CHAPTER 19

What Is Economics?

19.1 The Nature of Economic Analysis

Economics is one of several sciences that attempt to explain and predict human behavior. It is distinguished from the other behavioral sciences (psychology, anthropology, sociology, and political science) by its emphasis on rational decision making under conditions of scarcity. Economists generally assume that people have well-defined goals and preferences and that they allocate their limited resources so as to maximize their own well-being in accordance with those preferences.

Stages of Economic Analysis

Much of economic analysis can be divided into three stages. First, we make explicit assumptions about people's goals and about the constraints on their behavior. This allows us to formulate an economic problem: Within the limits imposed by the constraints, what is the best way to achieve the goals? Second, we determine the solutions to these problems, and we see how the solutions vary in response to changes in the constraints. We assume that the individuals under study can also solve their economic problems and that they behave accordingly. We describe this by saying that the individuals *optimize*. Third, we examine the interactions among individuals: Each person's behavior affects each other person's constraints. In view of these interactions, we are often able to conclude that there is only one possible outcome in which all individuals are simultaneously optimizing. Such an outcome is called an *equilibrium*.

We shall now examine each of these stages in more detail.

Formulating the Individual's Economic Problem

The first step in economic analysis is to make explicit assumptions about individuals' desires and the nature of the constraints that they face. For example, we assume that a consumer has indifference curves that are convex toward the origin and must select a market basket that is within his budget line. Or we assume that a competitive firm wants to maximize profits and must sell its output and purchase its inputs at fixed market prices. Or we assume that a worker views both leisure and consumption as desirable but can consume no more than he earns in the marketplace.

Each of the agents in these examples faces an economic problem: a choice among competing alternatives. The consumer can eat more eggs and drink less wine, or he

can eat fewer eggs and drink more wine, but once he has allocated his entire income he cannot have more of both. The firm can reduce its costs by cutting back production, but it must accept a reduction in revenues as the consequence if it does. The worker can earn more income, or he can improve his suntan, but he must choose between the two.

The problem of an economic actor is to decide how to allocate scarce resources among competing ends. Such tradeoffs can always be expressed in terms of *costs,* which is another word for forgone opportunities. The cost of eating an egg is forgoing some amount of wine, the cost of increasing a firm's revenues is (at least partly) measured by the price of inputs, the cost of a day's wages is a forgone day at the beach. Therefore, we can say that the first step in economic analysis is to make explicit assumptions about both the desirability and the cost of various alternatives.

Optimization

The second step in economic analysis is to solve the agent's economic problem. The solution can typically be expressed in terms of the crucial principle of *equimarginality:* If an activity is worth pursuing at all, then it should be pursued until the marginal cost is equal to the marginal benefit. The consumer should buy eggs until the marginal value of an additional egg is equal to the marginal value of the wine that he could trade it for. (This is another way of saying that he should move along his budget line until it is just tangent to an indifference curve.) The firm should produce until its marginal cost is equal to its marginal revenue. It should select an input combination that equates the marginal product of a dollar's worth of labor to the marginal product of a dollar's worth of capital. The worker should relax until the marginal cost in forgone wages is equal to the marginal benefit of relaxation—or, in other words, he should work until the marginal income from working is equal to the marginal cost in forgone leisure.

The economist assumes that people act according to the principle of equimarginality. This is often expressed by saying that the economist assumes that people are *rational.* Indeed, it has been said that a student becomes a true economist on the day when he fully understands and accepts the principle that people equate costs and benefits at the margin. In Section 19.2, we will address the question of whether the economist's assumption is a reasonable one. Here we will pursue its consequences.

In addition to solving the individual's optimization problem, the economist also asks how the solution would change if the constraints changed. For example, in modeling a consumer's behavior, the economist notes first that the consumer's optimum occurs at a point where the budget line is tangent to an indifference curve, but he is also interested in how this tangency moves when there is a shift in the budget line due to a change in prices or a change in income. Although the real-world consumer needs to choose only a single consumption basket, the economist imagines how the consumer would behave in a variety of hypothetical circumstances and predicts the basket that the consumer would choose in each situation. The consumer's demand curve is an example of the economist's solution to a family of optimization problems. The demand curve in Exhibit 4.8 shows that *if* the price of X is \$6, the consumer's optimal basket will contain 2 units of X; *if* the price is \$3, his optimal basket will contain 3 units; and so forth.

A competitive firm's supply curve constitutes another example of how the economist expresses his solutions to a family of optimization problems. The point corresponding to a price of P shows that quantity at which the firm can equate marginal cost with marginal revenue, given that it is constrained to sell at the market price of P. As the constraint (i.e., the price) varies, so does the solution to the problem (i.e., the corresponding quantity).

Equilibrium

Solving the optimization problem tells the economist how people respond to various constraints. In order to predict their behavior, he must still determine what constraints are actually in force. The key here is that each individual's actions affect the options available to others. One of the constraints faced by a competitive firm is that it cannot sell its wares at a price higher than consumers will pay. That price is determined by the actions of other firms and of the consumers themselves, all of whom are solving their own optimization problems. Those optimization problems, in turn, involve constraints that are partly the result of the original firm's actions.

In Section 18.3, we saw the same thing in a slightly different context: Farmer Brown attempts to maximize profit under conditions of uncertainty; the constraints that he faces are the probabilities associated with various market prices; these constraints are themselves determined by the amount of wheat that other farmers bring to market, in other words, by the solutions to other farmers' optimization problems. And the entire process comes full circle, because the optimization problems faced by the other farmers include constraints that are partly the result of the actions of Farmer Brown.

In some sense the various optimization problems being solved by economic agents must have solutions that are compatible with each other. This requirement, known as an *equilibrium condition,* enables the economist to "solve" his model and make predictions about actual behavior. Consumers choose an optimal basket given the market prices that they face; firms supply a profit-maximizing mix of goods given those same market prices. In order for the quantity demanded by consumers to equal the quantity supplied by firms, prices cannot be arbitrary. In many circumstances there is only one equilibrium price that equates supply and demand.

Economists use many different equilibrium conditions. A *Nash equilibrium* is one in which each individual optimizes, taking the actions of other individuals as his constraints. The prisoners of Exhibit 11.6 achieve a Nash equilibrium when both confess. A *Walrasian equilibrium* is one in which each individual optimizes, taking market prices as given. The supply and demand diagrams of Chapter 1 illustrate Walrasian equilibria.

The third step in most economic analysis is the choice of an equilibrium condition and a study of the resulting equilibria: Do any exist? How many are there? How can they be computed? How will they change in response to changes in exogenous variables? (An *exogenous variable* is one that is taken to be determined outside the economic model under consideration. For example, the tastes of consumers and the technology available to firms are often treated as exogenous variables.[1])

Other Aspects of Economic Analysis

The economic study of human behavior consists largely of analyzing problems in the way we have just described: First, specify agents' goals and the nature of their constraints; second, solve the corresponding optimization problems (usually employing the equimarginal principle); and third, impose an equilibrium condition to find out what particular constraints agents must be facing and to describe their behavior.

Not all economic analysis can be fit into this simple mold, however. For example, economists are often concerned with modeling the process by which an equilibrium

[1] The process of studying how equilibria change in response to changes in exogenous variables is known as *comparative statics.* When you solved problem 11 at the end of Chapter 1, you were performing an exercise in comparative statics.

is achieved. This is known as the study of *economic dynamics.* On the other hand, that process is often most productively viewed as the solution to another, more subtle problem of optimization and equilibrium.

Economics also provides tools for analyzing the desirability of outcomes according to various criteria. The efficiency criterion introduced in Chapter 8 is one of the most popular, but economists can and do consider many other criteria as well.

The Value of Economic Analysis

In this book you have seen many examples of economic models. What do such models teach us? Some economic models are intended to reflect certain aspects of the world with sufficient accuracy to allow the economist to make precise numerical predictions. Such models are obviously of interest to anyone who must make decisions today that will be appropriate tomorrow. The shoemaker wants to know what the price of shoes will be next week; the policymaker wants to know how a tax on gasoline will affect the price of cars, or how a "comparable worth" law will affect the average size of firms.

Often, economic models are insufficient to make numerical predictions, but they do allow us to predict directions of change. Using the economic models in this book, you can predict that a tax on shoes will raise the price of shoes, reduce the quantity of shoes traded, and reduce economic efficiency. You can also predict a range for the possible price rise (at least zero and no more than the amount of the tax). A more precise model, incorporating more information about the supply and demand curves, would allow a more precise prediction, but even the rough prediction of the simple model is obviously of interest.

There is also a large class of economic models whose assumptions and conclusions are essentially untestable. Consider the Edgeworth box of Chapter 8. We used this box to describe the outcome of a situation in which exactly two people trade exactly two goods and are constrained to use the artificial medium of a price system in doing so. Outside of an experimental laboratory, no such situation would ever be observed.

Why, then, does the Edgeworth box interest us? The answer is that economists are often interested in understanding the outcomes of real-world situations involving bargaining. Many of these situations are far too difficult to model precisely or to think about in their entirety. But an economist who has studied a wide variety of bargaining models develops a strong "seat of the pants" intuition for what *sorts* of things are likely to affect the outcome. After years of studying abstract models—each one abstract in its own way—the economist develops a sense that certain factors matter in certain ways and others don't matter at all. This intuition is the most powerful tool an economist has for understanding the world, but he can only develop it by first understanding simplifications of the world such as the Edgeworth box.

For example, consider the proposition that the economic incidence of a tax is independent of its legal incidence. In Chapter 1, we proved this proposition under certain conditions—markets are competitive, all taxes are either sales or excise taxes, taxes are flat rate (5¢ per cup) as opposed to something more complicated, and so forth. Economists have examined the impact of taxation in a wide variety of models, each with its own special assumptions, and keep getting the same result: The legal incidence of taxation does not matter. Not only does the economist observe the pattern here but he begins to develop an intuition into *why* this result obtains in such a wide variety of circumstances. When the economist is asked to comment on the impact of a complicated taxation scheme in the real world, even though it might be the case that none of his models fits the situation exactly, he can predict with confidence that the

legal incidence of the tax is irrelevant. He can do so because he understands why it is irrelevant in his models, and he can see that the same intuition is applicable in the case at hand.

Here is another, more general example: The economist's intuition always reminds him of the importance of incentives. Noneconomists are often skeptical that a rise in the price of gasoline will cause people to drive significantly less, that a tax on labor will reduce employment, or that rent controls will reduce the quantity and quality of housing. The economist knows these things to be true. His knowledge derives largely from his study of models of *other* markets, which have revealed the general principle that incentives matter.

In coming to understand the world by first understanding a potpourri of abstract models, the economist is no different from the physicist or any other scientist. Ask a physicist what will happen to your body if you slam on your brakes while going around a curve at 60 miles per hour. He will tell you, with sufficient accuracy to convince you not to do it. He will do so even if he has never written down or studied the physics of the particular situation you are describing. He is able to do so because he has studied the physics of a large number of models, each of which captures some important aspects of the situation, and has observed the common features of what these models predict. In the process he has developed a feel for the sorts of cause-and-effect relationships that are likely to hold. The kind of knowledge embodied in that "feel" is a large part of any successful science.

19.2 The Rationality Assumption

Models start with assumptions. Economic models start with the assumption of rational behavior, usually in the sense that actors accurately solve their optimization problems so as to maximize their well-being within the limits allowed by the constraints (that is, scarcities) with which they must contend. This assumption characterizes economic models. It is perfectly possible to study human behavior productively without assuming rationality, but then one isn't doing economics.

The Role of Assumptions in Science

Students are sometimes uncomfortable with the assumption of universal rationality. Often they point out that the assumption is clearly false, and they are surprised that their economics professors don't seem particularly concerned about this. But the fact of the matter is that all assumptions made in all sciences are clearly false. Physicists, the most successful of scientists, routinely assume that the table is frictionless when called upon to model the motions of billiard balls. They assume that the billiard balls themselves are solid objects. They assume that objects fall in vacuums. They study the behavior of electric charges that are localized at mathematical points and that interact only with a small number of other charges, as if the rest of the universe did not exist.

All scientists make simplifying assumptions about the world, because the world itself is too complicated to study. All such assumptions are equally false, but not all such assumptions are equally valuable. Certain kinds of assumptions lead consistently to results that are interesting, nonobvious, and at some level testable and verifiable. Other kinds of assumptions do not. In any given problem it is important to make simplifying assumptions of the sort that have proved to be successful in the past. It is usually

equally important that the model be *robust;* that is, the exact statements of the assumptions should not enter in a crucial way, so that slightly different assumptions would still lead to the same conclusion.

To a large extent, *learning to be an economist consists of learning to make the right simplifying assumptions.* Indeed, we could replace the word *economist* with *physicist* or *anthropologist* or more generally with *scientist,* and this statement would still be true. Unfortunately, no one has ever succeeded in expressing a set of rules for determining the difference between a good and a bad simplification. You undoubtedly discovered this to your frustration when you began working the problems in this book. Often, the problems require assumptions, and often your assumptions probably seemed as good to you as any others, but your teacher did not agree. If you were successful in the course, you gradually developed a sense for what is and what is not the right approach to a problem. If you go on in economics, you will continue to develop this sense, which is what will make you an economist.

All We Really Need: No Unexploited Profit Opportunities

The rationality assumption in economics continues to disturb some students at a far more visceral level than the frictionless planes that other sciences assume. It seems plausible that a world without friction could resemble our own world in important ways, but students find it much more difficult to believe that the behavior of perfectly rational individuals could bear much resemblance to the behavior of the people they encounter in their everyday life. (This difficulty is particularly pronounced among students who live in dormitories!)

It is a misconception, however, to believe that a world in which most people are irrational would have to function very differently from a world in which everyone is rational. Imagine a world in which most people are irrational most of the time, but where enough people are rational enough of the time so that there are *no unexploited profit opportunities.* Such a world would function very similarly to one in which everyone is rational. Rather than give a general argument for this proposition, let us examine an illustrative example.

The Law of One Price

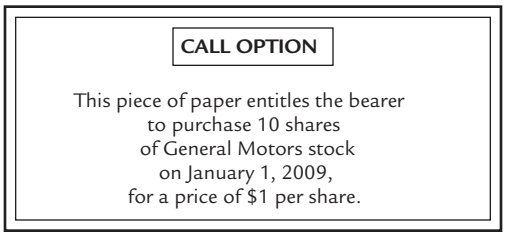
Economists believe in the *law of one price,* which says that identical goods will sell for identical prices (here *identical* means identical in all relevant characteristics, including, for example, time of delivery). It is easy to believe that this law would hold in a world of perfectly rational individuals. But it also holds in a world with no unexploited profit opportunities. Why? Because if you value two identical goods at different prices, your neighbor can make money by selling you one and buying from you the other. In the course of doing this, he and others like him will cause the prices of the goods to change and will keep doing this until all of the profit opportunities have been exploited—that is, until the prices of the goods are equal.

The Pricing of Call Options

You may think that the law of one price is a very trivial sort of example. Yet it can be applied to solve very nontrivial problems. One example is the pricing of *call options.*

A call option is a piece of paper entitling you to buy a share of some specified stock at some future date for some prespecified price. These pieces of paper are traded in organized markets called *options markets.* Exhibit 19.1 shows an example of a call option.

EXHIBIT **19.1** **A Call Option**



Suppose that it is now January 1, 2008, and General Motors stock is selling at $1.00 per share. Suppose also that on January 1, 2009, it will surely be selling for either $.50 per share or $1.50 per share. Suppose finally that the going rate of interest is 25%. How much should you pay for the call option?

The first thing to ask is what the option will be worth a year from today. If the stock goes up $1.50, then your option will enable you to purchase 10 shares (worth $15) for a price of $10; in other words, it will be worth $5. If the stock goes down to $.50, then you will choose not to exercise your option, so that it is worth zero. In Exhibit 19.2 we record the possibilities.

What is the call option worth today? You might suspect that this depends on the probability that the value of the stock will go up. You might think that if the stock is almost certain to go up, then the option is worth nearly $5, whereas if it is almost certain to go down, then the option is worth nearly zero. However, this is not correct.

To see why, and to price the call correctly, consider your friend Jeeter, who does not deal in options at all, but who adopts a strategy of borrowing $2 to buy 5 shares of stock. What will Jeeter's investment portfolio be worth a year from today? If the stock goes up, his 5 shares are worth $7.50, from which he must subtract $2.50 in order to repay his $2 debt with interest. In other words, his portfolio is worth $5. If the stock goes down, his 5 shares are worth $2.50, from which he must still subtract $2.50, so his portfolio is worth zero. In other words, *Jeeter's portfolio is identical to your call option* in the sense that it will have the same value as your option regardless of what happens to the price of the stock.

Now, by the law of one price, the call option must sell for the same amount of money that it would take to follow Jeeter's strategy. That strategy requires a net outlay

EXHIBIT **19.2** **Values of a Call Option**

Value of GM Stock on 1/1/09	Value of Call Option on 1/1/09
$1.50	$5
.50	0

We assume that on January 1, 2009, GM stock will surely sell for either $1.50 or $.50. The table shows the value of the call option from Exhibit 19.1. If the GM stock sells for $1.50, the option allows you to buy 10 shares at $1 apiece and to make a $5 profit. If the GM stock sells for $.50, the call option is worthless.

of $3 (he takes in $2 in borrowed funds and lays out $5 to buy the 5 shares of stock). Therefore, the call option also sells for $3.

We have just seen a highly streamlined example of the *Black–Scholes Option Pricing Model,* which is used to predict real-world option prices with remarkable accuracy.[2] The model not only assumes that all investors are rational, it also assumes that they are extraordinarily clever: Whenever an option is offered, all of the market participants conjure up imaginary friends with portfolios that are identical to the option in order to price it correctly. In fact, even more is assumed. In the full-blown model, prices change continuously and stocks can go up or down by arbitrary amounts (as opposed to our example, where we allowed only two possible future values). In this case, solving the model requires knowledge of a sophisticated area of mathematics called the "Ito calculus." Most professors of mathematics have never heard of the Ito calculus, but Black and Scholes assume that all investors are whizzes at it.

How can such an unrealistic model possibly make accurate predictions? (If your answer is that it can't, be reminded that it does.) The answer is that although the model appears to invoke universal rationality, its conclusions actually follow from the much weaker assumption that there are no unexploited profit opportunities. The few people in the market smart enough to exploit all of the profit opportunities cause prices to behave as if everyone were perfectly rational—and had a Ph.D. in mathematics besides. The same sort of phenomenon occurs in many economic models.

19.3 What Is an Economic Explanation?

Economists like to look for puzzling phenomena and see whether they can be explained on the basis of rational behavior. Explanations that have implications beyond the case at hand are especially desirable because they can be tested in other circumstances. Here are a few examples.

Celebrity Endorsements

Why are there celebrity endorsements? Why is a stereo system advertised by radio personality Paul Harvey worth more than the same stereo system without a famous name attached to it?

One possible explanation is that buyers are either irrational or very foolish: They don't recognize that endorsements carry no information about product quality and are gulled into believing that because Paul Harvey is a famous and accomplished radio announcer, any stereo that he advertises is likely to be of high quality.

To an economist such an explanation is unsatisfactory. Economists insist on seeking explanations that are grounded in rational behavior. There are two reasons for this insistence. First, on the basis of his past experience, the economist is aware of the power and wide applicability of economic analysis, which presumes rationality. Second, by attempting to extend such analysis into realms where it first appears inapplicable, the economist tests the limits and the durability of his theories.

Imagine a physicist sitting in his garden who notices that a baseball lying on the grass has risen of its own accord and has begun to hover 3 feet off the ground. He could

[2] This model first appeared in F. Black and M. Scholes, "The Pricing of Options and Corporate Liabilities," *Journal of Political Economy* 81 (1973): 637–654.

"explain" this phenomenon by abandoning his former insistence on the universality of gravitation, or he could attempt to find an explanation that is consistent with all of his previous experience. His gut will lead him to the second course of action. Perhaps it will eventually turn out that the laws of gravitation *are* wrong, but it is most productive to begin with the assumption that there must be some less radical solution to the problem.

If physicists abandoned their theories so easily, physics could never progress. The first physicist to have observed a helium-filled balloon would have admitted that there was no gravity, and the true physics of the situation would not have been discovered. By attempting to fit unfamiliar phenomena into familiar patterns, we arrive at deeper understandings of both the patterns and the phenomena.

So the economist is unwilling to abandon rationality quite so easily. Another easy "solution" presents itself: Perhaps people have a *taste* for wearing celebrity-endorsed clothing. They don't expect higher quality from the endorsed products; they just like wearing products that have been endorsed.

This solution is marginally better than the first one, but only marginally. The objection is that it's just too easy. Any human action can be explained on the basis of someone's having had a taste for that action. If we allow ourselves this easy out, we will never seek for deeper explanations.

The physicist could explain the floating baseball by saying that all of the laws of gravitation are true but that this one baseball happens to contain a unique antigravity substance that is activated only at 2 P.M. on Tuesdays (or whatever time the physicist happens to be making his observation). We expect our physicists to work harder for their pay. We should expect the same of our economists.

Here is an *economic* explanation of celebrity endorsements: New firms enter the marketplace with different strategies. Some plan to make a quick killing by selling shoddy products and then getting out. Others plan to offer products of high quality, which is expensive for them at first, and to be successful by earning a good reputation that will pay off in future years. Firms of the second type would like to let you know that they are of the second type. One way for them to do so is to hire a celebrity at a very high price. This conveys the information that the firm plans to be around a long time—long enough to earn back its investment in celebrity advertising.

Whether or not this is the correct explanation, it is at least an economic one. It says that firms and individuals face certain constraints, one of which is the inability of firms to issue binding promises that they are not fly-by-nights and that they optimize within the limits that these constraints impose. They convey the information expensively, which is better than not conveying it at all.

The explanation also has testable implications, which is an extremely desirable feature. It suggests that firms whose reputations are already well established should invest less in celebrity endorsements than firms that are just starting up and that firms producing products whose quality is easily verified at the time of purchase should invest less in celebrity endorsements than those firms producing products whose quality is revealed only after a long period of use. Real-world observations can now be used to confirm or contest the theory.

The Size of Shopping Carts

Celebrity endorsements are a puzzle, and economists love puzzles. Another puzzle that is very popular among some economists concerns the size of shopping carts. Shopping carts today are larger than they were 20 years ago. Why?

It has sometimes been suggested that the larger shopping carts constitute an attempt on the part of grocery store managers to induce shoppers to make more purchases. The idea is that shoppers are embarrassed to enter the checkout line with a half-full cart.

Not only does this fail as an economic explanation, it fails as any kind of explanation at all! In order to explain a new phenomenon, one must address the issue of why it arose when it did and not earlier. The "embarrassment" theory is a theory of why shopping carts should always be big, not one of why they should grow bigger.

Here is a menu of economic explanations, which might or might not be correct.

Over the past 20 years, large numbers of women have entered the marketplace, and relatively few households now have a member who engages in housework (including shopping) on a full-time basis. Therefore, people want to allocate less time to shopping and they accomplish this by reducing the number of trips to the store, while buying in larger quantities each time they go. Hence the need for larger shopping carts.

Or: Starting again with the observation that changes in family structure have led to people wanting to economize on their shopping trips, we observe that one response has been for supermarkets to carry a wider range of items. It is now possible to shop for groceries, pharmaceutical products, and even small appliances under one roof. This enables the shopper to spend less time running from store to store, but it also necessitates larger shopping carts.

Or: Large shopping carts, and the wide aisles that are necessary to accommodate them, have always been desirable luxury items. They are also expensive, because wide aisles mean that stores must occupy more land. As shoppers have become wealthier over the past few decades, they have become increasingly willing to pay higher prices in exchange for wider aisles and bigger carts.

Can you suggest other theories? Can you think of any evidence that would help you choose among the ones suggested here?

Why Is There Mandatory Retirement?

In 1986 the U.S. Congress severely restricted the practice of mandatory retirement. The fact that it was necessary to pass legislation to curtail this practice is an indication of its popularity. What made mandatory retirement so popular?

Professor Edward Lazear raised this question in a 1979 article, in which he examined the inadequacies of various traditional explanations.[3] Most of those traditional explanations rely on the assertion that workers' productivity declines significantly after a certain age and that employers deal with this through mandatory retirement. However, this cannot be a complete explanation. Among workers of any given age, there is wide variability in productivity. Employers do not refuse to hire the less productive workers, they simply pay them lower wages. Thus, "low productivity" cannot be a full explanation of why employers want to eliminate older workers completely.

Lazear offers an alternative explanation of mandatory retirement. Suppose that a worker is employed by a given firm for his entire working life. In a competitive labor market, the worker must receive a stream of wages whose present value is equal to the present value of his lifetime marginal product. There are many ways in which he can receive this stream of wages. Under Plan A the worker might be paid $20,000 each year, whereas under Plan B he receives less than $20,000 in some years and more than

[3] E. Lazear, "Why Is There Mandatory Retirement?," *Journal of Political Economy* 87 (1979): 1261–1284.

$20,000 in other years. Both the firm and the worker will be indifferent between Plan A and Plan B provided the two streams of wages have the same present value.

Now suppose that the worker agrees to acquire special skills that involve working harder but make him worth $30,000 per year to the company. In exchange for this, the firm pays him a higher wage, and both parties benefit. However, there is a catch: There is no way for the worker to guarantee in advance that he will really perform as promised. If he is paid on Plan A and if his salary is raised from $20,000 per year to $29,000 per year, the firm must be concerned that he will work at the old level of effort for a year, collect the $29,000, and then skip town.

Suppose, alternatively, that the worker is paid under a form of Plan B in which he is paid much less than his marginal product when he is young and much more than his marginal product when he is old. Now the contract to acquire special skills is enforceable: The worker must actually perform before he is compensated. The firm has its guarantee, and both parties benefit because the mutually beneficial contract can now be enforced.

Only one problem remains. The worker agrees to be paid less than he is worth to the firm while he is young in exchange for being paid more than he is worth when he is old. The firm will agree to such an arrangement only if it has a definite ending date. Hence the need for mandatory retirement.

You are invited to consider this explanation of the prevalence of mandatory retirement in light of Lazear's criticisms of other explanations. To what extent does Lazear's explanation avoid those problems? To what new criticisms is it susceptible? Is it, on balance, an improvement over other theories? Can you advance a new theory that makes even more sense?

Notice that if Lazear's story, or anything like it, is true, then both employers and employees benefit from mandatory retirement. It is true that any employee approaching his retirement would prefer to be allowed to continue working. But it is also true that the same employee, at the beginning of his working life and taking into account his entire lifetime earnings, is better off when he can commit himself to accepting mandatory retirement than when he cannot. The abolition of mandatory retirement reduces the ability of workers to offer guarantees of performance, reduces the willingness of firms to pay for such guarantees, and thereby reduces both the lifetime productivity and the lifetime compensation of workers.

There is an important moral to be drawn here: In evaluating public policy toward a social institution, it is necessary first to ask why that institution arose. It is impossible to know whether mandatory retirement is a good or a bad thing—by *any* criterion—without knowing why it exists in the first place. Social practices do not arise in vacuums; they arise because somebody finds them useful. It is incumbent upon the critic of these practices to understand who finds them useful and why before discarding them.

Why Rock Concerts Sell Out

Tickets for major entertainment events such as U2 concerts predictably sell out well in advance. Television news programs show footage of hopeful ticket buyers lined up for blocks and even camping out overnight so as not to lose their place in the ticket line. Clearly, if the promoters raised their prices they would still sell out. Why, then, do they not raise their prices?

A possible answer is that all of those overnight campers are good publicity for a rock group. A problem with this theory is that it seems like it would be equally good publicity to sell a lot of tickets at very high prices. If people think, "This group must be

great; people camped out just to see them," would they not also think, "This group must be great; people paid hundreds just to see them"?

Another possible answer is that promoters are not interested in selling just concert tickets. They are also interested in selling T-shirts, CDs, and all of the other paraphernalia associated with rock groups. Typically, teenagers buy more of these paraphernalia than adults do. Also typically, teenagers are more willing to camp out overnight to buy a ticket than adults are. So by setting prices low and assuring long lines, the promoters also assure themselves of young audiences and lucrative T-shirt sales.

99¢ Pricing

We close with one more example of an attempt to offer an economic explanation of an apparently irrational phenomenon. Consider the following letter to Ann Landers:

> **DEAR ANN LANDERS:** I read your letter to E. A. in Riverside, the man who wanted to know why stores charge odd prices, such as 99 cents, $1.99, $29.99, etc. You answered: "It's a sales gimmick that's been around forever."
>
> I am a 10-year-old boy and I think I have a better answer.
>
> Around 1875, Melville Stone owned a newspaper named the Chicago Daily News. The price was a penny. Circulation was good, but after a while it began to drop off. He found that it was because pennies were in short supply. Mr. Stone persuaded Chicago merchants to sell their merchandise for a penny below the regular price. This put more pennies in circulation and it helped save the paper.
>
> My source is: "Why Didn't I Think of That?" by Webb Garrison.
>
> —N. C. Reader
>
> **DEAR N.C.:** When I receive a letter like this from a 10-year-old boy, it gives me fresh hope for the youth of this country. Thanks for writing.[4]

Ann's own explanation ("It's a sales gimmick . . ."), which is also the explanation given by most noneconomists, relies on irrational consumers and therefore doesn't conform to the rules of the economic game. Unfortunately, her correspondent's explanation is far worse, because it makes no sense from any point of view, economic or not. The child psychologist Jean Piaget has determined that most children begin to master the principle of conservation at about age 7. By the age of 8, they understand, for example, that when water is poured from a short, thick container into a tall, thin container, the quantity of water does not change. One might then expect a 10-year-old to recognize that when a penny changes hands, there are neither more nor fewer pennies in circulation than there were previously.

Here is a suggestion for an economic explanation of how the pricing scheme in question developed. Around the same time that Melville Stone was trying to boost the circulation of the *Chicago Daily News,* the cash register was invented. It was now much easier for store owners to prevent their employees from stealing, because the register kept records of each purchase. However, a sale is recorded only when the register is opened, which would be necessary only if it were required to make change. A clerk can quietly slip a $20 bill into his pocket if the price of the item is $20, but he must ring up the sale and open the register if he has to give a penny in change.

[4] Permission granted by Ann Landers and Creators Syndicate.

Rationality Revisited

These examples illustrate one further point about the rationality assumption. To a large extent, the assumption of rationality is nothing more than a commitment to inquire sympathetically into people's motives. When we see people flocking to buy clothes endorsed by celebrities, or when we see concert promoters "underpricing" their tickets, we have a choice. Either we can remark—wistfully or cynically, according to our temperament—on the inadequacy of human nature, or we can ask, "How might such behavior be serving someone's purposes?" The first option offers the satisfaction of exempting oneself from the great mass of human folly. The second offers an opportunity to learn something.

Adopting the rationality assumption means pledging to treat all human behavior as worthy of respectful consideration. Rather than dismiss the buyers of stereos endorsed by Paul Harvey as victims of a herd mentality, or the concert promoter as a plodder who fails to see profit opportunities, we force ourselves to think deeply about what their true motives and strategies might be. In the process, we discover possibilities and develop insights that would never arise if we allowed ourselves to simply dismiss as "irrational" anything we failed to understand immediately. By disallowing the easy way out, we commit ourselves to careful and creative analysis of why people behave as they do, which is an excellent habit for any social scientist to cultivate.

19.4 The Scope of Economic Analysis

We began this chapter by saying that economics is the science that studies human behavior by positing rational action in the face of constraints. Traditionally, such reasoning was applied primarily to the trading of goods and services in the marketplace. However, in the last 30 years it has become clear that the economic way of thinking can be productively applied to a wide range of activities both in and out of the marketplace. Economists study love and marriage, the structure of families, medieval agriculture, religious activity, cannibalism, and evolution. By extending their methods into such areas, many of which are dominated by actors who are traditionally supposed to be engaged in nonrational behavior, economists have demonstrated the power of their approach. In this section, we will summarize a few of the most exciting nontraditional applications of economics.

Laboratory Animals as Rational Agents

In a series of remarkable experiments, a group of researchers has demonstrated that laboratory animals respond to economic stimuli in the ways that economic theory would predict.[5]

Rats as Consumers

In one experiment rats were permitted to "purchase" root beer and collins mix by pressing levers that caused the liquids to be dispensed. The rats were given fixed incomes (e.g., 300 lever pushes per day) and prices (e.g., one lever push generates .05 ml of root

[5] J. H. Kagel, R. Battalio, H. Rachlin, L. Green, R. Basmann, and W. R. Klemm, "Experimental Studies of Consumer Demand Behavior Using Laboratory Animals," *Economic Inquiry* 13 (1975): 22–38; see also R. Battalio, L. Green, and J. H. Kagel, "Income-Leisure Tradeoffs of Animal Workers," *American Economic Review* 71 (1981): 621–632.

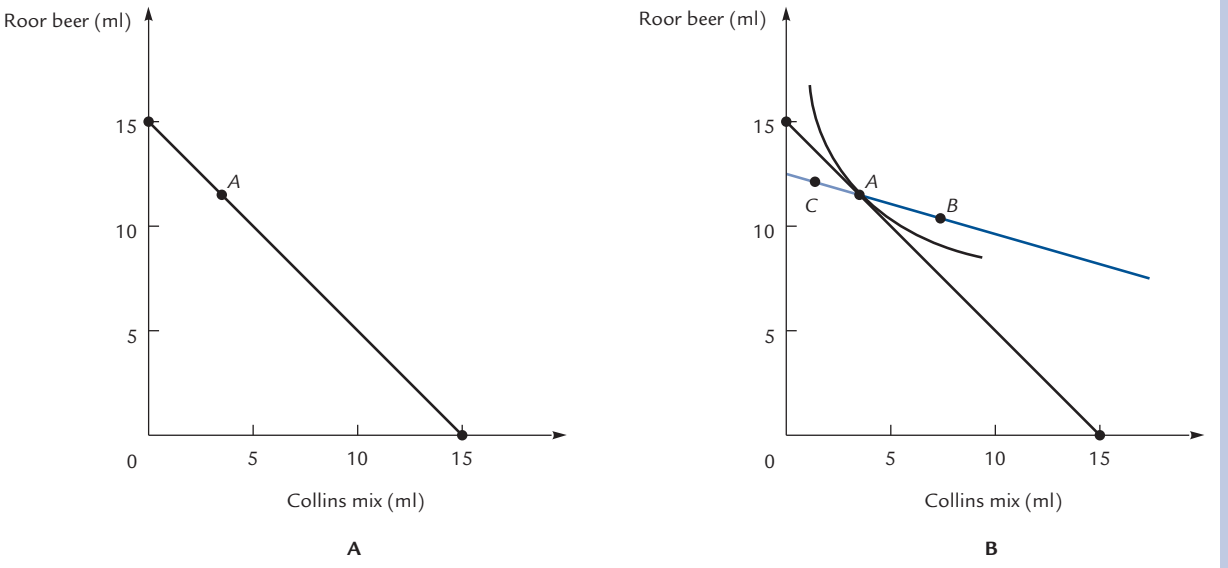
beer or .1 ml of collins mix). Their consumption patterns were noted. Then the rats' incomes and the prices they faced were varied, so that their behavior could be observed under a variety of budget constraints. The rats' behavior demonstrated downward-sloping demand curves and upward-sloping Engel curves, as an economist would expect.

Moreover, the rats' consumption patterns were internally consistent in the sense predicted by economic theory. For example, panel A of Exhibit 19.3 illustrates one rat's consumption point when given an income of 300 lever presses and facing prices of 1 press per .05 ml for both liquids. The rat chose point *A*. His income and prices were then adjusted to give him the color budget line shown in panel B. If the rat was a rational maximizer, with an indifference curve tangent to the first budget line at *A,* then his new optimum would have to occur at a point below *A* on the new budget line. In fact, he chose point *B,* confirming this prediction.

Pigeons as Suppliers of Labor

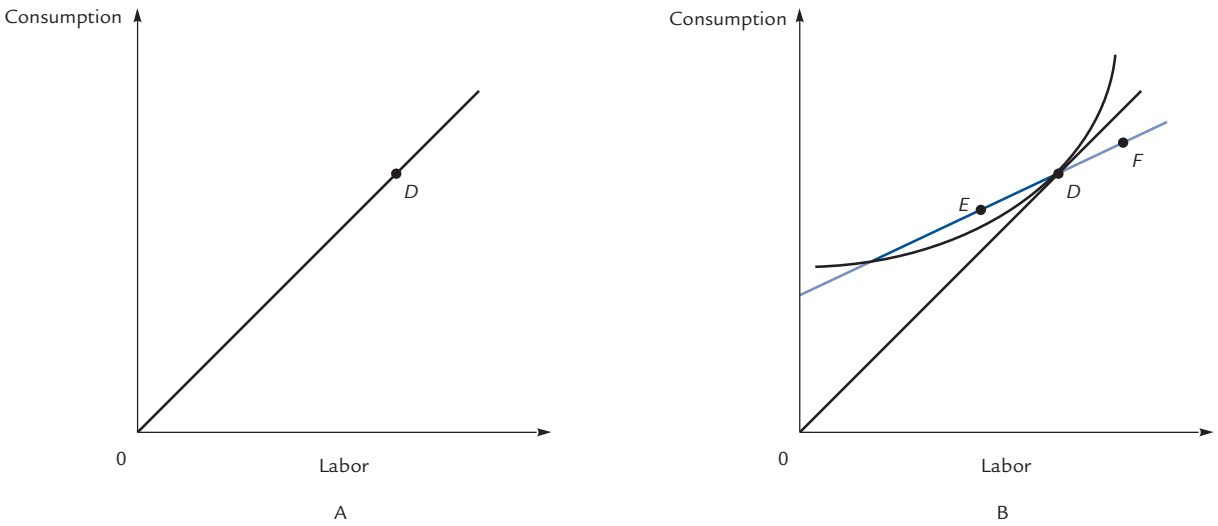
In a later experiment, pigeons were required to earn their incomes (in this case, food) by pecking a response key. Their behavior was observed under variations in both wage rates (amount of food per peck) and nonlabor income (free food delivered at regular intervals). The pigeons demonstrated all of the expected substitution and income effects. In particular, when their nonlabor income was fixed, their labor supply curves were backward bending, as you would expect after having read Section 16.1 of this book.

EXHIBIT **19.3** **Rats as Rational Consumers**



In panel A a rat with the black budget line chose point *A.* Prices and his income were then adjusted so that he now had the color budget line in panel B. According to economic theory, the rat must now choose a point like *B* (on the darker part of the new line) rather than a point like *C* (on the lighter part). The reason is that if an indifference curve were tangent at *C,* it would have to cross the original indifference curve. In fact, the rat chose point *B,* confirming the economic prediction.

EXHIBIT **19.4** **Pigeons and Labor Supply**



In panel A a pigeon with the black budget line chose point *D.* His wage and his nonlabor income were then adjusted so that he had the color budget line. According to economic theory, the pigeon must now choose a point like *E* (on the darker part of the new line) rather than a point like *F* (on the lighter part). The reason is that if an indifference curve were tangent at *F,* it would have to cross the original indifference curve. In fact, the pigeon chose point *E,* confirming the economic prediction.

In one version of the experiment, pigeons were initially presented with no nonlabor income, so that their budget line was as shown in panel A of Exhibit 19.4. They chose point *D.* Then their wages were lowered, while they were simultaneously given just enough nonlabor income to give them the color budget line shown in panel B. Assuming that the pigeons are rational maximizers, they must now choose a point on the darker portion of the color line, such as point *E,* and, in fact, they do so.

Often, noneconomists argue that economists are far too optimistic in their assumption that people have sufficient intelligence to respond appropriately to subtle changes in prices and income. The next time you find yourself in conversation with such a noneconomist, you can ask him whether he thinks that most human beings are as intelligent as rats and pigeons.

Altruism and the Selfish Gene

There is a growing literature on the interface and analogies between economics and biology.[6] One area of mutual interest is the study of *altruism.* Economists have long been aware that people choose to give gifts to others, especially to their children and other close relatives. Perhaps you would not be in college if it weren't for this phenomenon. Such behavior can be explained by saying that people have a "taste" for it, but as we have noted before, economists are distinctly uncomfortable with this kind of glibness. So we must look deeper.

[6] See, for example, J. Hirshleifer, "Economics from a Biological Viewpoint," *Journal of Law and Economics* 20 (1977): 1–52; and G. Tullock, "Biological Externalities," *Journal of Theoretical Biology* 33 (1971): 565–576.

Recently, biologists have begun to explore the notion that altruism is a result of purely selfish (nonaltruistic) behavior on the part of the genetic material that is the true medium for natural selection. If you are carrying a certain gene, then there is a 50% chance that your child is carrying the same gene. The gene's survival probability is enhanced if you behave in a way that improves the survival prospects of your children. Now suppose that some particular gene has the effect of making you feel altruistic toward your children. Then that gene will gain an evolutionary advantage and tend to propagate.[7]

Economists have explored some of the consequences of altruistic behavior in the family. For example, suppose that the household is headed by an altruistic parent who gives bequests to the children in such a way as to equalize the children's "incomes," where these incomes include all of the things that are important to a child. If one child is more satisfied than the others, then the parent will tend to give more attention, presents, and so forth to the other children (and consequently less to the satisfied one) until the situation becomes more equal.

Now suppose that the family contains a "Rotten Kid" who is thinking of stealing his sister's marbles. Suppose also that the theft of the marbles would be economically inefficient, either because he values them less than she does or because some marbles are likely to be lost in the struggle over their ownership. The Rotten Kid might be deterred from stealing the marbles if he feared being found out and punished by the parent. But more remarkably, he will not steal the marbles even if the parent is totally unable to observe or discover the theft. The reason is that the reduction in his sister's level of satisfaction will cause the parent to divert resources to the sister and away from the Rotten Kid, even though the parent has no idea of the reason why the sister has seemed so unhappy lately. The economic inefficiency of the theft means that there will be a smaller social surplus to divide among the children, and an equal share of a smaller pie is not an improvement from the Rotten Kid's own point of view.

This "Rotten Kid theorem" is due to Professor Gary S. Becker, whose book on the economic analysis of family life is a highly recommended (but somewhat technically sophisticated) source of novel and clever economic argument.[8]

The analysis of altruism is by no means a frivolous pursuit. The extent to which parents care about their children's welfare is an important component in understanding savings behavior, responses to taxation, and responses to government debt. (For example, see the discussion of the Ricardian Equivalence theorem in Chapter 17.) Ultimately, the economic analysis of these important variables (which in turn are critical in the determination of the interest rate and the rate of inflation, among other things) must rest on an understanding of behavior in the household.

The Economics of Scattering

In medieval Europe many small farmers held their land in scattered plots. This means that a typical farmer would own three or four small plots of land at considerable distances from each other. Historians and economists are puzzled by this phenomenon, which seems to entail unnecessary inefficiencies. (Here is an inefficiency you might not have thought of: With so many small plots, there are many more boundaries between neighbors, and consequently many more externalities. Farmers sometimes remove

[7] For a fascinating account of this fascinating approach to biology, see R. Dawkins, *The Selfish Gene* (New York: Oxford University Press, 1976). The book's proposed explanations of puzzles in animal behavior are very much in the spirit of economics.

[8] G. S. Becker, *A Treatise on the Family* (Cambridge, MA: Harvard University Press, 1981).

rocks from their own land near the boundary and toss them onto their neighbor's land. With scattering, almost all land is near a boundary, and a lot of energy gets spent tossing rocks back and forth.)

Many explanations have been offered for scattering. Professor Donald McCloskey has examined these explanations and found them wanting from the economist's viewpoint (he is also the source of the parenthetical observation in the preceding paragraph).[9] He has suggested an alternative. Farming communities are subject to localized disasters. Wind, rain, or fire can destroy all of the crops in one part of town while leaving those in other parts untouched. If there is no organized market for insurance, a rational farmer will be willing to accept the inefficiencies of scattering in exchange for the corresponding reduction in risk. With scattered plots, he will grow less in the average year, but he is much less likely to face a year in which all of his crops are destroyed.

It is sometimes argued that medieval and modern man differ so radically that the economic models developed in the nineteenth and twentieth centuries for understanding behavior in industrialized societies are not useful tools in the study of the distant past. McCloskey's work indicates the opposite: Peasants in the Middle Ages were willing to pay a price for a reduction in risk, just as economic theory would predict (see Chapter 18 of this book), and the price that they were willing to pay was a reasonable one, given the risks involved.

If economic theory applies to rats and pigeons, then surely we should expect it to apply to human beings in situations very different from our own. The scope of economic analysis is being extended every day. This is an exciting time to be studying economics.

Author Commentary www.cengage.com/economics/landsburg

AC1. Ancient rabbis seem to have solved a difficult economic problem by instinct.

AC2. For more information on shopping carts, read this article.

AC3. For another article on shopping carts, see this one.

Problem Set

1. Reexamine problem 24 at the end of Chapter 3. What agents are involved in this problem? What are they maximizing and what are their constraints? When you work the problem, at what point are you solving an optimization problem? At what point are you computing an equilibrium?

2. Look back at various other problems in this book. Which are primarily concerned with optimization problems? Which with equilibria? Which with both?

3. Suppose that General Motors stock is currently selling for $\$S$ per share, that 1 year from today it will either have gone up to $\$U$ or down to $\$D$, and that the

[9] D. McCloskey, "The Open Fields of England: Rent, Risk and the Rate of Interest, 1300–1815," in D. Galenson, ed., *Markets in History: Economic Studies of the Past* (Cambridge: Cambridge University Press, 1989). This article makes fascinating reading and applies many of the ideas you have learned in this course both to draw striking conclusions about the past and to refute alternative theories.

annual interest rate is *r.* You are offered a call option that will allow you to buy GM stock next year at a price of $*C,* where *C* is between *U* and *D.* In terms of *S, U, D, r,* and *C,* what is the value of this call option?

4. **True or False:** Television sets will be more expensive in an area with great reception and lots of channels than in an area served by only one channel, which comes in poorly.

5. Why do banks construct elaborate buildings with Greek columns? Does your explanation show why supermarkets don't do the same thing? Does it predict which banks are most likely to construct such buildings?

6. **True or False:** *Good Housekeeping* tests products and awards its Seal of Approval to those found to be of high quality. Manufacturers who have been judged worthy of the seal must still pay to display it. By being selective about how it awards the seal, the magazine has acquired a reputation for trustworthiness, which makes the seal a valuable commodity. Consider the proposition that Paul Harvey awards the use of his name in the same selective way that *Good Housekeeping* awards its seal and that his endorsement is valuable for that reason. Contrast this proposition with the explanation offered in the chapter. In what ways does one seem more reasonable than the other? What could you observe in the real world to test the truth of either proposition?

7. Evaluate the explanation of mandatory retirement given in the chapter.

8. Criticize the explanation of "99¢ pricing" given in the chapter. Can you think of an alternative economic explanation? What could you observe in the real world to help establish or refute the validity of the text's explanation?

9. Criticize the Rotten Kid theorem.

10. Suppose that McCloskey's theory of scattering is correct. What exogenous social developments would tend to reduce the preponderance of scattering? How would the amount of scattering be related to the interest rate?

11. Consider the following alternative theory of scattering: Every time a farmer dies, his land is divided among his children, creating several small plots. Whenever there is a marriage, the ownership of several of these plots becomes merged. What flaws are there in this theory? Is it consistent with rational behavior on the part of the peasants? Is it more or less plausible from that point of view than McCloskey's theory?

    In the remaining problems, construct theories to explain the phenomena described. Try to base your theories on rational behavior. In each case, describe some additional predictions of your theory, and present some ways that you could use real-world observations to test it.

12. Women spend more on medical care than men do.

13. Blockbuster movies generate long lines at the ticket counter, but theater owners don't raise prices for blockbusters.

14. Baseball tickets are priced in such a way that the box seats almost always sell out long before the bleachers do.

15. Ski resorts charge for lift tickets on a per-day rather than a per-ride basis, and there are often long lines at the lifts.

16. Firms lay off workers rather than reduce their salaries.

17. When workers go on strike, the firm loses profits and the workers lose wages. If the strike were called off, the two parties would have a bigger pie to divide between them. Nevertheless, there are strikes.

18. People prefer to bet on the sports teams they are rooting for than on the opposing teams.

19. Following an earthquake, sales of earthquake insurance go up.

20. Some items are sold in English auctions (where the item is offered for sale at a low price and buyers bid the price up until only one buyer is left). Others are sold in Dutch auctions (where the item is offered at a high price and the seller calls out successively lower prices until a buyer steps in).

Can you construct a theory that will predict which sort of auction will be used for which sort of item? Does your theory take into account the incentives that buyers have to attend the auction in the first place?

21. Many societies have strict taboos against baby selling.

22. People give each other gifts that they are not sure the recipient will like, even though they could as easily give cash instead. (Saying that a gift shows you took the time to shop is no answer, because cash shows you took the time to earn the money.)

23. People voluntarily leave tips in restaurants, even when they know they won't be returning.

24. People give to charitable organizations and to political causes.

25. Over half the electorate turns out to vote for presidential elections, even though the probability of any individual's changing the outcome is negligibly small.

26. Car manufacturers will sometimes offer a $500 rebate on a new car rather than take $500 off the sales price. This is so even though reducing the price would lower the sales tax and thus benefit the consumer by more than $500.

27. People in rural communities are often unhappy about the switch to daylight saving time, because they tend to wake up very early (say, at 5:30 A.M.) and under daylight saving time it is dark at that hour. A solution would be to continue waking up at the "old" 5:30 A.M. (which is renamed 6:30 A.M. under daylight saving time). But this solution is not implemented.

28. In the United States, a hotel room for two people usually costs less than twice as much as a hotel room for one person, whereas in England a room for two often costs exactly twice as much as a room for one.

29. *(This problem was suggested by Marvin Goodfriend.)* Governments are engaged in the business of redistributing income through the tax system. At the same time, private individuals are prohibited by law from redistributing income (via strong-arm tactics, breaking and entering, extortion, and the like). Thus, the government maintains and enforces a monopoly in the income redistribution market, and there is a general agreement, among both economists and noneconomists, that this is a good thing. But economists generally oppose government monopolies in other areas, such as the postal service. Are they being inconsistent?