

Suggested Readings

- Joyce Appleby, *Capitalism and a New Social Order: The Republican Vision of the 1790s* (New York: New York University Press, 1984).
- Samuel Bowles and Herbert Gintis, *Schooling in Capitalist America: Educational Reform and the Contradictions of Economic Life* (New York: Basic Books, 1976).
- Alan Dawley, *Class and Community: The Industrial Revolution in Lynn* (Cambridge, MA: Harvard University Press, 1976).
- Eric Foner, *Thomas Paine and Revolutionary America* (New York: Oxford University Press, 1976).
- Philip S. Foner, *Organized Labor and the Black Worker* (International, 1976).
- David M. Gordon, Richard Edwards, and Michael Reich, *Segmented Work, Divided Workers: The Historical Transformation of Labor in the United States* (Cambridge: Cambridge University Press, 1982).
- Greg Grandin, *The Empire of Necessity: Slavery, Freedom and Deception in the New World* (Picador, Reprint edition, 2015).
- Thom Hartmann, *Unequal Protection: The Rise of Corporate Dominance and the Theft of Human Rights*, 2nd edition (San Francisco: Berrett-Koehler, 2009).
- Morton J. Horwitz, *The Transformation of American Law, 1780–1860* (Cambridge, MA: Harvard University Press, 1977).
- Nancy Isenberg, *White Trash: The 400-Year Untold History of Class in America* (Viking, 2016).
- Peter Lindert and Jeffrey Williamson, *Unequal Gains: American Growth and Inequality since 1700* (Princeton: Princeton University Press, 2016).
- Grant McConnell, *The Decline of Agrarian Democracy* (Berkeley: University of California Press, 1953).
- Terrence McDonough, Michael Reich, and David M. Kotz (eds), *Contemporary Capitalism and Its Crises: Social Structure of Accumulation Theory for the 21st Century* (Cambridge, UK: Cambridge University Press, 2010).
- Samuel Rosenberg, *American Economic Development Since 1945* (New York: Palgrave Macmillan, 2003).
- C. Vann Woodward, *The Strange Career of Jim Crow* (New York: Oxford University Press, 1957).
- Erik Olin Wright, *Class Counts: Comparative Studies in Class Analysis* (Cambridge: Cambridge University Press, 1997).
- Howard Zinn, *A People's History of the United States* (New York: Harper & Row, 1990).
- Michael Zweig, *The Working Class Majority: America's Best Kept Secret* (Ithaca, NY: ILR Press, 2011).

Supply and Demand: How Markets Work

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Ibn Battuta, the great fourteenth-century Arab geographer, reported that long-distance trade occurred as follows along the Volga River in what is modern-day Russia:

Each traveler . . . leaves the goods he has brought . . . and [the travelers] retire to their camping ground. Next day they go back to . . . their goods and find opposite them skins of sable, miniver, and ermine. If the merchant is satisfied with the exchange he takes them, but if not he leaves them. The inhabitants then add more skins, but sometimes they take away their goods and leave the merchant's. This is their method of commerce. Those who go there do not know whom they are trading with or whether they be *jinn* [phantoms] or men, for they never see anyone.¹

Herodotus, the ancient Greek historian, describes similar exchanges—called *silent trade*—between the Carthaginians and the people of Libya in the fifth century BC. After having left their goods, Herodotus reports, the Carthaginians withdrew, and the Libyans “put some gold on the ground for the goods, and then pull back away from the goods. At that point the Carthaginians . . . have a look, and if they think there is enough gold to pay for the cargo they take it and leave.” Herodotus describes how the process continued until an acceptable price was hit upon, remarking with surprise that “neither side cheats the other . . . [The Carthaginians] do not touch the gold until it is equal in value to the cargo, and the natives do not touch the goods until the Carthaginians have taken the gold.”²

Silent trade is but one of the many ways that people have devised to engage in the process of exchange. Transfers of goods among strangers can range from gifts at one extreme, through mutually advantageous exchanges, to what might be called plunder at the other extreme. The potential gains from trade are often greater, the more distant geographically or socially are the parties to the exchange. The fact that the parties to a silent trade did not meet face to face helped to reduce the chances of outbreaks of violence among the often heavily armed traders.

¹Ibn Battuta, *Travels in Asia and Africa: 1325–1354* (London: Routledge and Kegan Paul, 1929), 151.

²Herodotus, *The Histories* (New York: Oxford University Press, 1998), 300–301.

Other kinds of trade are anything but silent. The trading floor of one of the world's stock markets is a din of offers and bids, and a fruit market in modern Nigeria resounds with the almost musical call of market women advertising their wares and the hum of haggling over prices. Other modern markets are as silent and anonymous as the silent trade. When you buy a shirt or a book online, the only sound you hear is the mouse click when you hit the shopping cart icon on your screen. Similarly, you can buy an entire basket of groceries at a supermarket without saying a word, and, in contrast to the Nigerian fruit market, the only need for verbal communication occurs when the checker asks if you want plastic or paper bags for your goods! If you buy an item online through an auction market (such as e-Bay), you will experience an entirely different kind of market: there you will compete with others in posting a price for a good, the sale going to the highest bidder.

Goods and services are exchanged in many different ways. Families exchange gifts at holiday times, individuals work at jobs in return for money, and one member of a couple cares for the kids while the other works for the wages that pay the rent. In each case, who gets what in return for what is determined in a particular way, sometimes by custom, sometimes by law, and sometimes by the competitive forces of supply and demand. The main idea of this chapter is that *competitive markets—an important form of exchange—can be analyzed using the concepts of supply and demand*. This idea is expressed in two key points:

1. *Competitive markets* consist of many potential buyers and sellers, each acting independently, with no one participant having enough power to dictate terms to any other.
2. The key concepts in understanding how competitive markets work are *supply curves, demand curves, and market-clearing*.

The Nature of Markets

A **market exchange** is a transfer to another party of the title to a good, or of the right to receive a service, in return for some form of payment on mutually acceptable terms.

A **market** refers to all the buying and selling activities of those persons willing to trade a good or service as long as the price is within an acceptable range; a market consists of suppliers potentially wanting to sell and demanders potentially wanting to buy.

A **market exchange** occurs when the owner of a good or service sells it to someone else. Selling it usually means that it is exchanged for money: the seller transfers ownership of the item to the buyer and receives money in return. The other side of the transaction is that the buyer pays money to acquire ownership of the good or service. If money is not involved in a transaction—that is, if one product or service is traded directly for another product or service—this is called *barter*.

A market exchange is thus a transfer to another party of title to a good, or the right to receive a service, in return for some form of payment on mutually accepted terms. To say that the terms of a market exchange are mutually accepted means that under the circumstances, both parties would rather make the exchange on the terms that are being offered than make no exchange at all.

People always have the right to refuse a market exchange. Therefore, by definition, all market exchanges that take place can be said to be *voluntary* in nature. But sometimes the right to walk away from an exchange does not mean much. For example, in principle a severe illness in your family may force you to sell much of what you own to pay the medical bills. It is not that someone is holding a gun to your head and telling you to sell your possessions, but sometimes circumstances can force people into exchanges they would otherwise avoid. (Recall Marlon Brando in *The Godfather* saying to one of his henchmen: “Make him an offer he can’t refuse.”)

The term **market** refers to the buying and selling activities of all those who are interested in trading (buying or selling) a particular good or service if the price is

within an acceptable range. Market activities are sometimes, but not always, concentrated in one location. Examples of markets with specific locations are the New York Stock Exchange and the Tokyo fish market. For other markets, however, there is no single specific place where you can “see” the market. For example, the Chicago labor market includes all the potential buyers and sellers of labor time who are meeting and coming to terms (or not coming to terms) anywhere in the Chicago area. A market, then, is not a place but rather a set of buying and selling activities.

Markets work to determine two basic economic outcomes: the *price* at which a good or service is exchanged and the *quantity* of it that will be bought and sold. These two outcomes affect many other aspects of society. The labor market, for example, determines not only wages (and hence living standards) but also the amount of employment (and hence also the number unemployed).

Each market has two types of participants: *demanders*, or those wishing to buy the good or service over some range of prices, and *suppliers*, or those wishing to sell the good or service over some range of prices. A market may comprise, say, two potential demanders facing three potential suppliers. This might occur in a local real estate market, if three people wish to sell their homes, and two other people are independently interested in buying any one of the three. Or the market might have a small number of suppliers and millions of demanders, like the market for computers. Some markets have thousands of suppliers and just a few demanders. An example is the labor market of a town with just a few large employers and considerable unemployment: many people will be seeking work (supplying their labor), but only the very few employers will be offering jobs (demanding labor).

In this chapter we focus on markets with large numbers of potential demanders and suppliers. Following in the tradition of Adam Smith, such markets are termed **competitive markets** since the rivalry of the different participants—each one competing to make an advantageous purchase or sale—greatly affects the actions of all the others. Many markets in the United States and throughout the world are not competitive in this sense. We explain the workings of markets with smaller numbers of competitors in Chapter 11.

The most important consequence of having large numbers of participants in competitive markets is that no one of them is powerful enough to influence the price at which goods will sell. If there were just one seller, for example, a large corporation, it could gain a higher price for its product by making less of it available. But this strategy is ruled out in competitive markets.

Competitive markets are those with many actual or potential demanders and suppliers.

Demand and Supply

We can understand how markets work by looking at the interaction of demanders and suppliers. We do this with the help of demand curves and supply curves.

Demand

A **demand curve** indicates, for each possible price, how much of the good or service demanders are willing and able to buy.

A *demand curve* is a graphical representation of the buyers' side of the market. It shows, for a given time period, such as a day, how much of a particular commodity the demanders of this product will want to purchase at each possible price, given their taste for the product and the amount of money they have at their disposal. Each point on the curve represents a particular combination of a price (measured on the vertical axis) and the corresponding quantity demanded (measured on the horizontal axis).

Consider, as an example, the market for a certain item, say, beer in Iowa City, Iowa. (In the remainder of this chapter we assume that the beer referred to is all of the same type and quality; in the jargon of economics, we assume that beer is a *homogeneous* commodity.) Imagine that we asked every person in Iowa City (and all those who might travel to Iowa City to buy beer), “How many bottles of beer would you buy today if the price were \$2 per bottle?” We would then add up all the answers. If the total came to 1,040 bottles, we would have one point on the demand curve: at a price of \$2, buyers will demand 1,040 bottles on this day.

We might then repeat the survey, asking buyers how many bottles they would buy, first, if the price were \$1 and, second, if it were \$0.50 per bottle. Suppose we obtained answers of 2,000 bottles at a price of \$1 and 3,760 at \$0.50. We would then have two more points on the demand curve for beer in Iowa City on this day.

In Figure 8.1 the demand curve D shows the various quantities of beer that buyers in Iowa City will demand on a certain day at all the possible prices, including the prices of \$2, \$1, and \$0.50 for which we obtained answers in our survey. It is important to remember that both the demand curve and the supply curve present answers to *hypothetical* questions. In the case of the demand curve, the question is, “If the price were to be _____, what quantity would you buy today?” As we will explain shortly, most of the combinations of price and quantity on the demand curve and the supply curve will not actually be chosen.

Demand curves are almost always thought of as sloping downward to the right, or having a negative slope, as does D in Figure 8.1. The economic reason for this is

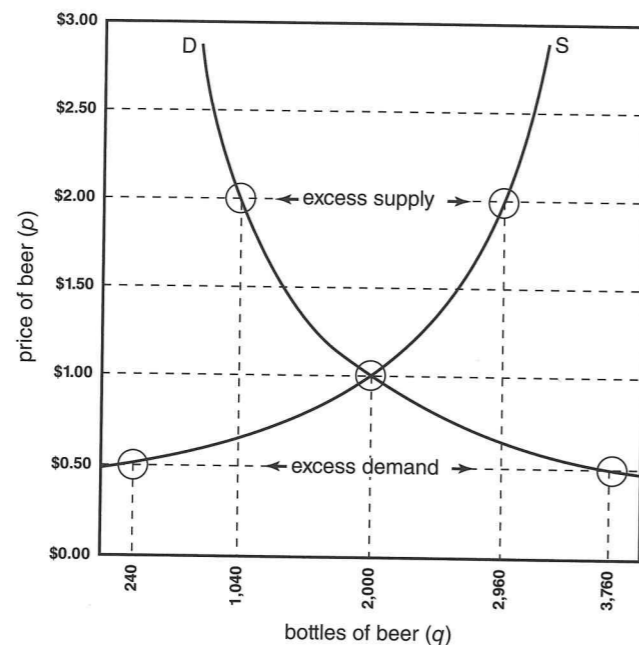


FIGURE 8.1 The demand curve and the supply curve.

The demand curve D provides the following information. If the price of beer per bottle is p dollars, the amount demanded by consumers will be q bottles a day. For example, if the price is \$2 a bottle, consumers will buy 1,040 bottles a day. The supply curve S provides similar information about what producers will offer on the market. If the price is p dollars per bottle, suppliers will offer q bottles per day on the market. For example, if the price is \$2 a bottle, beer suppliers will want to sell 2,960 bottles a day. Normally, demand curves slope downward (to the right) and supply curves slope upward.

that, in general, the lower the price, the more of the good buyers will want to buy. In our beer example (Figure 8.1), if the price is high, say, \$2 per bottle, then consumers will want to buy relatively few bottles per day. If the price is low, say, \$0.50 per bottle, they will buy a larger quantity each day.

Note that the demand curve does not represent what buyers *need*. It reflects only what they *want* and are *able to purchase*, given the *price* and their *incomes*. Adam Smith defined what is reflected in a market as “effectual demand” (saying that a poor man’s wish for a carriage drawn by six horses would not be an effectual demand), and modern economists have followed in his footsteps, defining “demand” simply as a want backed up by money.³ We cannot tell from D whether the buyers of beer are desperately thirsty after performing arduous labor or whether they have already had more beers than they should have had. Indeed, if there are some people in Iowa City who desperately want beer but have no money to buy it, their wants will not be expressed in D at all, since the demand curve expresses only what people are willing and able to buy. All the demand curve tells us is how much beer consumers will buy at any given price.

How much beer people want to buy will depend on many considerations besides the price. As we have noted, it will depend on the buyers’ incomes. If everybody suddenly got a pay raise, people might want to buy more of many things, including beer. Another factor is the number of potential buyers. If new people came to town, that would tend to increase the demand for beer. More importantly, demand will change with the strength of people’s desire—or, as economists put it, their “preference”—for a product. Thus, a consumer in Iowa City may want to buy more beer if she recently watched an effective beer ad on TV, or if the weather has just turned hotter. A final variable is the price of a competing product. For example, people might buy less beer if the price of wine suddenly dropped. Such products are termed *substitutes*.

A demand curve, then, expresses how much the buyers are willing and able to buy at the various possible prices, *assuming* that nothing else affecting their demand changes. If nothing else changes, the demand curve allows us to say how a change in the price will affect the quantity demanded. For instance, in Figure 8.1 we can see that if the price drops from \$2 to \$1 per bottle, *and if nothing else changes*, the quantity demanded will rise from 1,040 to 2,000 bottles a day.

Supply

A **supply curve** indicates, for each possible price, how much of the good or service suppliers wish to sell.

The **supply curve**, by contrast, represents the sellers’ side of the market. It depicts the suppliers’ willingness to sell beer at different prices, and this willingness to supply beer will depend to a large extent on the costs incurred by beer-producing firms. In Figure 8.1 the supply curve S shows, for a particular day, what quantity of beer sellers will supply to the market at various prices. For instance, if the price were to be \$2 on some day, suppliers would try to sell 2,960 bottles that day; at a price of \$0.50, suppliers would try to sell 240 bottles; and so on.

Supply curves are almost always thought of as sloping upward to the right (having a positive slope), as does the supply curve S in Figure 8.1. When prices are high, suppliers will want to sell a lot of beer compared to when prices are low. At higher prices it will pay to put on extra shifts of workers at the brewery. The high price may also attract new suppliers from nearby cities where sellers are not able to get such a high price. When the price is low, on the other hand, some suppliers in Iowa City may try to find other cities in which to sell their product; some of them might even stop producing beer.

³Adam Smith, *Wealth of Nations*, Book I, Chapter VII, eighth paragraph.

Other factors besides price influence how much of a product suppliers will want to sell at each price. The cost of producing beer compared with the rewards available from producing and selling other items will affect how much beer the suppliers will want to sell at each price. For example, if a labor-saving technical change occurs in the brewery industry, the cost of producing beer will fall, and the profits to be made in brewing and selling beer will rise. As a result more firms will be attracted into the industry and the amount supplied will increase. Similarly, if the grain used in making beer becomes more abundant, its price will drop, the costs of brewing will fall, and the quantity of beer supplied at each price will increase.

A supply curve, then, represents the quantities of a commodity that sellers will supply to the market at various possible prices, assuming that everything else affecting its supply remains unchanged. If nothing but the price changes, the supply curve tells us how the quantity of the good supplied will change when the price changes. In Figure 8.1, for example, if the price of beer rises from \$1 to \$2 per bottle on a certain day, suppliers will want to increase the amount they offer in the market that day from 2,000 to 2,960 bottles.

Some of the key factors determining the position of the supply curve include the technologies available for producing the good; the costs of the various inputs and how they vary with the amounts of the inputs used; and the number of firms producing the good, which may vary as the profitability of producing and selling beer varies relative to alternative business activities. (In a later section we discuss in detail what causes the supply curve to shift.) You may want to test your understanding of the supply curve by asking yourself how changes in any one of the above factors will shift the supply curve in Figure 8.1 either to the right or to the left. For example, what would happen to the supply curve if a new technology for producing beer were to be invented, one that would allow the same quantity of output to be produced with less labor?

MARGINAL COST All the influences that affect the position of the supply curve combine also to determine the **marginal cost** of a commodity's production. "Marginal cost" is defined as the *increase in the total cost incurred by a firm when it increases its total output of a commodity by one unit.*

To grasp the significance of the concept of marginal cost consider the following step-by-step reasoning: Small movements up a supply curve show, at each point along the curve, how much the price of a good must be increased to induce some supplier of that good to produce and offer for sale in the market one additional unit of the good. Even when the market price of something goes up, however, we know that no firm will produce an additional unit of the good in question unless the higher price covers the cost of producing an additional unit of it. Since the cost to a firm of producing an additional unit of a good is, in fact, its marginal cost, we can say that a supply curve shows not only the amount of a good that will be supplied at each price but also what the marginal cost of the good is for at least one firm in the market.

Of course, what happens in a market is not based on the decisions of a single firm. Indeed, the amount supplied in a market on any particular day will be the amount that results when the outputs of all the firms in the market are added together. The point here is simply to establish the idea that there is a marginal cost of producing and offering for sale one additional unit of a good. This concept will be important in Chapter 9, where we discuss the circumstances under which the market by itself produces what is best for society.

Average cost is the total cost of producing a certain number of units of a good or service divided by the total number of units produced.

AVERAGE COST The marginal cost of producing a product differs from the **average cost** of its production, which is defined as *the total cost of producing a certain number of units of a good or service divided by the total number of units produced.* While, at a particular level of output, the marginal cost is how much would be added to the total cost by producing just *one* additional unit, average cost is a measure of the cost of producing *all* of the units being produced at any given time.

In many cases both the marginal and the average costs of producing a commodity *rise* as more units of it are produced (beyond some minimum level of output). This is because, as production expands, crowding of existing facilities can raise the marginal cost of labor, making it more expensive to produce additional units of the commodity. For this reason the marginal cost curves for many commodities will be upward sloping to the right on a graph that has the number of units of output (per time period) on the horizontal axis and the corresponding marginal cost for each level of output on the vertical axis.

The reason average and marginal costs may rise with increasing output is easiest to see in agriculture or other natural resource-based industries. In these cases there is a limited amount of good land (or easily exploited natural resources), so production will be more costly at higher levels of output. This is because poorer quality land—or deeper mines or more remote forests—must be used.

However, there are also situations in which average cost *falls* as more is produced. Such a fall in average cost will result whenever there are **economies of scale**. Economies of scale exist when an increase in the number of units of output produced—an increase in the *scale* of production—brings about a fall in the average cost of a unit of output. Thus, as explained in Chapter 3, economies of scale produce *decreasing average costs* (as the quantity of output increases), and the two terms, since they refer to the same phenomenon, can be used interchangeably. To avoid confusion, however, we will generally use the term *economies of scale*, or *scale economies*.

Situations in which firms experience falling average costs (because of economies of scale) are common and important throughout the economy. Surprisingly, however, this familiar situation—in which average costs are falling—is discussed only briefly, if at all, in conventional economics textbooks, and we will see why in the next chapter. But first we must carry the discussion of supply and demand a bit further.

Economies of scale exist when an increase in the number of units of output produced—an increase in the *scale* of production—brings about a fall in the average cost, that is, a fall in the cost per unit of output.

Demand and Supply Interacting

We can now join the two strands of the story by explaining how supply and demand together will determine both the price of a good and the amount of it that will be traded (the *price* and the *quantity*). It will be useful here to refer once again to the hypothetical beer market in Iowa City and in the process to consult Figure 8.1 one more time (since it combines in a single graph both the supply curve and the demand curve for beer in Iowa City).

Of course, neither the buyers nor the sellers see the supply and demand curves. These are just analytical tools that *we* use to understand what *they* do. In most markets the sellers, not the buyers, set prices. Each seller sets a price assuming that a higher price will mean more profits per unit sold and that a lower price will mean more units sold. Depending on the demand curve, a move in either direction (that is, moving the price higher or lower) might increase the total amount of profits.

The price that maximizes profits will depend on what the other sellers are doing and how strong the demand is, two pieces of information about which a seller can guess

Marginal cost is the increase in the total cost incurred by a firm when it increases its total output of a commodity by one unit.

but cannot know in advance. The one thing that sellers do know and may act on is what happened in the recent past. If goods have piled up on their shelves, they may wish that they had been charging a lower price, and they will most likely consider reducing the price. Conversely, if they sold out before the end of the day (or the month), or if they have accumulated a waiting list of eager customers, they probably will be considering a price hike. Other sellers are engaged in the same trial and error method to get the price right.

To see how this process works, look at Figure 8.1 again and suppose that the average price of beer in Iowa City is \$2 per bottle. What will happen? As pointed out earlier, suppliers will wish to sell 2,960 bottles at this price, but demanders will want to buy only 1,040 bottles. The difference of 1,920 bottles is referred to as **excess supply**. Those suppliers who can find buyers at \$2 a bottle will be happy, while those who cannot find buyers at this price will be dissatisfied, and the second group will then offer slightly lower prices, say, \$1.75 or \$1.50 per bottle, in an effort to attract customers.

As long as excess supply persists, some suppliers will cut their prices in order to try to gain customers, and this will exert downward pressure on the market price. When the prevailing price has fallen to \$1 per bottle, the quantity that suppliers wish to sell (2,000 bottles) will be just equal to the quantity demanders wish to buy (also 2,000 bottles), hence there will be no more excess supply. Price cutting by suppliers will therefore stop at this price.

Now consider the opposite situation. If the initial price in the market had been \$0.50 per bottle, there would have been **excess demand**. As noted earlier, the demand for beer at this price would be 3,760 bottles, but the supply would be only 240 bottles, leaving an unmet (or “excess”) demand of 3,520 bottles. The supply of beer would fall short of the demand by this amount, and those unable to buy would tend to bid up the price. Excess demand would be eliminated only when the market price reached \$1, which, of course, is the same figure we arrived at in the analysis of excess supply.

Summing up, we can say that competition in the market for beer pushes the whole market toward a **market-clearing price**—the price at which sellers want to sell exactly the quantity that demanders want to buy. At such a price neither excess supply nor excess demand will exist, and the market is said to “clear.” In Figure 8.1, the market-clearing price in the Iowa City beer market is \$1, for at this price the quantity of beer supplied is precisely equal to the quantity demanded (2,000 bottles).

Figure 8.1 also shows that the market-clearing price and quantity are located at the *intersection* of the supply and demand curves. For this reason—and, as we shall see, only in markets similar to the one for beer in this example—it can be said that supply and demand *determine* both the quantity sold and the price at which it is sold, meaning, more precisely, that the particular positions of the supply and demand curves (and, of course, the factors that themselves determine the positions of these curves) determine the market-clearing price and quantity.

In a market such as the beer market, market clearing is often described as an **equilibrium** situation, and the concept of equilibrium is important in economic reasoning. It is used to describe *a situation in which there are no forces internal to the situation pushing it to change*. This concept is borrowed from physics, and it can be illustrated with a physical example: if one drops a marble into a bowl that is sitting on a table, the marble will roll around for a while, eventually stopping at the bottom of the bowl. The result is an equilibrium, for nothing internal to the situation (the location of the marble in the bowl and the shape of the bowl) will cause it to change. If one were to tilt the bowl or push on the marble, of course the marble would move, but these would be forces external to the situation.

Economists reason the same way. In the beer market the price and the quantity sold will remain at the market-clearing price and quantity until something from the

outside changes them. A change coming from the outside would be something like an increase in people’s taste—or, as economists like to say, their “preference”—for beer relative to other things such as wine. Such a change would bring about a rightward shift of the demand curve D , as will be more fully explained in the next section. Similarly, the adoption of a new technology for producing beer that reduces the cost of producing a bottle of beer would shift the position of the supply curve S downward. The resulting movements in these curves would change the market-clearing price and the amount of beer sold. But as long as the demand and supply curves remain in their present positions, the equilibrium price and quantity will not change.

It is a remarkable fact that there are some markets, including some very important ones, in which the equilibrium price is not the same as the market-clearing price. This means that in equilibrium the demanders have reasons why they do not offer a higher price than the current one, and suppliers likewise do not offer to sell at a lower price than the current one, and yet the quantity offered for sale is not the same as the quantity actually purchased. Nevertheless, the stability of an equilibrium situation (barring the appearance of any external, or *exogenous*, source of change) means that nothing an individual buyer or seller may try to do can change the equilibrium price or quantity.

In our Iowa City beer market example, the equilibrium price and quantity *are* the same as the market-clearing price and quantity. In that situation, none of the buyers or sellers of beer in Iowa City can benefit from any possible change in their behavior, given what all the other market participants are doing. For example, a buyer might like to pay less than the going price for a bottle of beer. But if such a buyer tried offering a lower price, no supplier would sell her or him any beer. Similarly, a supplier might like to sell beer at a price higher than the market-clearing price. But if any company raised its price, its sales would fall drastically, since similar beer would be for sale in the market at a lower price and this particular company’s customers would switch to other suppliers, especially if the company persisted in charging a higher price for a long period of time. (Recall that throughout this chapter we are assuming that any bottle of beer in the Iowa City market is exactly the same as any other bottle; although this assumption is somewhat unrealistic in this case, there are other commodities, such as wheat, corn, and milk, that are more like the *homogeneous* product in our example.) Thus, the prevailing market price (since it is available to anyone in the market) limits what any individual buyer or seller can do. This is the way a competitive market works.

In reality, of course, individual sellers will try changing their prices to see if they can do better. Even when there is no excess supply or demand, therefore, not all prices of a good will be the same. This may be confirmed by pricing beers at a few local stores or by checking the price of a book both at Amazon.com and BarnesandNoble.com. But it is not likely that prices of the same good will differ very much if there is a high degree of competition in the market for that particular good.

An important result of the analysis of the interaction of supply and demand in competitive markets is that *when a competitive market is in equilibrium, the price of the good will be equal to its marginal cost*. Another way of putting this is to say that in equilibrium $P = MC$ (where P stands for the price and MC the marginal cost). We will have more to say about this idea later, but the logic of it is as follows: If P is *not* equal to MC the amount supplied will change, so the market cannot be in equilibrium. To see this, imagine that P is greater than MC for some firm. A firm in this situation can gain by producing one additional unit, increasing its revenue by P at a cost of only MC . Similarly if P is less than MC for some firm, that firm can gain by producing one unit less (reducing its costs by MC but reducing revenues by only P). So the amount supplied by a firm will not change only if $P = MC$. Moreover, for the

Excess supply exists at a particular price when at that price more of some good or service is supplied than is demanded.

Excess demand exists when at a particular price more of some good or service is demanded than is supplied.

The **market clearing price** is the price at which buyers want to purchase exactly the quantity that sellers want to sell.

Equilibrium refers to a situation—a price and quantity exchanged—in which there are no forces internal to the situation pushing it to change.

market as a whole to be in equilibrium (recall the definition of an equilibrium) P will have to be equal to MC for every firm in the market.

Shifts in Demand or Supply

So far we have been considering how price and quantity are determined when the supply and demand curves are in a particular position. We have looked at each curve and asked how the quantity demanded or the quantity supplied would change in response to a certain change in the price. We will now consider what happens if something else besides the price changes.

For example, suppose that the demand curve D in Figure 8.2 represents the demand for beer in the middle of a certain semester at the University of Iowa. As the semester comes to an end and students leave campus for home, the situation will change, and smaller quantities of beer will be demanded in Iowa City at every possible price. This change is represented by a leftward *shift* of the whole demand curve from D to D^* (see Figure 8.2). On the other hand, a heat wave during the semester would have the opposite effect: it would shift the demand curve rightward by bringing about an increase in consumers' preferences for beer.

The demand curve plots how each price level determines the quantity demanded—but in a situation that is also determined by other factors that are not shown on the diagram.

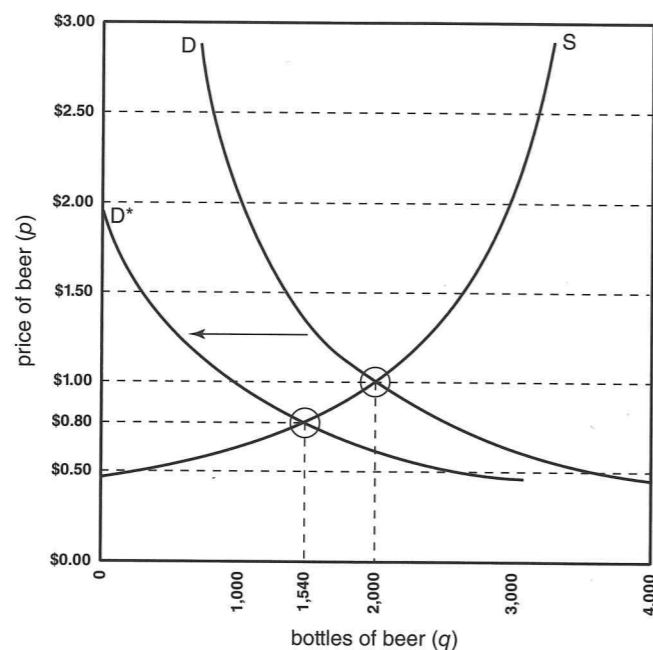


FIGURE 8.2 A shift of the demand curve.

When something other than the price changes, there will be a *shift* of the demand curve, either to the right or to the left. A *shift* of the demand curve is different from a *movement along* the curve, which is what happens when only the price changes. In this figure, D^* shows the position of the demand curve after it has shifted to the left, indicating that there is now less demand for beer at every price. It is also possible that, with a different change in one of the influences on the demand curve, it would shift to the right.

Thus a change in the price alone produces a *movement along* the demand curve, whereas a change in one or more of the conditions underlying the demand for the product (and therefore the location of the demand curve) produces a *shift* of the demand curve. As can be seen in Figure 8.2, the shift of the demand curve from D to D^* changes the market-clearing price from \$1 to \$0.80 per bottle and the quantity sold from 2,000 to 1,540.

Similarly, the supply curve for beer will shift if there is a change in something affecting supply other than the price. Suppose, for instance, that the price of the grain used in making beer rises. What will happen? The additional cost will reduce profits in the beer industry, and this will lead some suppliers to withdraw from the beer market, perhaps to utilize their resources in a more profitable industry. The higher costs will also cause other beer producers to scale back their operations in the hope that this will restore their previous level of profits. These two developments will shift the whole supply curve from S to S^* (see Figure 8.3). As can be seen in Figure 8.3, this shift in the supply curve, with D unchanged, will cause the market-clearing price to rise from \$1 to \$1.20 per bottle and the quantity sold to fall from 2,000 to 1,680.

As with the demand curve, a change in the price of the good creates a movement along the supply curve, whereas a change in something else affecting supply causes a shift of the entire curve. Shifts of a supply or a demand curve occur whenever one of the determinants of these curves' positions changes—whether it is, in the case of our beer market example, a new brewing technology, cheaper grain, a successful advertising campaign, or a change in the size of the relevant population. The determinants of the positions of supply and demand curves are summarized in Table 8.1.

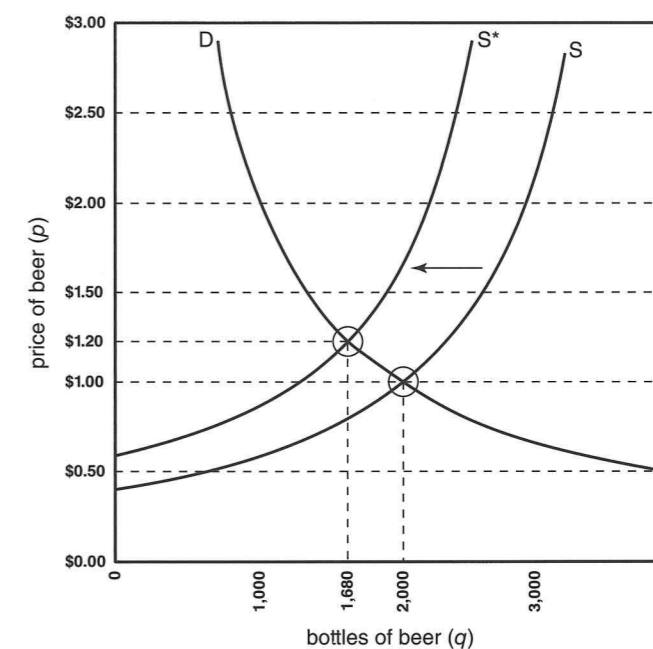


FIGURE 8.3 A shift of the supply curve.

When something other than the price changes, there will be a *shift* of the supply curve, either to the right or to the left. A *shift* of the supply curve is different from a *movement along* the curve, which is what happens when only the price changes. In this figure, S^* shows the position of the supply curve after it has shifted to the left, indicating that there will now be a smaller amount of beer supplied at every price. It is also possible that, with other changes in one of the influences on the supply curve, it would shift to the right.

TABLE 8.1. DETERMINANTS OF THE POSITIONS OF SUPPLY AND DEMAND CURVES

THE SUPPLY CURVE	THE DEMAND CURVE
Technology	Consumers' tastes or "preferences"
Costs of inputs, including the costs of obtaining the necessary permissions to use patented ideas, copyrighted material, etc.	Consumers' incomes and their distribution: more income at the high end will mean more demand for luxury goods; more at the low end will mean more demand for basics
Alternative opportunities for profit available to suppliers	Number of alternative products, and their prices, available to consumers
Number of potential producers	Number of potential buyers

Conclusion

Markets provide a way of coordinating economies by means of buying and selling, or exchange, relationships. Competition, both among buyers and among sellers, tends to produce a market-clearing price at which the quantity demanded equals the quantity supplied. The result is that market interactions determine both the prices of goods and the quantities of them that will be bought and sold.

But what does it mean to say that the equilibrium price of beer and the quantity of it that is sold are "determined by supply and demand"? This is a little like saying that a murder was committed by the gun. What actually determined the price and the quantity was whatever determined the positions of the supply and demand curves, because these determinants are what made a particular combination of price and quantity necessary to clear the market.

Supply and demand curves themselves do not do anything: they are even less involved than the gun. Rather, they are ingenious devices that help us understand and explain the many and complex influences on prices and quantities. The invention of supply and demand curves did not change the way markets work. However, it did lead to a better understanding of how markets function.

To summarize: Price and quantity are determined by all the factors that determine the positions of both the supply curve and the demand curve. The process of competition, in turn, works to make actual prices and quantities move toward equilibrium prices and quantities.

As we will see in later chapters, competition does not always cause markets to clear. There are some kinds of markets in which something like equilibrium prevails, and yet there is a persistent gap between the quantity demanded and the quantity supplied. In the labor market, for example, excess supply of labor (unemployment) can persist for long periods of time or even indefinitely. In Chapter 12 we explain exactly how the labor market differs from the market for beer, so that reductions in wages do not have the effect of clearing the labor market (that is, ensuring that everyone who wants a job has one).

When markets do not clear, supply and demand will influence the price and the quantity but can hardly be said to determine them, for there is obviously some other important influence at work if the market is not clearing. Our next chapter extends the analysis of supply and demand, explaining how markets may, under certain circumstances, coordinate the economy in beneficial ways, while, under other circumstances, they may fail to do so.

Suggested Reading

Alfred Marshall, *Principles of Economics*, 8th ed. (London: Macmillan, 1920).

Competition and Coordination: The Invisible Hand

9

In the late 1980s the governments of Poland, the Soviet Union, Czechoslovakia, and other Communist countries took a dramatic turn. Not only did they begin the process of granting voting rights and democratic freedoms to their citizenry, they also began to place more emphasis on markets rather than centralized economic planning as a way of coordinating their economies. The transition to market-oriented, mostly capitalist economies continued through the early 1990s, while the Soviet Union broke up into Russia and many other countries, Czechoslovakia divided into the Czech Republic and Slovakia, and Yugoslavia also fragmented into many small countries.

For more than seventy years in the Soviet Union and for forty years in the other countries, the government had made most important economic decisions. A system of economic planning had collected information and then implemented decisions on such issues as how much steel and other investment goods to produce, what technologies to use, how many schools to construct, what consumer goods to produce and how much of each, and how much workers, managers, doctors, and others should be paid.

These centrally planned economies initially had achieved major improvements in education, health, and other aspects of living standards, particularly for the less well-off members of their societies. But during the 1980s their governments began to implement major economic and political reforms in response to popular dissatisfaction not only with the lack of democratic rights but also with the slowdown or even reversal of economic growth. The most important economic reform was to allow private companies and individuals to make more economic decisions, and this meant relying on markets to coordinate millions of decisions.

The changes in economic approach in eastern Europe and the former Soviet Union dramatize the main idea of this chapter: *markets provide a way for individuals and firms to coordinate their many and complex economic activities, with no one in particular directing the process.* This idea is expressed in two main points:

1. By rewarding success and punishing failure, competitive markets provide a decentralized system of *motivation*; through market prices they also transmit *information* about the relative cost to society of various goods and services.

- Under certain circumstances markets *coordinate* the economy in ways that are generally beneficial. They do this when the individual's decision to buy a good is closely linked to the total benefit for society of having that good produced and used. But under other circumstances markets fail to perform this function well, and we describe such situations as *market failures*.

Adam Smith and Laissez-Faire Economics

In Chapter 2 we introduced Adam Smith as the eighteenth century political economist and philosopher whose book *The Wealth of Nations* (1776) was the most influential book on economics ever written. Smith developed the idea that the self-interested actions of individuals would create a system of competitive markets translating into material progress of all society. Certainly Adam Smith would have been pleased with the reforms in the former Communist countries, since they followed his inclination to let markets, not the government, coordinate production. In *The Wealth of Nations* Smith identified a basic challenge to society: how to coordinate the independent activities of large numbers of economic actors—producers, transporters, sellers, consumers—often unknown to one another and widely scattered across the world. This problem of coordination arises because no person is self-sufficient: everyone's livelihood requires a multiplicity of goods and services produced by others. This is much more true today than it was in Smith's era.

Smith developed the idea—radical in his day—that society could leave the coordination of the division of labor up to the individual self-interest of the economic actors themselves. This idea was radical because it asserted that a rational order might arise without any person or institution consciously attempting to create or maintain that order. The English philosopher Thomas Hobbes, writing a century before Smith, had advocated a powerful government as the only way to make order out of the chaos of the self-seeking activities of large numbers of people. Smith argued that markets could do the job as long as two conditions were in place: First, property rights must be well defined, to make it clear who owned what property, and therefore had the right to exchange it. Second, there must also be enough competition among economic actors so that no market was monopolized.

Smith explained how a system of competitive markets could translate the self-interested actions of individuals into results beneficial for society. This was a truly radical claim at a time when selfish behavior was regarded as immoral. Smith argued that while the self-interested activity of the farmer, the baker, or the barber may be based on greed, the pursuit of that greed will, under the right conditions, benefit all, even if most people care little or nothing for the well-being of their neighbors. The right conditions to produce socially beneficial results are well-defined property rights and competitive markets. Smith coined the phrase *the invisible hand* to refer to the tendency of markets to guide the economy toward the best use of its human and natural resources.

The key to all this is that the price of goods is a signal to producers. If the price of bread rises (for example, due to an increase in demand—a rightward shift of the demand curve), bakers are signaled that baking bread is now more profitable than before, and if they bake more bread, they will earn more money. If the price falls (due, for example, to an increase in supply—a rightward shift of the supply

curve), that signals bakers to bake less bread. No other announcement, instruction, nudging, or command is needed.

In Smith's view, then, markets would coordinate and regulate the economy, harnessing self-interest to achieve material progress for the whole society. Therefore, he thought the government, instead of trying to direct the economy, should leave well enough alone. This is roughly the meaning of the French expression *laissez-faire*.

Smith was partly right in one important sense and partly wrong in another. Under certain circumstances, letting prices guide economic activities through markets works fairly well. But in the more than two centuries since he wrote, we have learned that the circumstances under which markets work well are quite a bit narrower than he realized in the eighteenth century. We first look at how markets work when they work well, and then consider the conditions under which markets fail to work well.

Laissez-faire is an approach to economic policy that advocates a very limited role for the government, confining its activities to national defense and the enforcement of laws and contracts.

Coordination

The “production-reproduction cloverleaf” presented in Figure 4.1 is like an aerial photograph of the economy. It represents the horizontal dimension of the economy as a complex circulation of goods and services—and people. Things produced in one location end up being used in another. People born and raised in the home leave and take up employment in factories, offices, or their own businesses; sometimes they work in their own or other people's homes. The circulation of goods, services, and people is called the horizontal dimension because from this perspective things and people move from one place to another, a motion which is horizontal in nature. Understanding the horizontal dimension of the economy means explaining such movements of things and people, answering questions such as: Why do some people work at certain jobs and some at others? What determines who and how many will raise children, pour concrete, or make shoes? How do the shoes get from the shoe worker to the shoe wearer?

In various societies over the course of human history and around the world today, questions like these have been answered in very different ways. Consider, for example, a self-sufficient family farm on the American frontier in the early nineteenth century like the one described at the beginning of Chapter 7. Here most of the labor processes and movements of products shown in Figure 4.1 took place *within* a single household. Both the production of necessary inputs and the reproduction of people all took place (more or less) under one roof. Tools were made and repaired, draft animals were tended, a new fence was put up, food was prepared, firewood was collected, children were born and raised, and clothing was made—all of which meant that the farm was largely *self-sufficient*. What products were produced and how they were used was coordinated by a combination of custom, necessity, and patriarchal authority. Tasks were assigned according to age and sex. Though not common today, this is one distinct way of determining who will do what labor and how the resulting output will be used.

If each family does not produce everything its members use (if the family unit is not self-sufficient)—and this is true in most of the modern world—the situation is much more complicated. Most families, or their working family members, will specialize in a particular type of work, and families will have to engage in some form of *exchange* to get the goods and services they need. Various social arrangements will determine how labor will be specialized and how outputs will be distributed.

In India, for thousands of years the caste system has determined what kinds of work people do from birth. And although government affirmative action programs over decades have made some headway toward offering opportunities based on merit, not caste, nevertheless caste is still a factor in determining one's occupation. As mentioned earlier, in countries like the Soviet Union, it was central planners that determined the allocation of jobs and the distribution of output until the collapse of the Soviet-type system. Historically, in some societies, another method of organizing production and distribution was through an elaborate process of gift-giving; in still others theft or tribute played an important role. Caste, custom, plan, gift, theft, and tribute are all ways of determining what will be produced, for whom, and by whom. They are all different methods of *economic coordination*. While one or more of these factors play a part in most economies, by far the most important methods of economic coordination in the modern world are markets and planning. We refer to these as "coordination by rules" and "coordination by command."

Coordination by Rules and by Command

Seldom in history has anyone proposed so startling a notion as Adam Smith's concept of the invisible hand—that the economy, even if it is quite complex, does not need to be run by anyone at all. Another way of putting this is to say that the economy will run itself—if it is simply subjected to the right rules.

Imagine someone telling you that an invisible hand will coordinate the landings and takeoffs of planes at O'Hare Airport in Chicago (where there are, on an average day, around one hundred landings and takeoffs per hour). The advocate of the invisible air traffic controller might say, "We don't need the control tower. Pilots should just keep right and yield to traffic on their left or below them." Given this method for coordinating air traffic at O'Hare, we suspect that most people would decide to avoid air travel to Chicago.

Even though the amount of activity at O'Hare is awe-inspiring, the interactions that occur in a whole economy are infinitely more complex. In the United States, for example, the economy involves the interactions of approximately 30 million businesses, 125 million households, and 225 million adults, each of which make decisions every day that affect at least some of the others. Add the complexity of global economic interdependence into the picture, and one can easily see how daunting the task of coordination is—and how radical it was of Adam Smith to suggest that the economy need not be coordinated by anyone at all.

But Smith's notion of the invisible hand is not as preposterous as it sounds. Many of our interactions are, in fact, coordinated without a coordinator. Consider another traffic problem, this time for automobiles. In the United States we follow a simple rule—drive on the right—and it does a pretty good job of coordinating the interactions of millions of drivers passing each other every day.

The point is that coordination can be achieved by either of two means. One is **coordination by rules**, with no one dictating anyone else's precise behavior, but everyone observing a set of rules. The other is **coordination by command**, with someone (or perhaps more than one) directing the behavior of others. The basic difference comes down to obeying rules versus obeying orders. A rule specifies a range of behaviors appropriate in a given situation (drive on the right) without

specifying particular behaviors (where and when to drive). An order specifies a particular behavior (United flight 407 is to make a 90-degree left turn and land on runway 14A).

Which works better? Obviously, we need both types of coordination in our economy, by rules and by command, and the most appropriate method will vary with the situation. Adam Smith advocated the invisible hand because of his dissatisfaction with the particular kind of coordination by command that prevailed in eighteenth-century Britain. This involved, among other things, the government setting wages and prices, as well as creating large monopolies like the British East India Company. But even Smith acknowledged that the government should protect the nation from external enemies and assure internal justice with police and a system of courts. He also advocated that the government invest in bridges, roads, canals, and other "public works" (such as free education for all children) and proposed taxing alcohol to discourage drunkenness. And he was acutely concerned with the sometimes negative human consequences of the pursuit of economic gain. He worried, for example, that England might turn into a country of mindless robots if something were not done to alleviate the oppressive and mind-numbing conditions in its factories.

The Limits of Coordination by Command

We can understand how markets work if we first review two problems with coordination by command (planning), one having to do with *information* and the other with *motivation*. The individuals giving the commands (the planners) may not have enough information to do the job well, and those who are supposed to carry out their commands may have little motivation to do so. It is even possible that the planners themselves may have little incentive to do the job well.

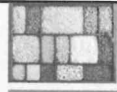
Air traffic coordination by command works well because all relevant information is available to the controllers on radar screens and computer monitors, and the pilots have a powerful motive to obey the controllers' orders: both their own and their passengers' lives depend on following the commands precisely. And, certainly, the controller has every reason to do the job well: a mistake might result in the loss of many lives as well as the loss of his job.

But in other situations neither the information nor the motivation is adequate. The central planners in the Soviet Union could not know the consumer tastes of its nearly 300 million inhabitants, so they could not make adequate decisions about what consumer goods to produce. Nor could they accurately determine the output capacity of each factory, mine, and office, so they could not assign production targets efficiently.

The problem in a large centrally planned economy is not exactly a *lack* of information: the consumers know more or less what they want, and the plant managers know more or less how much they can produce. So the information exists. The problem is that it is not in the right place: the relevant information is not readily available to the planners (the decision makers). Those who have the information may have an interest in keeping it from the planners or in lying to them. Consumers may wish to exaggerate their needs in hopes of getting more, and plant managers may want to understate their production capacities so that they will not have to produce so much.

Coordination by rules takes place when interactions are governed by general principles of behavior.

Coordination by command takes place when interactions are governed by orders specifying precise behavior.



Hunger Vs. Compulsion: Coordination by Rules And Coordination by Command

In England in Adam Smith's time, local governments were responsible for feeding the poor. In return for their food, poor people were required to work at particular jobs. This system, regulated by what were known as the Poor Laws, is an example of coordination by command.

Joseph Townsend (1739–1816), a geologist, collector of fossils, sometime physician, longtime Anglican parish priest, and prolific eighteenth-century writer, was one of the most severe critics of the Poor Laws. He thought it would be better to let hunger do the job of getting people to work. In 1786, a decade after the publication of Smith's *The Wealth of Nations*, Townsend wrote the following words in his essay *A Dissertation on the Poor Laws*:

Hope and fear are the springs of industry. . . . [But] what encouragement have the poor to be industrious and frugal . . . when they are assured that if, by their indolence and extravagance [and] by their drunkenness and vices, they should be reduced to want, they shall [then] be abundantly supplied not only with food and raiment but with their accustomed luxuries, at the expense of others. . . . In general it is only hunger which can spur and goad them on to labour. Yet our laws have said [that] they shall never hunger. The laws . . . have likewise said [that] they shall

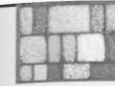
be compelled to work. But then legal constraint is attended with too much trouble, violence, and noise [and it also] creates ill will and never can be productive of good and acceptable service. Whereas hunger is not only a peaceable, silent [and] unremitt[ing] pressure but [is also] the most natural motive to industry and labor, it [therefore] calls forth the most powerful exertions. . . . The slave must be compelled to work, but the freeman should be left to his own judgment and discretion, should be protected in the full enjoyment of his own [wealth], be it much or little, and [should be] punished when he invades his neighbor's property. By recurring to those base motives which influence the slave, and trusting only to compulsion, all the benefits of free service, both to the servant and to the master, must be lost.

Anticipating by three centuries the arguments of some of today's advocates of "welfare reform," what Townsend was actually proposing in his *Dissertation* was a system of coordination by rules. The rules he was putting forward for consideration were: (1) you can eat only what you grow or buy and (2) you have no right to take anyone else's property, no matter how little you have or how hungry you are. The subtitle of Townsend's book was *By a Well-Wisher to Mankind*.

Source: Joseph Townsend, *A Dissertation on the Poor Laws* (Berkeley: University of California Press, 1971 [1786]), 23–24. Some punctuation in the

quoted passage has been slightly altered—and the words in brackets have been added—to assist the reader in following Townsend's train of thought.

The difficulties with coordination by command do not end with problems of information. The *motivations* of the planners and the other economic actors may also be a problem. In practice, so it was said, in the Soviet Union furniture factories would produce extremely heavy sofas, because their production quotas set by planners were measured by weight, not by the number of sofas. There was no lack of technological expertise—after all, the Soviets launched a man into space before the United States did—but there was not a strong motive for enterprises to serve the public conscientiously. As long as production quotas were met, managers seem to have been assured of their jobs. Even a good plan will not be implemented in the



The Key Role of Information

The late philosopher-economist Friedrich A. Hayek posed the challenge of how best to organize an economy as a problem of how to make the best use of information:

Which of these systems [central planning or competition] is likely to be more efficient depends on the question under which of them can we expect that fuller use will be made of the existing knowledge. And this, in turn, depends on whether we are

more likely to succeed in putting at the disposal of a single central authority all the knowledge which ought to be used but which is initially dispersed among many different individuals, or in conveying to the individuals such additional information as they need in order to enable them to fit their plans in with those of others.

—F. A. Hayek, "The Use of Knowledge in Society," *American Economic Review*, September, 1945.

way that best serves society unless both the plant managers and the workers have sufficient incentives to carry out the plan.

Given the problems associated with coordination by command, we need to examine the other main method of coordination in the modern world, coordination by rules. Adam Smith's idea was that markets can take the place of planning as long as two rules govern the economy: competition and private property. In an economy in which private property prevails, and in which most people are not self-sufficient, then, market activities—buying and selling—will have to play a major role in the economy. But under what circumstances will individual decisions about what to buy automatically benefit society?

The Invisible Hand

Adam Smith was not interested in the price of beer in Iowa City. He was interested in how the British economy should be organized: should it be run by royal decree, or should most economic outcomes be determined by the interactions of millions of buyers and sellers in competitive markets, with nobody in particular making the key decisions? He advocated the latter, a system of coordination by the rules of the competitive market. Since Smith's time his argument has been considerably refined, and some of its shortcomings have been clarified. The gist of it is quite simple, but to understand it at a deeper level we have to see what markets really do.

We are, however, not interested in what *particular* markets do: fish markets make fish available to consumers; housing markets make apartments and houses available. Rather, we want to know what markets do in general. As noted earlier, markets perform two important functions: they transmit economically important information and they provide the motivation to act on the information. Under ideal circumstances, then, markets address the two main shortcomings of coordination by command: they overcome the difficulties involving information and motivation.

In Adam Smith's Words . . .

[E]very individual . . . employs his capital [and] endeavours . . . to direct [it in such a way] that its produce may be of the greatest possible value. . . . [Thus] every individual necessarily labours to render the annual revenue of the society as great as he can. He generally, indeed, neither intends to promote the public interest, nor knows how much he is promoting it . . . [H]e intends only his own gain, and he is in this . . . 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.

—Adam Smith, *The Wealth of Nations* (New York: Random House, 1937), Book IV, Ch. II, 421.

The motivation the market provides is of two kinds. First, markets encourage consumers to try to meet their needs with goods that cost less than other goods that could also meet the same needs. People shop around for the best buy, seeking the good that will satisfy a particular need at the lowest available price. If, for example, a person would be just as happy with a hamburger as with a tenderloin steak, the relatively lower price of the hamburger will induce them to satisfy their hunger in the way that takes the smaller toll on society's resources.

Second, the market encourages producers, either companies or individuals, to economize on the use of inputs, by constantly seeking the lowest-cost inputs that will do the job. Since that is what society needs—to produce what it wants using no more of resources than necessary—society benefits when individuals or firms make such decisions.

Thus, both consumers and producers will seek to do something very sensible, namely, to conserve what is costly and use what is less costly, where we mean the cost to society. Nobody will require them to do this. They will do it simply because it is in their personal interest to do it. As Adam Smith implied, the market achieves its results behind the backs of the participants. This is the basic argument that supports his notion of the “invisible hand.”

The Invisible Hand in Action

The case for the invisible hand rests ultimately on the claim that even if all of the economic actors behave only with regard to their own self-interest, markets can allocate scarce economic resources in a desirable way. Advocates of *laissez-faire* (limited government) argue that competitive markets not only address the problems of information and motivation, but in so doing offer a method of coordination that is superior to central planning (coordination by command).

The beer market in Iowa City offers an example of how a competitive market can induce producers and consumers both to respond to a change in tastes and to economize on society's scarce resources. First, as in Chapter 8, imagine that the beer market is in equilibrium and that the market-clearing price is \$1 a bottle. Suddenly the U.S. surgeon general comes out with a report saying that drinking wine causes baldness. What will happen in the beer market?

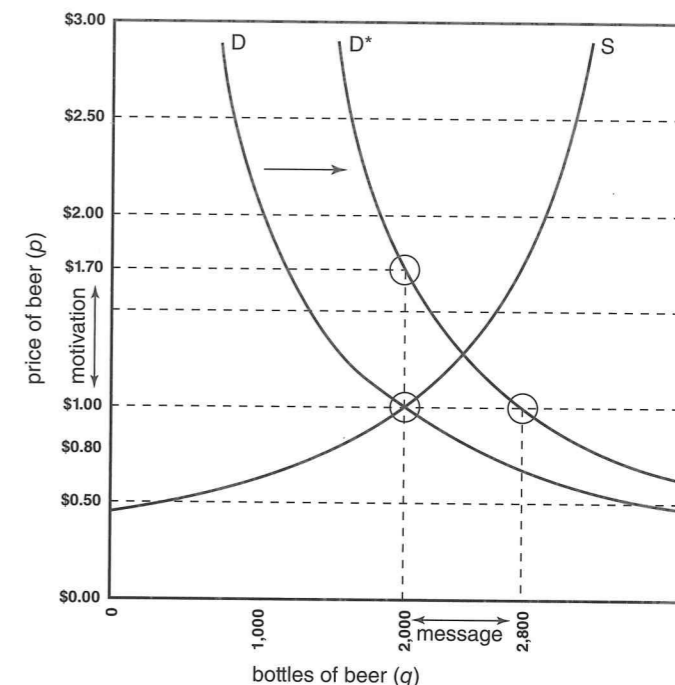


FIGURE 9.1 Market messages and market motivation.

The shift of the demand curve to the right (from D to D^*) initially creates excess demand in the hypothetical Iowa City beer market (see Chapter 8). As long as the price per bottle remains at \$1.00, excess demand of 800 bottles will now exist because the supply is only 2,000 bottles while the demand is for 2,800. The 800 disappointed customers will be willing to pay more for a bottle of beer, and the suppliers will be willing to produce more if the price rises. As the price rises, the market is sending the message: “More beer!” Suppliers can increase their total profits by selling more beer than before, so they will be motivated to supply more beer. Thus, the rising price is the *motivation* provided by the market.

As people switch from wine to beer, more beer will be demanded at each price, shown by a rightward shift in the demand curve for beer, from DD to D^*D^* (see Figure 9.1). The result is an excess demand for beer: At the price of \$1, producers are still willing to supply 2,000 bottles, but now the public demands 2,800 bottles, so there is excess demand of 800 bottles. If the price remains at \$1 at first, then producers only supply 2,000 bottles per day, and there will be a line of 800 disappointed customers, some of whom would have been happy to pay up to \$1.70 per bottle. But suppliers will be willing to produce more beer if the price rises. That is what it means that the supply curve is upward sloping: A higher price motivates suppliers to produce more bottles (for instance, perhaps because to produce more, they will have to pay some workers overtime for working extra hours, and the higher price will allow the beer producer to do this). Demanders who worry about not getting beer at all will also be willing to pay a higher price than \$1. The price therefore rises, and suppliers are then able and willing to supply more beer. Thus, in the form of the rising price the market is sending a message: “More beer!” Suppliers who respond to this signal can sell more beer and make more money.

The motivation to expand the production of beer comes from the opportunity now available to beer producers to make additional profit by selling beer at a higher price. The profit seeking of the beer suppliers will lead them to do not only what is

in their own interest, but also what is in the interest of consumers. Moreover, insofar as this process leads to the best possible use of the economy's resources, it may also be said to promote the interests of society as a whole.

To summarize: If excess demand exists, the market offers producers a *carrot*: higher total profits await those who grasp the meaning of the market's information and expand production. When excess supply exists, the market provides producers with motivation in the form of a *stick*: Some firms will need to go out of business and invest their resources in some other kind of business or other location. If they do not, all firms will suffer falling profits. In this way the market directs self-interested producers to do what is in both their interest and the interests of consumers, even if they are consciously only interested in their own success. This is the invisible hand in action.

How did the invisible hand overcome the two main shortcomings of coordination by command, namely, the planners' lack of relevant information and the absence of incentives either to plan well or to carry out good plans should they happen to occur? The answer is *decentralization*. Prices are the signals. They provide information about consumers' wants and producers' capacities and costs, and this information is communicated directly among all the market participants without first having to go through a central planning office. Also, the motivation to "do the right thing"—with regard to the efficient allocation of resources—is based simply on the self-interest of all participants. When all the players in the market seek the best possible deal for themselves, everyone benefits.

TABLE 9.1. PRICES ARE A DECENTRALIZED SYSTEM OF INFORMATION AND MOTIVATION

PRICES AS INFORMATION	
•	to consumers: the price measures how much it costs to produce an additional unit of a commodity.
•	to producers: prices measure how much demand there is for an additional unit of the commodity and how much it costs to acquire the necessary inputs.
PRICES AS MOTIVATION	
•	to consumers: prices, in conjunction with the need to stay within one's budget, motivate consumers to satisfy their wants as cheaply as possible.
•	to producers: prices, in conjunction with the need to make money in order to stay in business, motivate the lowest-cost production of goods and services that consumers want.

TABLE 9.2. THE INVISIBLE HAND: ASSUMPTIONS AND CONCLUSIONS

If the prices of goods, as they are sold to consumers, measure the ability of the goods to satisfy human needs, and
If the costs of producing goods, as measured by firms, take into account the social costs of acquiring and using the goods,
Then the profit made on each unit of a good (the price minus the cost per unit) will measure the social contribution made by producing each good, and
Hence the pursuit of self-interest (firms seeking greater profits and consumers trying to maximize their satisfactions) will result in a socially desirable allocation of our human and natural resources.

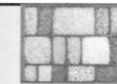
If all this sounds a little too good to believe, it is because we have not yet asked how well or poorly the invisible hand works if the ideal circumstances we have been assuming are not, in fact, present.

Problems with the Invisible Hand

A **market failure** is said to take place when the spontaneous interactions of buyers and sellers on markets each pursuing their own objectives results in outcomes that are different from the decision that society as a whole would make if it had all the information it needed to make the choice.

For the invisible hand to work well, the individual's choice of which product to buy must also be a decision that benefits society. What links these two? The answer is that if the price of each of the several products among which the consumer is choosing accurately reflects the cost to society of producing and using that product, then the individual will make the same decision that a well-informed planner (with good motives) would have made, and society will benefit. In that case, the link between individual decisions and benefit to society is strong, and the invisible hand works well; coordination through markets alone delivers benefit to society.

Unfortunately, as economists have learned, there are many kinds of situations in which markets do not perform so well. Individuals make decisions, but for a variety of reasons these decisions do not automatically benefit society. When this happens, we say a **market failure** exists. We will clarify these ideas shortly with a series of illustrations. But first, it is worth noting that if the invisible hand counts dollars spent on goods and services as votes for what society should produce, then people with more money have more votes. The box, "Voting with Dollars" points out a problem with this arrangement.



Voting with Dollars

It is sometimes said that markets are like elections, in which consumers "vote" with their dollars for the commodities they want. If a large number of dollar "votes" are cast for yellow shirts, a large number of yellow shirts will be produced. In a capitalist economy competition for profits will see to it that resources are allocated in such a way as to produce commodities in the proportions determined by dollar votes.

Voting for commodities in markets is an unusual kind of election, however, because some people vote

more times than others. If every dollar of household income had been cast as a vote in 2014, the average household in the richest fifth of the U.S. population would have had more than sixteen times as many votes (194,053) as the average household in the poorest fifth (11,676). Rather than the one-person, one-vote principle of democracy, this is more like an economic version of ballot-box stuffing.

Source: U.S. Census Bureau, Carmen deNavas-Walt and Bernadette D. Proctor, *Income and Poverty in the United States: 2014*. Current Population Reports, p60-252. September 2015. Table A-2: Selected

Measures of Household Income Dispersion: 1967 to 2014, available at: <https://www.census.gov/content/dam/Census/library/publications/2015/demo/p60-252.pdf>

Market Failure

To understand when the invisible hand works well and when it does not, we need to look at how individual economic decisions are linked—or not—to the benefit of society. What circumstances make individual decisions closely linked to social benefit, so that the market works well in coordinating economic activity? A key to the answer is our old friend, *information*. If the buyer chooses what and how much to buy based on all the information available to the whole society, then the invisible hand will work well. In many situations, however, the information on which the buyer bases her decision does not reflect the effect the decision will have on society.

First, the buyer herself needs to have accurate information. When I buy something, I need to know exactly what I am buying. How else can I know how much it is really worth to me (how much I should be willing to pay for it) and therefore how much resources society should devote to producing it? Everyone sooner or later buys something that turns out to be disappointing: a restaurant meal that causes indigestion, an electronic device that works poorly if at all, a medicine that has bad side effects, clothing that falls apart in no time, a car that is a lemon. In such cases, buyers have made bad choices because they lacked the information they needed to make good choices. Through no fault of their own, their spending tells society to use up resources producing something that is not worth the price paid for it. This is one kind of *market failure*: misinformation means that individual economic decisions do not automatically benefit society.

But in a capitalist economy, sellers often have little incentive to tell potential buyers all that is wrong with things they hope to sell, unless the law requires that they do. Information is therefore often a problem. Much advertising focuses on stirring emotions, not conveying information. On TV ads, serious and possibly fatal side effects of drugs are announced—as required by law—while actors smile broadly, fondle their pets, and glow with health, so that viewers pay little attention to any dire warnings.

There is another important way in which a mismatch can exist between what informs my individual buying decision, and what information should be the basis for society's decisions about how to use resources. Even when I have good information about how *I* will be affected, my buying decision may affect others (that is, society as a whole), in ways that my buying decisions will normally not take into account. In late 2015, Associated Press journalists exposed slavery in catching and processing of seafood (fish, shrimp, and so on) in southeast Asia. Some workers were literally kept in cages, and were physically prevented from leaving or even communicating with their families. They were beaten when they tried to complain, rebel, or escape.¹ Before these revelations, clearly buyers of seafood were unaware of these facts, and so did not consider slave labor in deciding whether to buy seafood. But society was most definitely harmed by these brutal and inhuman methods of producing seafood. (This story is told here in the past tense, but although about two thousand slaves were released and the reporters won a Pulitzer prize, there is no certainty at all that slavery has been eradicated, even in the southeast Asian seafood industry.)

The buyer pays for the seafood, but the cost to society is both the cost of physically producing the seafood (with low labor cost because the labor is enslaved), and the cost in the form of the misery suffered by the slaves and their families. Since the cost to

society is much higher than the cost to the seafood buyer, from the standpoint of society the price of seafood is too low, and society is putting too much of its resources into the slave seafood industry (it should not put *any*). Society would be better off putting its resources into some other economic activity. This is a market failure of a common kind. It also has a special name: an *externality*. It is so named because the purchase of the seafood has an “external” effect on someone who is neither directly the buyer nor directly the seller—in this case the enslaved workers. In fact, U.S. law prohibits imports of goods made with slave labor, but clearly the law was not being adequately enforced.

The invisible hand does not work well when the price facing the individual buyer does not reflect the cost to society. If the cost to society is higher than the cost to the buyer, then from the standpoint of society too much of the good is being bought, and so too many resources are being put into producing it. These resources could produce more benefit if used to produce something else.

Why, then, does the invisible hand of the market fail, in many situations, to coordinate economic activities in ways that produce desirable results? The general answer is that people affect one another's well-being in countless ways, and market prices often fail to take into account all the effects of our actions on others. In small groups, such as families and friendships, we typically consider the costs and benefits of our actions not only with regard to ourselves but also as they might affect the others we care about. Such consciousness, also known as altruism, is an essential part of social life, but it obviously does not prevail when we are interacting with large groups of strangers, about whom we may know little and care less. Still, a concerted campaign to get people to systematically refuse to buy products made with slave labor, or products with strongly negative effects on society, can sometimes be successful. If people believe others are going to act out of conscience, they will sometimes do so, too.

The underlying assumption of the invisible hand is that *if prices are right*, all the effects of people's actions on one another will be taken into account in the prices of goods and services. Thus, Adam Smith's theory (including its modern version) holds that—if we assume (as Smith did) that the existing distribution of wealth is acceptable—coordinating an economy with markets will bring about an optimal allocation of society's resources. Proponents of the invisible hand theory offer examples such as the following to support the theory: When a certain consumption choice, say, ordering a tenderloin steak, uses up a lot of society's resources, that consumption choice will be appropriately paid for in the price of the steak. This is because the consumer will be paying a price that is exactly the amount it cost to produce that tenderloin steak.

The problem is that *prices are often not right*. Consider the tenderloin steak. Most industrially fattened cattle are routinely treated with antibiotics as a way to prevent disease among hundreds or thousands of cattle crowded together in a feedlot. But using antibiotics constantly on a massive scale causes bacteria to evolve that are resistant to antibiotics. Already they are becoming more common. A likely future scenario (not necessarily that far away) is that bacteria resistant to *all* known antibiotics will exist, spread, and fatally infect humans, because there is no antidote. The one who buys the tenderloin steak may not know this, and it may not affect his choice to buy it. But society will pay the price for future illness and mortality.

Negative Externalities as Market Failures

In the case of the steak, we say the market for steak has a *negative externality*. The buyer and the seller of the steak are the two people directly involved in the sale of the steak, and neither one is directly hurt (much) by the fact that the transaction has made

¹Public Broadcasting System Newshour, “How the AP Uncovered Secret Slavery Behind the Seafood in Your Supermarket,” April 20, 2016, at 6:20 PM EDT, available at <http://www.pbs.org/newshour/bb/how-the-ap-uncovered-secret-slavery-behind-the-seafood-in-your-supermarket/>.

a little more likely the chance of a future outbreak of drug-resistant disease. It does this by signaling feedlot owners that using antibiotics routinely on cattle will result in saleable meat. But society will definitely be affected by an outbreak that will cause pain and suffering to many. These people, and the effects on them, are *external* to the transaction and have no say in it. Hence we say the market has an *externality*, and since the higher likelihood of disease is a negative outcome, we call it a *negative externality*. Of course, individual consumers could make the decision to stop buying meat altogether, or only to buy antibiotic-free meat. But fish farms also liberally use antibiotics; and many cattle are also given hormones, which European Union authorities, at least, clearly believe carry negative externalities, and therefore ban such meat.

As is now widely known, the decision to buy and burn gasoline also has a negative externality: it produces air pollution, which harms asthma sufferers and others, imposing both medical expenses and lost work time on them and their caregivers. It also produces greenhouse gases that contribute to global warming (see Chapter 1). Global warming, in turn, increases extreme and destructive weather patterns, like floods, drought, wildfires, and windstorms—and these cause damage, death, and injury. The increased lung disease, and the injuries and deaths and destruction caused by worsening weather, are all *external* effects of people's decisions to fill up their gas tanks and drive. These costs are imposed on society, but at most only a tiny bit of that cost falls on the buyer or seller of gasoline. Here again, the individual decision is delinked from the benefit to society by the fact that a negative externality exists. Buying and burning the gasoline is far more costly to society than it is to the buyer. In this situation, society (through the individual decisions of many buyers of gasoline who do not take account of the costs to society) is putting far more resources into the production of gasoline than it should.

In all these cases there is a discrepancy between (a) the costs borne or benefits received by the decision maker and (b) the costs and benefits experienced by all the members of society. The costs and benefits accruing to the decision maker are referred to as the **private costs** and benefits of the activity in question, whereas when added together all the costs and benefits experienced by everyone (again including the decision maker) are termed the **social costs** and benefits.

How can this be fixed? If the government places a large enough tax on a gallon of gasoline, one equal to the damage caused by producing and burning that gallon, then the individual buyer will have to take account of the full cost to society, because the individual buyer will have to pay the tax equivalent of the social cost. Those who advocate this actually call for a tax not just on gasoline but on anything that produces carbon compounds such as carbon dioxide and other greenhouse gases. Such a *carbon tax* would “internalize the externality,” that is, force buyers to pay a cost equivalent to the costs to society, so that they take into account these costs in deciding how much gasoline to buy. The tax can make the private cost equal to the social cost. For instance, currently jurisdictions at various levels in the United States are being urged to pass carbon taxes, as a way of slowing global warming. This more or less would restore the effectiveness of the invisible hand, provided it were also done with *all* negative externalities, not just the one from buying and burning gasoline.

Positive Externalities as Market Failures

There is also such a thing as a *positive externality*. The clearest way to understand this is to consider the *benefits* of a transaction. If you buy a college education, you expect to get a great deal of benefit out of it in the form of future earning power,

along with the joy of learning and of making lifelong friends. But does society also benefit? Certainly—because educated people contribute to the development of technology, that usually benefits everyone. They also contribute to public debate and to the general availability of sound information on which to base public policy decisions. So those not involved in the decision to pay for an education, namely, the general public, enjoy the *positive external effects* of your decision to get an education. Thus we say that education has *positive externalities*. The social benefits exceed the private benefits.

Similarly, if you get a vaccination against a communicable disease (like measles or whooping cough), those who have not gotten the disease are then a little less likely to get it. This is a positive externality. To internalize positive externalities like college educations and vaccinations, they should be subsidized, that is, sold at a price lower than the cost of producing them—because without the subsidy, their private cost is higher than their social cost.

Thus an externality can be either positive or negative. It is positive if the external effects of a transaction are beneficial to others. It is negative if the external effects impose costs on others.

Important sources of positive externalities are education, the production of knowledge, the introduction of new technologies, and vaccinations. Important examples of negative externalities are pollution, other kinds of environmental degradation, and automobile traffic congestion in metropolitan areas. Table 9.3 lists some examples of positive and negative externalities.

TABLE 9.3 POSITIVE AND NEGATIVE EXTERNALITIES

ACTION	EXTERNALITY	PRICE NOT EQUAL TO SOCIAL COSTS/BENEFITS
Drinking too many beers	The costs of alcohol abuse on families, friends, and medical providers	The price of the beer does not reflect such negative externalities
Driving a car	This can contribute to traffic congestion, and it also causes environmental degradation from both the production and the use of fossil fuels	The price of the gas used does not reflect these negative externalities
Research	The benefits of any good ideas produced will most likely be enjoyed by other people or companies	Any increase in the profits of the firm that supported the research—or rise in the salary of the individual who conducted it—may not take into account all the benefits of the resulting knowledge enjoyed by others
Education	The benefits of one person's education are enjoyed by neighbors and workmates	The individual benefits (higher earnings) do not capture the positive externalities enjoyed by others
Training employees	Some employees will move to other firms, the owners of which will benefit from the training paid for by the firm that did the training	The training firm's profits do not reflect the benefits flowing to other firms with the workers who move
Wearing a \$500 watch (luxury consumption)	This may have the effect of lowering the (relative) status of others, creating envy	The \$500 price of the watch does not include the status and envy costs imposed on others

Private costs are the costs borne by the user of a good or service (a person or a company), while the total costs borne by all members of a society are termed **social costs**. At best, prices only measure private costs.

Monopoly as a Market Failure

We have already learned that for the invisible hand to work well, the information that informs the individual buyer's decision must coincide with the information that would inform the whole society's decision about what to produce and therefore how to allocate productive resources to do so. We know that if the individual decision maker has misinformation about the quality of the product, that alone can break the equivalence between individual decision and social benefit.

Another way in which that link, or equivalence, can be broken is if the price that faces the individual buyer exceeds the cost of producing one more unit of output. This happens if the market has just one monopoly seller, or a few large firms. The invisible hand argument assumes that markets are competitive, with many actual or potential buyers and sellers in every market. Given this assumption, no producer can charge more than the marginal cost of producing a particular commodity. In the real world, however, many markets are not competitive.

In the case of a *monopoly*, a single producer with no actual or potential competitors can raise the price buyers must pay for its product without fear that its customers will switch to buying from another supplier. The only ones who will buy it are those who are both willing and able to pay a high price for it. An obvious example is patented drugs for which the patent owner—typically a giant drug company—charges a price many times the cost of producing it. A monopoly has *market power* since it can raise the price of its product merely by producing (and selling) less of it. This will create an artificial scarcity in the market for the product and drive up its price. In this situation the price charged will be higher than the marginal cost, and therefore less of it will be bought—and produced—than would be true if society decided how much to produce, based on the cost of producing an additional unit of it.

Of course, if there were other firms that could produce the same product, they would enter the market, would compete for customers by charging a lower price, and would continue doing this until the price of the product fell to its marginal cost. It is this process that leads to the result that in a competitive market, the market-clearing price will be equal to the marginal cost ($P = MC$) in every firm. But with barriers to the entry of new firms, which is what makes a monopoly a monopoly, a monopolist does not have to fear competition from new firms. The workings of markets that are not perfectly competitive are discussed in Chapter 11.

Economies of Scale as a Market Failure

Prices often exceed marginal cost for yet another reason, one of great importance in the electronic age. To see this, ask yourself what is the marginal cost of an eBook. Chapter 8 explained that marginal cost is just the increase in the total cost that a producer incurs by producing one additional unit of output. Since it costs almost nothing to give one more person access to an existing electronic document, the marginal cost of an eBook is very close to zero, possibly a matter of just pennies. Even if the publisher makes a royalty payment to the author for each copy sold, the marginal cost will still be low—considerably less than the *average* cost of production of the book.

Recall that the average cost is the total cost divided by the number of units produced. The total cost has two distinct parts. The larger cost is for all the labor and materials that are used in just producing the very first copy of the book. This includes the cost of writing, designing, editing, typesetting, and producing the book, including the cost of professional-looking artwork as well as the required payments

for permission to use any copyrighted material, and any interest paid to the bank on loans, rent for the use of production facilities, and the costs of advertising and distribution (which need to be set into motion before the book is actually published). Such costs do not vary with the number of electronic units produced.

The invention of the printing press was an enormous advance in making information widely available. The fact that the *marginal cost* of reproducing and distributing the electronic document is very close to zero is another great boon to society. It means that it is far cheaper to make the book available to thousands or millions of people than before. However, it also creates a problem for the publisher.

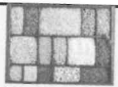
For society, the cost of producing/distributing one more book is nearly zero. But the publisher who sets the price at marginal cost will never recoup the costs incurred in producing the first copy: writing, typesetting, and putting the book into the electronic form that works with eBook software. Setting the price at marginal cost will make the publisher lose money. The publisher needs to recover at least the *average cost* per copy of the eBook. If the up-front costs are \$100,000 and the cost of making the eBook available to one more customer is \$1, then if the publisher sells 10,000 copies of the eBook, the break-even price (the average cost) would be \$11 ($\$100,000/10,000 + \1); in order to make a profit the publisher would have to charge perhaps a dollar more.

An industry like this with large up-front costs and a marginal cost that is constant, or at least not rising, has *economies of scale*. The average cost falls as those large up-front costs are distributed among a larger and larger number of units sold. If there are economies of scale in an industry, the average cost always exceeds the marginal cost (because it includes the marginal cost plus a piece of the up-front costs).

The eBook industry, with its economies of scale, is an example of a market failure. Society could get the benefit of the low marginal cost if the publisher could sell at marginal cost without going bankrupt, or if the publisher were a state-owned enterprise and could pay for its costs partly out of tax revenue, so that bankruptcy was not a danger. But the need to make a profit makes it impossible for society to get the full advantage of a production process with economies of scale. In effect, *the invisible hand is not working* in this case.

Notice that the production and sale of the eBook is also happening within a monopoly, namely, the copyright that the publisher holds, which legally protects the publisher's sole right to reproduce it unless the copyright holder grants that right (usually in exchange for money). If it were legal for others to copy the eBook, then they could do so for the marginal cost, and the publisher could no longer succeed in charging a higher price—and with the prospect of losing money, might not undertake to publish the eBook at all. And if electronic copies circulated at such a low price, and most people acquired works in that form, then the publishing industry might find itself struggling to survive, which itself could affect society in a way that many would regret.

The phenomenon of economies of scale provides but one more way of explaining why markets fail. If we put all of the explanations of market failure together—inadequate pricing, externalities (spillovers), incomplete contracts, market power, and economies of scale—we arrive at a more complete understanding of the concept of market failure. We can regard as a market failure any situation in which the market interactions of buyers and sellers result in outcomes that are undesirable either to individuals or to society as a whole. The accompanying box (“The Invisible Foot . . .”) provides a list of some of the more common types of market failure.



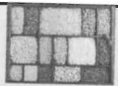
The Invisible Foot: When Markets Fail

Market failures occur when the market interactions of buyers and sellers result in outcomes that do not make society as a whole better off, even though individual buyers believe they are making good decisions for themselves. Market failures result

- when markets are controlled by a small number of buyers or sellers. (For example, when there is a single monopoly seller, the price charged for a good will exceed the cost to the firm of producing another unit of the good.)
- when environmental degradation or other negative externalities resulting from either production or consumption occur. If it is in production (like air pollutants emitted from factories), then the cost to the firm of producing another unit of the good will be lower than the cost to society; the private cost will be lower than the social cost.
- when positive externalities are present. Here, the benefit or cost to the individual consumer will not accurately measure the benefit or cost to society as a whole. An example is when the education one person gets has beneficial effects on society by making public discussion better informed.
- when people's needs are not reflected in market demands. This may happen when individuals, such as homeless people, do not have enough money to purchase necessities (like housing) for themselves in the market.

The type of market failure that stems from economies of scale leads at least some countries to avoid relying on privately owned companies for the supply of such things as electric power generation, transportation networks, and phone systems, all of which are usually characterized by economies of scale. Such countries choose, instead, to have either their governments or regulated enterprises carry on these types of economic activities. Whether these solutions work better in practice than private production without regulation depends on the nature of the government in question.

The fourth category of market failure listed in the "Invisible Foot" box raises, again, the issue of efficiency and income distribution discussed in Chapter 3. The question is whether one can say that an economy is efficiently allocating a society's resources if some people have huge incomes while others do not have enough income to provide for their most basic needs. The box on "Sleeping Sickness" provides a concrete illustration of the issue that was brought out earlier in the box "Voting with Dollars."



Sleeping Sickness: "It Really is a Failure of Capitalism."

Sleeping sickness is a horrible disease common in Africa; it attacks the brain, driving sufferers insane before killing them. Spread by the tsetse fly, in the late 1990s it struck over a quarter of a million people each year. A key drug in curing one variety of the disease is eflornithine, combined with

another drug in the second stage of the disease. It is so effective that even comatose sleeping sickness patients have been revived, earning it the name "resurrection drug."

Wonderful news. A triumph of modern medicine? Not exactly. Eflornithine began as an anti-cancer

drug in the 1970s that failed. By 1990 eflornithine was known to be good for treating sleeping sickness, but production ceased in 1995 because a drug that saves mainly poor people is unprofitable; the people who need it cannot afford it. It was saved from oblivion only when the Bristol Myers Squibb Company found a profitable use for it as the main ingredient in Vaniqa, a cream that removes women's facial hair.

Maladies like the 17 Neglected Tropical Diseases (NTD) identified by the World Health Organization, including sleeping sickness, river blindness, and guinea worm disease, ruin the lives of many in poor countries, yet the market does not deliver remedies. Pharmaceutical companies worldwide sell only 1 percent of what they produce in Africa, but three-quarters of their output to the United States, Europe, and Japan, with less than a fifth of the world's population. And only a tiny portion of private firms' medical research is focused on diseases endemic to poor countries. Just 1 percent of drugs licensed worldwide between 1975 and 1997 were for tropical diseases.

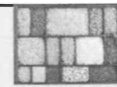
Where markets failed to solve this problem, the Neglected Tropical Diseases initiative, a public-private partnership announced in 2012, has stepped in. The World Health Organization, a leader in it, has been implementing a plan to combat such diseases, aided by drugs donated by major drug companies.

Sources: Michael Kremer, "Pharmaceuticals and the Developing World," *Journal of Economic Perspectives*, Fall 2002, pp. 67–90; Donald McNeil, "Cosmetic Saves a Cure for Sleeping Sickness," *New York Times*, February 9, 2001, p. A1; *NOW with*

Guinea worm disease (dracunculiasis), for instance, is now down to just twenty-two reported cases in 2015, with hope of eradication by 2020.

The Bill and Melinda Gates foundation also funds efforts to reduce the incidence of disease in Africa. Over a decade ago, on his PBS show *Now*, Bill Moyers asked Bill Gates, "What does it say to you that 11 million children, roughly, die every year from preventable diseases? What does it say to you that of the 4 million babies who die within their first month, 98 percent are from poor countries? What do those statistics tell you about the world?" Gates replied, "It really is a failure of capitalism. You know, capitalism is this wonderful thing . . . But in this area of diseases of the world at large, it's really let us down." Moyers then countered: "But markets are supposed to deliver goods and services to people," and Gates responded, "and when people have money it does . . . Here what we have is . . . not only don't the people with money have the disease, but they don't see the people who have the disease. If we took the world and we just reassorted each neighborhood to be randomly mixed up, then this whole thing could get solved. Because you'd look out your window and you'd say, you know, there's [a] mother over there whose child is dying. You know, let's go help that person."

Bill Moyers, PBS, May 9, 2003; "Dracunculiasis Surveillance Programmes Respond Strongly to Rumors, While Cases Plummet," available at http://www.who.int/neglected_diseases/news/surveillance_programmes_respond_to_rumours/en/.



Private Incentives, Public Benefits

Until early 2003 the congested traffic in central London crept along at a snail's pace. Facing near gridlock, Mayor Ken Livingstone tried a radical solution: charge those driving private cars for the congestion they impose on others. In February 2003 the city imposed a fee of \$8 a day for driving a car in the central part of London except central London

residents. A computer system kept track daily of who had paid (one could pay by texting, or in other ways). License plate number-recognition devices installed throughout the central part of the city nabbed scofflaws.

Traffic congestion costs that are imposed on others are examples of negative externalities (like the

costs of pollution). Livingstone's plan forced drivers to take these costs into account. Economists call this "internalizing the externality," and this is the remedy that most economics textbooks recommend: a tax or fee equal to the cost imposed on society.

Livingstone's critics thought his plan would worsen the traffic problem and hurt businesses in the affected area. To the surprise of many, however, it worked. Traffic flowing into central London fell by 20 percent, and delays were cut by almost 30 percent. Average traffic speeds jumped from 9.5 mph

to 20 mph. On an average day in March 2003, about 100,000 motorists paid the congestion fees. The revenue from fees—and from the hefty fines paid by those who foolishly tried to beat the system—brought over \$1 million a day to the city government. A third of the companies in the affected area said that Livingstone's new policy was helping them; only 5 percent said it was hurting their business. After six weeks of operation, half of Londoners liked the policy, while only a third disliked it. Livingstone's popularity ratings hit an all time high.

Source: "Ken's Coup," *The Economist*, March 22, 2003, p. 39.

Coordination Failure

Coordination failure occurs when markets or other types of coordination by rules fail to coordinate an economy in such a way as to produce outcomes that are desirable.

When markets fail to coordinate an economy in such a way as to produce outcomes that are desirable, economists call this a *coordination failure*. The term *coordination failure* refers to any situation in which the self-interested behavior of individuals results in an outcome that is less beneficial to them than one that might have been achieved by better-coordinated, or cooperative, behavior. Two parables can be used to introduce the concept of a coordination failure. The first is known as the "Prisoner's Dilemma," and the second, the "Tragedy of the Commons."

The Prisoner's Dilemma and the Benefits of Cooperation

This widely circulated story makes the following point: individuals who *cooperate* may come closer to achieving their personal objectives than do those who pursue their self-interest without regard to the well-being of others. The theory of how markets coordinate an economy—conveyed in Adam Smith's metaphor of the "invisible hand"—shows that *under certain conditions* competition based on self-interest but coordinated by markets will bring about a desirable allocation of economic resources. The story of the Prisoner's Dilemma, however, dramatizes the fact that *under other conditions* lack of cooperation results in a coordination failure.

The story begins when two individuals who have committed a crime are picked up by the police and placed in separate cells. The police have enough evidence to convict either or both of the prisoners (who we will call "A" and "B") of a lesser crime for which the sentence is two years in jail, but they wish to get at least one of the prisoners to confess to the crime and implicate the other one, which will result in longer sentences. Each prisoner has to choose either to confess to or deny involvement in the crime. The consequences of all the possible choices are explained below and summarized in Table 9.4. A and B both know all the four points below, but because they are not allowed to communicate, each must decide independently whether to confess or deny guilt.

The possible outcomes are these, and Table 9.4 shows each outcome in a shaded box numbered to correspond to the numbers below:

1. If both A and B deny involvement in the crime, each will be convicted of a lesser offense (regarding which the prosecutor has ample evidence), and each will be sentenced to two years in jail.
2. If A denies guilt, but B confesses and implicates A, then A will be sentenced to four years in jail, and B to only one year.
3. If A confesses, implicating B, but B denies guilt, B will be sentenced to four years in jail, and A to only one year.
4. If both prisoners confess, they will get three-year sentences.

First, assume that both prisoners make their choices based only on their own interests. What will A and B each decide to do? It turns out that under this assumption each prisoner has the incentive—*regardless of whether the other prisoner confesses or denies*—to confess to the crime and implicate the other partner. Let us see why.

Suppose you are prisoner A. If your partner confesses and implicates you, then denying guilt will get you a four-year jail term (shaded cell 2), while in that situation confessing will get you a three-year jail term (shaded cell 4). So if your partner confesses, you are better off confessing. On the other hand, if your partner denies involvement in the crime, you are still better off confessing: If in this case you deny guilt you will get a two-year jail term (shaded cell 1), but if you confess you will only get a one-year jail term (shaded cell 3). So if your partner does not confess, you are still better off confessing. In short, whatever your partner does, if you confess to the crime you will end up better off than if you deny your role in the crime.

Notice that we have been assuming that you must act to protect yourself, because you cannot coordinate with your partner by agreeing that neither of you will confess. This is because you are isolated, each of you in separate interrogation rooms. So you are led to assume that your partner is going through the same thought process, and will also decide that confessing is the best strategy. This means both of you will be put away for three years (shaded cell 4). Notice, too, that there is a better outcome, namely, for neither of you to confess, so that each of you gets only two years in jail—but without an ironclad agreement between the two of you that you each are confident that your partner will stick to, you will both act independently and end up with three-year terms.

Now imagine instead that you and your partner are very close, and that each one of you truly believes that the other will not confess. Under these assumptions *cooperative* behavior can prevail, with both denying guilt, and both therefore serving two

TABLE 9.4. PRISONER'S DILEMMA

		PRISONER B	
		Confesses	Denies
Prisoner A	Confesses	A and B both get 3 years (4)	A gets 1 year B gets 4 years (3)
	Denies	A gets 4 years B gets 1 year (2)	A and B both get 2 years (1)

years in jail (shaded cell 1). This outcome is clearly better for each of you than the one resulting when you both act based only on your own interest (shaded cell 4). This could happen, for example, if both you and your partner are people who keep promises (whether or not keeping them seems to be in your own interest) and if, before committing the crime, you each promise to claim innocence if arrested.

The moral is that *in some situations the pursuit of self-interest by all parties leads to outcomes in which none of the participants benefit*. These situations are just the opposite of the situation described by the invisible hand.

The Prisoner's Dilemma can help answer questions such as: why is it so difficult to prevent destruction of the environment or to establish minimum standards of workplace health and safety among nations? In these cases the choices are not to confess or deny, but to "adhere to environmental (or workplace) standards" or "violate the standards."

THE PRISONER'S DILEMMA AND GLOBAL WARMING. As Chapter 1 mentioned, a major obstacle to agreeing on a plan to stop global warming is that the government of each country prefers to see all *other* nations limit *their* emissions of greenhouse gases like carbon dioxide while avoiding the politically unpopular task of limiting its own citizens' freedom to pollute. Many people in rich countries resist limits on activities, like driving a car, that pollute the environment; and many people in poor countries believe that limiting greenhouse gas emissions in their countries would hamper industrialization and make it harder to raise their living standards to those of rich nations.

The countries of the world thus face a coordination problem: if each nation's government acts independently and seeks to serve only the perceived interests of its own citizens (or its most powerful ones), nations are not likely to adopt the measures needed to avert global warming. To see why this is so, imagine that there are just two countries, called North and South, and just two options, called Nothing (meaning do nothing to prevent global warming) and Protect (meaning adopt protective measures to slow or halt global warming). Each country would like the other one to reduce its greenhouse gas emissions while avoiding the costs of doing so itself. Thus, for each the best alternative is to do Nothing while the other does Protect. The worst alternative for each is to Protect while the other does Nothing. The second-best alternative for both is that both Protect, and the third-best alternative for each is that both do Nothing.

The options available to the players are shown in Table 9.5. This is a Prisoner's Dilemma situation, and as we have seen earlier, what is best for each is worst for all. If each country makes its decision independently and they both do what their own people see as being in their own self-interest, both countries will do Nothing. They would both be better off, however, if they both chose to Protect.

TABLE 9.5. NORTH'S ACTION/SOUTH'S ACTION

		NORTH'S ACTION	
		Nothing	Protect
South's Action	Nothing	Third best for both	Best for S, worst for N
	Protect	Best for N, worst for S	Second best for both

The best outcome can be achieved, however, only if the two countries agree to Protect, perhaps accomplishing such an agreement by signing an international treaty committing themselves to implementing protective measures. But two questions need to be answered. First, who will enforce the agreement? There is no world government or any other body that could force each nation to abide by its agreements. The second problem is that different ways of protecting the global environment result in differing costs and benefits for each country. Why, for example, would the poor countries of the world agree to pay an equal share of the costs of reducing greenhouse gas emissions, most of which are now caused by the high-income countries?

The poor countries might argue that each nation should have the right to pollute in proportion to its population. In this case any solution to the problem would require drastic reductions in carbon dioxide emissions in the rich countries (where pollution per capita is high), while leaving the poor countries relatively free to industrialize in a way that increases pollution. While this solution may seem fair to many people, it is likely to be politically unpopular in the rich countries.

In practice, as it turns out, there is one factor that has encouraged nations to take action against global warming on their own: the truly noxious clouds of air pollution from burning coal smothering a number of cities in China and elsewhere recently, driving China's own population to rebel, and causing massive disruption to economic activities. Such events have helped to spur the government to adopt environmentally conscious policies, including seeking alternatives to burning fossil fuels, such as passive solar (using the sun to heat water for household uses).

Extending the lesson of the Prisoner's Dilemma more generally to economic systems, we can say that reliance on competitive markets may fail to coordinate an economy in a desirable way: the pursuit of self-interest by individuals may result in outcomes that are not optimal from the point of view of any member of the society. This is what is meant by the term *coordination failure*.

The Tragedy of the Commons

Another illustration of a coordination failure is referred to as "the tragedy of the commons," a parable set forth in 1968 by Garrett Hardin in a now-classic article in *Science* magazine.² This parable is about the possibility that environmental destruction will result from the uncoordinated pursuit of individual self-interest.

Imagine a large lake, its shores dotted by the houses of people who fish in the lake to earn their livings. No one owns the lake: it is the common property of all the members of the surrounding community. The situation described here, one that involves communal ownership of an important shared resource, is similar to arrangements that were widespread in many of the early settlements in New England (it has, of course, also existed in other parts of the world at various times in history), and it takes its name from the shared grazing land for cattle and other livestock that was referred to as the town "common."

In the parable of the lake, each person decides independently the number of hours to fish each day (or, alternatively, how many fish to catch) before heading back to shore. As self-interested people, they fish as long as the additional benefit of another hour (or another fish) is greater than the inconvenience or discomfort of the additional time and effort spent fishing.

²Garrett Hardin, "The Tragedy of the Commons," *Science* 162 (Dec. 13, 1968).

However, as in the case of the Prisoner's Dilemma, what is rational for one is not beneficial for all. The more each person fishes, the more difficult it is for the others to catch fish. The reason for this is simple: there are a limited number of fish to be caught, and as each person catches more of them, fewer are left to be caught by the other lakeside residents. Each person would like to see limits put on the fishing of the others while remaining free, herself, to fish without limit. As long as there are no limits placed on anyone's fishing, there will be overfishing. The end result is predictable: there will soon be hardly any fish left in the lake, and, eventually, the lake will be entirely "fished out." That is the tragedy.

This story is about fishing in a lake, but it might just as well be about overgrazing open pastureland, dumping sewage into a river, or polluting the air. The moral of the story is that the pursuit of individual self-interest can be highly irrational because it can have very negative, possibly irreversible, consequences.

A real-life example of the tragedy of the commons is the case of what happened with a particular effort to harness geothermal energy for the generation of electricity. A potentially cheap and environmentally clean way of generating electricity involves tapping the steam that shoots in geysers out of the earth. In the years since this method of producing electric power became practical, a huge field of geysers 70 miles north of San Francisco has been regarded as a promising place to try it out. When energy prices suddenly rose in the mid-1970s, the geysers north of San Francisco became the focus of intense but largely uncoordinated energy development. However, as more and more electricity-generating plants were built there, the amount of steam available for earlier-installed plants fell. (In such a field of geysers there is a common but limited amount of steam deep beneath the earth's surface.) Eventually, so much steam was being tapped that none of the electricity-generating plants could operate at full capacity. By the early 1990s it became clear that because the number of plants had not been limited, the geysers were no longer an efficient source of energy.³

How can tragedies like this be avoided? There are many answers to this question, but all involve finding some way to take others' interests into account when making decisions. The most obvious solution to the problem would be simply to regulate access to the common resource. In the fictitious case described above, the fishing people around the lake could have met, ascertained how many fish might reasonably be taken from the lake each week, and decided collectively on a fishing limit for each member of the community that would have allowed the weekly target to be met. In fact, there are fishing villages in Japan, Turkey, and elsewhere that engage in this practice.⁴

If, on the other hand, the problem was overgrazing, those with the animals could figure out how much grazing the common land could support and then decide on the number of animals each herder would be allowed to graze. Solutions to the problem such as the ones mentioned so far all involve what is termed *social regulation of the commons*.

An alternative, which might be termed the *private property solution*, would be for the commons to be owned by a private individual or company. Such an owner would, say (in the cases mentioned above), not only employ the lake residents to fish or the animal herders to graze their livestock, but also would, in self-interest, limit

the use of the common resource in order to prevent its deterioration. Obviously, the owner would not want to see the lake overfished or the pasture overgrazed. A problem with this "private property solution" to the tragedy is that the common resource is often too large to be owned by a single individual or company. A tragedy of the commons was averted when depletion of the high-altitude ozone layer was halted by a 1989 ban on ozone-depleting chemicals. World oceans are a similarly threatened common resource. For such large commons, private ownership is obviously not possible, so the social regulation approach is all there is. However, as noted earlier (see "The Prisoner's Dilemma and Global Warming" above), social regulation is not easy to work out in practice.

One approach is the system under which the government sells or otherwise distributes pollution rights, or "emissions permits," that allow companies to emit a certain quantity of pollutants into the atmosphere, soil, or water during a particular time period. Once such rights have been acquired, they can be exchanged among companies in what is, in effect, a market for pollution rights. In such a market pollution rights can be traded for anything from cash to pollution-absorbing forests. What generally happens, however, is that a company builds a state-of-the-art environment-friendly plant and therefore has a surplus of pollution rights—rights it does not need to use because its new plant emits less pollution than most older plants. This company can then sell its unused pollution rights to another company whose plant exceeds the pollution standard set by the government. Under this system the more a company pollutes the more it will have to pay. Moreover, if the price of a pollution right is set correctly, a company will have to take into account in a precise way the harm it does to others when it decides what technology to use when it is planning, say, the construction of a new plant. With this system, its proponents argue, profit and loss calculations will bring about a desired amount of pollution reduction in the most efficient possible way. However, pollution reduction from such schemes has been nowhere near sufficient to avert global warming.

Because millions or billions of dollars as well as life and death matters of public health are affected by policies to correct market failures, the special-interest groups that stand to benefit or lose from their adoption often dominate debates about these policies. An as yet unanswered question is: how can ordinary people build up enough influence in policy-making centers such as Washington, DC, to equal or outweigh the influence that lobbyists, representing a small number of individuals or corporations, exert on the legislators and others who determine which policies will be adopted—or not adopted—to correct for the various types of market failures discussed in this chapter?

Suggested Readings

James K. Boyce, *The Political Economy of the Environment* (Cheltenham, UK: Edward Elgar, 2002).

Allen E. Buchanan, *Ethics, Efficiency, and the Market* (Totowa, NJ: Rowman & Allanheld, 1985).

John Eatwell, Murray Milgate, and Peter Newman, eds., *The New Palgrave: The Invisible Hand* (New York: Norton, 1989).

Milton Friedman, *Capitalism and Freedom* (Chicago: University of Chicago Press, 1962).

³Richard Kerr, "Geothermal Tragedy of the Commons," *Science*, 253 (July 12, 1991): 134–35.

⁴F. Berkes, D. Feeny, B. J. McCay, and J. M. Acheson, "The Benefits of the Commons," *Nature*, 340 (July 13, 1987), 91–94.