDAMENTAL THEOREMS OF WELFARE ECONOMICS

Two of the most important results of welfare economics describe the relationship between competitive markets and Pareto efficiency. These results are called the **fundamental theorems of welfare economics**. The first theorem tells us that if the economy is *competitive* (and satisfies certain other conditions), it is Pareto efficient.

The second theorem asks the reverse question. There are many Pareto efficient distributions. By transferring wealth from one individual to another, we make the second individual better off and the first worse off. After we make the redistribution of wealth, if we let the forces of competition freely play themselves out, we will obtain a Pareto efficient allocation of resources. This new allocation will be different in many ways from the old. If we take wealth away from those who like chocolate ice cream and give it to those who like vanilla, in the new equilibrium, more vanilla ice cream will be produced and less chocolate, but no one can be made better off in the new equilibrium without making someone else worse off.

Let's say there is a *particular* distribution that we would like to obtain. Assume, for instance, that we care particularly about the aged. The second fundamental theorem of welfare economics says that the *only* thing the government needs to do is redistribute initial wealth. *Every Pareto efficient resource allocation can be obtained through a competitive market process with an initial redistribution of wealth.* Thus, if we do not like the income distribution generated by the competitive market, we need not abandon the use of the competitive market mechanism. All we need do is redistribute the initial wealth, and then leave the rest to the competitive market.

The second fundamental theorem of welfare economics has the remarkable implication that every Pareto efficient allocation can be attained by means of a *decentralized market mechanism*. In a decentralized system, decisions about production and consumption (what goods get produced, how they get produced, and who gets what goods) are carried out by the myriad firms and individuals that make up the economy. In contrast, in a **centralized allocation mechanism**, all such decisions are concentrated in the hands of a single agency—the central planning agency—or a single individual, who is referred to as the *central planner*. Of course, no economy has even come close to being fully centralized, although under communism in the former Soviet Union and some of the other Eastern bloc countries, economic decision making was much more concentrated than in the United States and other Western economies. Today, only Cuba and North Korea place heavy reliance on central planning.

FUNDAMENTAL THEOREMS OF WELFARE ECONOMICS

- Every competitive economy is Pareto efficient.
- Every Pareto efficient resource allocation can be attained through a competitive market mechanism, with the appropriate initial redistributions.

The second fundamental theorem of welfare economics says that to attain an efficient allocation of resources, with the desired distribution of income, it is not necessary to have a central planner, with all the wisdom an economic theorist or a utopian socialist might attribute to him or her; competitive enterprises, attempting to maximize their profits, can do as well as the best of all possible central planners. This theorem thus provides a major justification for reliance on the market mechanism. Put another way, if the conditions assumed in the second welfare theorem were valid, the study of public finance could be limited to an analysis of the appropriate governmental redistributions of resources.

Why the competitive market, under ideal conditions, leads to a Pareto optimal allocation of resources is one of the primary subjects of study in standard courses in microeconomics. Because we will be concerned with understanding why, under some circumstances, competitive markets do not lead to efficiency, we first need to understand why competition, under ideal conditions, leads to efficiency. Before turning to this, though, it is important to emphasize that these results are *theorems;* that is, logical propositions in which the conclusion (the Pareto efficiency of the economy) follows from the assumptions. The assumptions reflect an ideal competitive model, in which, for instance, there are many small firms and millions of households, each so small that it has no effect on prices; in which all firms and households have perfect information, say, concerning the goods that are available in the market and the prices which are being charged; and in which there is no air or water pollution.[2] The accuracy of these assumptions in portrayal of our economy and the robustness of the results—the extent to which the conclusions change when the assumptions change—are two of the main subjects of debate among economists. In the next chapter, we look at some of the important ways in which markets fail to deliver efficient outcomes; that is, we identify important circumstances in which the ideal conditions underlying the fundamental theorems of welfare economics are not satisfied.

[2] There are also a number of technical assumptions.

EFFICIENCY FROM THE PERSPECTIVE OF A SINGLE MARKET[3]

We can see why competition results in economic efficiency using traditional demand and supply curves. The demand curve of an individual gives the amount of the good the individual is willing to demand at each price. The market demand curve simply adds up the demand curves of all individuals: it gives the total quantity of the good that individuals in the economy are willing to purchase, at each price. As Figure 3.1 illustrates, the demand curve is normally downward sloping: as prices increase, individuals demand less of the good. In deciding how much to demand, individuals equate the **marginal (additional) benefit** they receive from consuming an extra unit with the **marginal (additional) cost** of purchasing an extra unit. The marginal cost is just the price they have to pay.

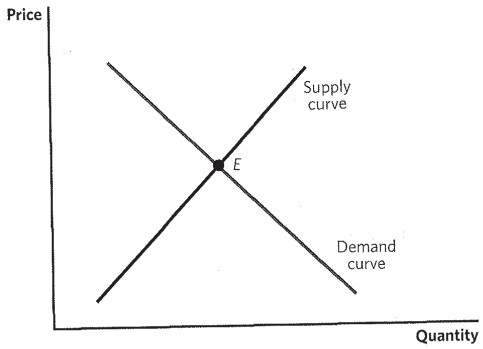
The supply curve of a firm gives the amount of the good the firm is willing to supply at each price. The market supply curve simply adds up the supply curves of all firms: it gives the total quantity of the good that firms in the economy are willing to supply, at each price. As Figure 3.1 illustrates, the supply curve is normally upward sloping: as prices increase, firms are willing to supply more of the good. In deciding how much of a good to produce, competitive firms equate the marginal (additional) benefit they receive from producing an extra unit—which is just the price they receive—with the marginal (additional) cost of producing an extra unit.

[3] This is often called the *partial equilibrium approach*, in contrast to the *general equilibrium approach* that looks at all markets simultaneously. We take the latter approach in the next section.

FIGURE 3.1

EFFICIENCY FROM THE PERSPECTIVE OF A SINGLE MARKET

In deciding how much to demand, individuals equate the marginal benefit they receive from consuming an extra unit with the marginal cost, the price they have to pay. In deciding how much to supply, firms equate the marginal benefit they receive, which is just the price, with the marginal cost. At the market equilibrium, where supply equals demand, the marginal benefit (to consumers) is equal to the marginal cost (to firms)—and each equals the price.



Efficiency requires that the marginal benefit associated with producing one more unit of any good equal its marginal cost—for if the marginal benefit exceeds the marginal cost, society would gain from producing more of the good; if the marginal benefit was less than the marginal cost, society would gain from reducing production of the good.

Market equilibrium occurs at the point at which market demand equals supply, point *E* in Figure 3.1. At this point, the marginal benefit and the marginal cost each equal the price; thus, the marginal benefit equals the marginal cost, which is precisely the condition required for economic efficiency.

ANALYZING ECONOMIC EFFICIENCY

To develop a deeper analysis that goes beyond the basic supply and demand framework just presented, economists consider three aspects of efficiency, all of which are required for Pareto efficiency. First, the economy must achieve **exchange efficiency**; that is, whatever goods are produced have to go to the individuals who value them most. If I like chocolate ice cream and you like vanilla ice cream, I should get the chocolate cone and you the vanilla. Second, there must be **production efficiency**. Given the society's resources, the production of one good cannot be increased without decreasing the production of another. Third, the economy must achieve **product mix efficiency** so that the goods produced correspond to those desired by individuals. If individuals value ice cream a lot relative to apples, and if the cost of producing ice cream is low relative to apples, then more ice cream should be produced. The following sections examine each of these types of efficiency in turn.

THE UTILITY POSSIBILITIES CURVE

In preparation for learning what is entailed by each of the three aspects of Pareto efficiency, the concept of the **utility possibilities curve** is useful. Economists sometimes refer to the benefits that an individual gets from consumption as the *utility* that the individual gets from the combination of goods he or she consumes.[4] If the person gets more goods,

[4] The concept of utility is only a useful way of thinking about the benefits that an individual gets from consumption. There is no way of measuring utility other than indirectly by looking at what individuals are willing to pay; no machine can ascertain the number of "utiles," or whatever the unit of measurement of utility might be called, derived from eating a pizza or listening to a CD.