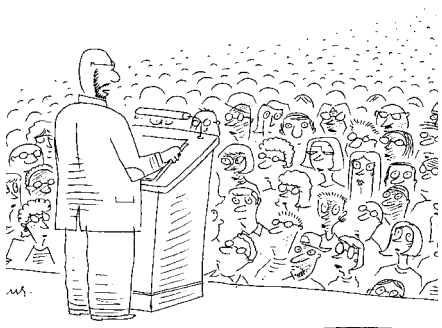
CHAPTER 1

THINKING LIKE AN ECONOMIST

How many students are in your introductory economics class? Some classes have just 20 or so; others average 35, 100, or 200 students. At some schools, introductory economics classes may have as many as 2,000 students. What size is best?

If cost were no object, the best size for an introductory economics course—or any other course, for that matter—might be a single student. Think about it: the whole course, all term long, with just you and your professor! Everything could be custom-tailored to your own background and ability, allowing you to cover the material at just the right pace. The tutorial format would also promote close communication and personal trust between you and your professor. And your grade would depend more heavily on what you actually learned than on your luck when taking multiple-choice exams. We may even suppose, for the sake of discussion, that studies by educational psychologists prove definitively that students learn best in the tutorial format.

Why, then, do so many universities continue to schedule introductory classes with hundreds of students? The simple reason is that costs *do* matter. They matter not just to the university administrators who must build classrooms and pay faculty salaries, but also to *you*. The direct cost of providing you with your own personal introductory economics course—most notably, the professor's salary and the expense of providing a classroom in which to meet—might easily top $40,000. *Someone* has to pay these costs. In private universities, a large share of the cost would be recovered directly from higher tuition payments; in state universities, the burden would be split between higher tuition payments and higher tax payments. But in either case, the course would be unaffordable for many, if not most, students.



Are small classes "better" than large ones?

economics the study of how people make choices under conditions of scarcity and of the results of those choices for society

With a larger class size, of course, the cost per student goes down. For example, in a class of 300 students, the cost of an introductory economics course might come to as little as $200 per student. But a class that large would surely compromise the quality of the learning environment. Compared to the custom tutorial format, however, it would be dramatically more affordable.

In choosing what size introductory economics course to offer, then, university administrators confront a classic economic trade-off. In making the class larger, they lower the quality of instruction—a bad thing—but at the same time, they reduce costs, and hence the tuition students must pay—a good thing.

ECONOMICS: STUDYING CHOICE IN A WORLD OF SCARCITY

Even in rich societies like the United States, *scarcity* is a fundamental fact of life. There is never enough time, money, or energy to do everything we want to do or have everything we would like to have. **Economics** is the study of how people make choices under conditions of scarcity and of the results of those choices for society.

In the class-size example just discussed, a motivated economics student might definitely prefer to be in a class of 20 rather than a class of 100, everything else being equal. But other things, of course, are not equal. Students can enjoy the benefits of having smaller classes, but only at the price of having less money for other activities. The student's choice inevitably will come down to the relative importance of competing activities.

That such trade-offs are widespread and important is one of the core principles of economics. We call it the **scarcity principle,** because the simple fact of scarcity makes trade-offs necessary. Another name for the scarcity principle is the **no-free-lunch principle** (which comes from the observation that even lunches that are given to you are never really free—somebody, somehow, always has to pay for them).

The Scarcity Principle (also called the No-Free-Lunch Principle): Although we have boundless needs and wants, the resources available to us are limited. So having more of one good thing usually means having less of another.

Inherent in the idea of a trade-off is the fact that choice involves compromise between competing interests. Economists resolve such trade-offs by using *cost-benefit analysis,* which is based on the disarmingly simple principle that an action should be taken if, and only if, its benefits exceed its costs. We call this statement the **cost-benefit principle,** and it, too, is one of the core principles of economics:

The Cost-Benefit Principle: An individual (or a firm, or a society) should take an action if, and only if, the extra benefits from taking the action are at least as great as the extra costs.

With the cost-benefit principle in mind, let's think about our class-size question again. Imagine that classrooms come in only two sizes—100-seat lecture halls and 20-seat classrooms—and that your university currently offers introductory economics courses to classes of 100 students. Question: Should administrators reduce the class size to 20 students? Answer: Reduce if, and only if, the value of the improvement in instruction outweighs its additional cost.

This rule sounds simple, but to apply it we need some way to measure the relevant costs and benefits—a task that is often difficult in practice. If we make a few simplifying assumptions, however, we can see how the analysis might work. On the cost side, the primary expense of reducing class size from 100 to 20 is that we will now need five professors instead of just one. We'll also need five smaller classrooms

rather than a single big one, and this too may add slightly to the expense of the move. For the sake of discussion, suppose that the cost with a class size of 20 turns out to be $1,000 per student more than the cost per student when the class size is 100. Should administrators switch to the smaller class size? If they apply the cost-benefit principle, they will realize that *the reduction in class size makes sense only if the value of attending the smaller class is at least $1,000 per student greater than the value of attending the larger class.*

Would you (or your family) be willing to pay an extra $1,000 for a smaller economics class? If not, and if other students feel the same way, then sticking with the larger class size makes sense. But if you and others would be willing to pay the extra tuition, then reducing the class size to 20 makes good economic sense.

Notice that the "best" class size, from an economic point of view, will generally not be the same as the "best" size from the point of view of an educational psychologist. The difference arises because the economic definition of "best" takes into account both the benefits *and* the costs of different class sizes. The psychologist ignores costs and looks only at the learning benefits of different class sizes.

In practice, of course, different people will feel differently about the value of smaller classes. People with high incomes, for example, tend to be willing to pay more for the advantage, which helps to explain why average class size is smaller, and tuition higher, at private schools whose students come predominantly from high-income families.

The cost-benefit framework for thinking about the class-size problem also suggests a possible reason for the gradual increase in average class size that has been taking place in American colleges and universities. During the last 15 years, professors' salaries have risen sharply, making smaller classes more costly. During the same period, median family income—and hence the willingness to pay for smaller classes—has remained roughly constant. When the cost of offering smaller classes goes up but willingness to pay for smaller classes does not, universities shift to larger class sizes.

Scarcity and the trade-offs that result also apply to resources other than money. Bill Gates is the richest man on Earth. His wealth was once estimated at over $100 billion—more than the combined wealth of the poorest 40 percent of Americans. Gates has enough money to buy more houses, cars, vacations, and other consumer goods than he could possibly use. Yet Gates, like the rest of us, has only 24 hours each day and a limited amount of energy. So even he confronts trade-offs, in that any activity he pursues—whether it be building his business empire or redecorating his mansion—uses up time and energy that he could otherwise spend on other things. Indeed, someone once calculated that the value of Gates's time is so great that pausing to pick up a $100 bill from the sidewalk simply wouldn't be worth his while.

If Bill Gates saw a $100 bill lying on the sidewalk, would it be worth his time to pick it up?

APPLYING THE COST-BENEFIT PRINCIPLE

In studying choice under scarcity, we'll usually begin with the premise that people are **rational,** which means they have well-defined goals and try to fulfill them as best they can. The cost-benefit principle illustrated in the class-size example is a fundamental tool for the study of how rational people make choices.

rational person someone with well-defined goals who tries to fulfill those goals as best he or she can

As in the class-size example, often the only real difficulty in applying the cost-benefit rule is to come up with reasonable measures of the relevant benefits and costs. Only in rare instances will exact dollar measures be conveniently available. But the cost-benefit framework can lend structure to your thinking even when no relevant market data are available.

To illustrate how we proceed in such cases, the following example asks you to decide whether to perform an action whose cost is described only in vague, qualitative terms.

EXAMPLE 1.1 **Should you walk downtown to save $10 on a $25 computer game?**

Imagine you are about to buy a $25 computer game at the nearby campus store when a friend tells you that the same game is on sale at a downtown store for only $15. If the downtown store is a 30-minute walk away, where should you buy the game?

The cost-benefit principle tells us that you should buy it downtown if the benefit of doing so exceeds the cost. The benefit of taking any action is the dollar value of everything you gain by taking it. Here, the benefit of buying downtown is exactly $10, since that is the amount you will save on the purchase price of the game. The cost of taking any action is the dollar value of everything you give up by taking it. Here, the cost of buying downtown is the dollar value you assign to the time and trouble it takes to make the trip. But how do we estimate that dollar value?

One way is to perform the following hypothetical auction. Imagine that a stranger has offered to pay you to do an errand that involves the same walk downtown (perhaps to drop off a letter for her at the post office). If she offered you a payment of, say, $1,000, would you accept? If so, we know that your cost of walking downtown and back must be less than $1,000. Now imagine her offer being reduced in small increments until you finally refuse the last offer. For example, if you would agree to walk downtown and back for $9.00 but not for $8.99, then your cost of making the trip is $9.00. In this case, you should buy the game downtown, because the $10 you'll save (your benefit) is greater than your $9.00 cost of making the trip.

But suppose, alternatively, that your cost of making the trip had been greater than $10. In that case, your best bet would have been to buy the game from the nearby campus store. Confronted with this choice, different people may choose differently, depending on how costly they think it is to make the trip downtown. But although there is no uniquely correct choice, most people who are asked what they would do in this situation say they would buy the game downtown.

ECONOMIC SURPLUS

economic surplus the economic surplus from taking any action is the benefit of taking that action minus its cost

Suppose again that in Example 1.1 your "cost" of making the trip downtown was $9. Compared to the alternative of buying the game at the campus store, buying it downtown resulted in an **economic surplus** of $1, the difference between the benefit of making the trip and its cost. In general, your goal as an economic decision maker is to choose those actions that generate the largest possible economic surplus. This means taking all actions that yield a positive total economic surplus, which is just another way of restating the cost-benefit principle.

Note that the fact that your best choice was to buy the game downtown doesn't imply that you *enjoy* making the trip, any more than choosing a large class means that you prefer large classes to small ones. It simply means that the trip is less unpleasant than the prospect of paying $10 extra for the game. Once again, you've faced a trade-off—in this case, the choice between a cheaper game and the free time gained by avoiding the trip.

OPPORTUNITY COST

opportunity cost the opportunity cost of an activity is the value of the next-best alternative that must be forgone in order to undertake the activity

Of course, your mental auction could have produced a different outcome. Suppose, for example, that the time required for the trip is the only time you have left to study for a difficult test the next day. Or suppose you are watching one of your favorite movies on cable, or that you are tired and would love a short nap. In such cases, we say that the **opportunity cost** of making the trip—that is, the value of

what you must sacrifice to walk downtown and back—is high, and you are more likely to decide against making the trip.

In this example, if watching the last hour of the cable TV movie is the most valuable opportunity that conflicts with the trip downtown, the opportunity cost of making the trip is the dollar value you place on pursuing that opportunity—that is, the largest amount you'd be willing to pay to avoid missing the end of the movie. Note that the opportunity cost of making the trip is not the combined value of *all* possible activities you could have pursued, but only the value of your *best* alternative—the one you would have chosen had you not made the trip.

Throughout the text we will pose exercises like the one that follows. You'll find that pausing to answer them will help you to master key concepts in economics. Because doing these exercises isn't very costly (indeed, many students report that they are actually fun), the cost-benefit principle indicates that it's well worth your while to do them.

EXERCISE 1.1

You would again save $10 by buying the game downtown rather than at the campus store, but your cost of making the trip is now $12, not $9. How much economic surplus would you get from buying the game downtown? Where should you buy it?

THE ROLE OF ECONOMIC MODELS

Economists use the cost-benefit principle as an abstract model of how an idealized rational individual would choose among competing alternatives. (By "abstract model" we mean a simplified description that captures the essential elements of a situation and allows us to analyze them in a logical way.) A computer model of a complex phenomenon like climate change, which must ignore many details and includes only the major forces at work, is an example of an abstract model.

Noneconomists are sometimes harshly critical of the economist's cost-benefit model on the grounds that people in the real world never conduct hypothetical mental auctions before deciding whether to make trips downtown. But this criticism betrays a fundamental misunderstanding of how abstract models can help to explain and predict human behavior. Economists know perfectly well that people don't conduct hypothetical mental auctions when they make simple decisions. All the cost-benefit principle really says is that a rational decision is one that is explicitly or implicitly based on a weighing of costs and benefits.

Most of us make sensible decisions most of the time, without being consciously aware that we are weighing costs and benefits, just as most people ride a bike without being consciously aware of what keeps them from falling. Through trial and error, we gradually learn what kinds of choices tend to work best in different contexts, just as bicycle riders internalize the relevant laws of physics, usually without being conscious of them.

Even so, learning the explicit principles of cost-benefit analysis can help us make better decisions, just as knowing about physics can help in learning to ride a bicycle. For instance, when a young economist was teaching his oldest son to ride a bike, he followed the time-honored tradition of running alongside the bike and holding onto his son, then giving him a push and hoping for the best. After several hours and painfully skinned elbows and knees, his son finally got it. A year later, someone pointed out that the trick to riding a bike is to turn slightly in whichever direction the bike is leaning. Of course! The economist passed this information along to his second son, who learned to ride almost instantly. Just as knowing a little physics can help you learn to ride a bike, knowing a little economics can help you make better decisions.

RECAP | **COST-BENEFIT ANALYSIS**

Scarcity is a basic fact of economic life. Because of it, having more of one good thing almost always means having less of another (the scarcity principle). The cost-benefit principle holds that an individual (or a firm, or a society) should take an action if, and only if, the extra benefit from taking the action is at least as great as the extra cost. The benefit of taking any action minus the cost of taking the action is called the *economic surplus* from that action. Hence the cost-benefit principle suggests that we take only those actions that create additional economic surplus.

FOUR IMPORTANT DECISION PITFALLS*

Rational people will apply the cost-benefit principle most of the time, although probably in an intuitive and approximate way, rather than through explicit and precise calculation. Knowing that rational people tend to compare costs and benefits enables economists to predict their likely behavior. As noted earlier, for example, we can predict that students from wealthy families are more likely than others to attend colleges that offer small classes. (Again, while the cost of small classes is the same for all families, the benefit of small classes, as measured by what people are willing to pay for them, tends to be higher for wealthier families.)

PITFALL 1: MEASURING COSTS AND BENEFITS AS PROPORTIONS RATHER THAN ABSOLUTE DOLLAR AMOUNTS

As the next example makes clear, the cost-benefit principle proves helpful in another way. The example demonstrates that people aren't born with an infallible instinct for weighing the relevant costs and benefits of many daily decisions. Indeed, one of the rewards of studying economics is that it can improve the quality of your decisions.

EXAMPLE 1.2 **Should you walk downtown to save $10 on a $2,020 laptop computer?**

You are about to buy a $2,020 laptop computer at the nearby campus store when a friend tells you that the same computer is on sale at a downtown store for only $2,010. If the downtown store is half an hour's walk away, where should you buy the computer?

Assuming that the laptop is light enough to carry without effort, the structure of this example is exactly the same as that of Example 1.1—the only difference being that the price of the laptop is dramatically higher than the price of the computer game. As before, the benefit of buying downtown is the dollar amount you'll save, namely, $10. And since it's exactly the same trip, its cost must also be the same as before. So if you are perfectly rational, you should make the same decision in both cases. Yet when real people are asked what they would do in these situations, the overwhelming majority say they would walk downtown to buy the game but would buy the laptop at the campus store. When asked to explain, most of them say something like "The trip was worth it for the game because you save 40 percent, but not worth it for the laptop because you save only $10 out of $2,020."

This is faulty reasoning. The benefit of the trip downtown is not the *proportion* you save on the original price. Rather, it is the *absolute dollar amount* you save.

*The examples in this section are inspired by the pioneering research of Daniel Kahneman and the late Amos Tversky. Kahneman was awarded the 2002 Nobel Prize in economics for his efforts to integrate insights from psychology into economics.

Since the benefit of walking downtown to buy the laptop is $10—exactly the same as for the computer game—and since the cost of the trip must also be the same in both cases, the economic surplus from making both trips must be exactly the same. And that means that a rational decision maker would make the same decision in both cases. Yet, as noted, most people choose differently.

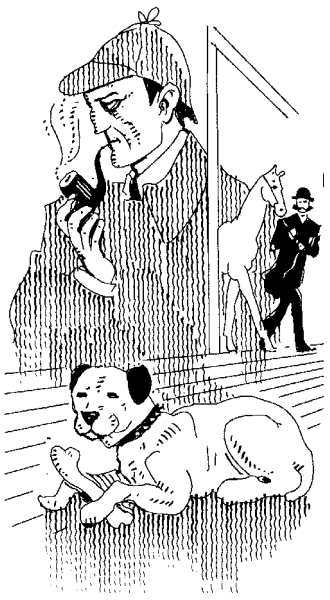
EXERCISE 1.2

Which is more valuable: saving $100 on a $2,000 plane ticket to Tokyo or saving $90 on a $200 plane ticket to Chicago?

The pattern of faulty reasoning in the decision just discussed is one of several decision pitfalls to which people are often prone. In the discussion that follows, we will identify three additional decision pitfalls. In some cases, people ignore costs or benefits that they ought to take into account, while on other occasions they are influenced by costs or benefits that are irrelevant.

PITFALL 2: IGNORING OPPORTUNITY COSTS

Sherlock Holmes, Arthur Conan Doyle's legendary detective, was successful because he saw details that most others overlooked. In *Silver Blaze,* Holmes is called on to investigate the theft of an expensive racehorse from its stable. A Scotland Yard inspector assigned to the case asks Holmes whether some particular aspect of the crime requires further study. "Yes," Holmes replies, and describes "the curious incident of the dog in the nighttime." "The dog did nothing in the nighttime," responds the puzzled inspector. But as Holmes realized, that was precisely the problem. The watchdog's failure to bark when Silver Blaze was stolen meant that the watchdog knew the thief. This clue ultimately proved the key to unraveling the mystery.



Opportunity costs are like dogs that fail to bark in the night.

Just as we often don't notice when a dog fails to bark, many of us tend to overlook the implicit value of activities that fail to happen. As discussed earlier, however, intelligent decisions require taking the value of forgone opportunities properly into account.

The opportunity cost of an activity, once again, is the value of the next-best alternative that must be forgone in order to engage in that activity. If buying a computer game downtown means not watching the last hour of a movie, then the value to you of watching the end of that movie is an opportunity cost of the trip. Many people make bad decisions because they tend to ignore the value of such forgone opportunities. To avoid overlooking opportunity costs, economists often translate questions like "Should I walk downtown?" into ones like "Should I walk downtown or watch the end of the movie?"

EXAMPLE 1.3

Should you use your frequent-flyer coupon to fly to Fort Lauderdale for spring break?

With spring break only a week away, you are still undecided about whether to go to Fort Lauderdale with a group of classmates at the University of Iowa. The round-trip airfare from Cedar Rapids is $500, but you have a frequent-flyer coupon you could use to pay for the trip. All other relevant costs for the vacation week at the beach total exactly $1,000. The most you would be willing to pay for the Fort Lauderdale vacation is $1,350. That amount is your benefit of taking the vacation. Your only alternative use for your frequent-flyer coupon is for your plane trip to Boston the weekend after spring break to attend your brother's wedding. (Your coupon expires shortly thereafter.) If the Cedar Rapids–Boston round-trip airfare is $400, should you use your frequent-flyer coupon to fly to Fort Lauderdale for spring break?

The cost-benefit principle tells us that you should go to Fort Lauderdale if the benefits of the trip exceed its costs. If not for the complication of the frequent-flyer

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Is your flight to Fort Lauderdale "free" if you travel on a frequent-flyer coupon?

coupon, solving this problem would be a straightforward matter of comparing your benefit from the week at the beach to the sum of all relevant costs. And since your airfare and other costs would add up to $1,500, or $150 more than your benefit from the trip, you would not go to Fort Lauderdale.

But what about the possibility of using your frequent-flyer coupon to make the trip? Using it for that purpose might make the flight to Fort Lauderdale seem free, suggesting you would reap an economic surplus of $350 by making the trip. But doing so would also mean you would have to fork over $400 for your airfare to Boston. So the opportunity cost of using your coupon to go to Fort Lauderdale is really $400. If you use it for that purpose, the trip still ends up being a loser, because the cost of the vacation, $1,400, exceeds the benefit by $50. In cases like these, you are much more likely to decide sensibly if you ask yourself, "Should I use my frequent-flyer coupon for this trip or save it for an upcoming trip?"

We cannot emphasize strongly enough that the key to using the concept of opportunity cost correctly lies in recognizing precisely what taking a given action prevents us from doing. The following exercise illustrates this point by modifying the details of Example 1.3 slightly.

EXERCISE 1.3

Same as Example 1.3, except that now your frequent-flyer coupon expires in a week, so your only chance to use it will be for the Fort Lauderdale trip. Should you use your coupon?

PITFALL 3: FAILURE TO IGNORE SUNK COSTS

The opportunity cost pitfall is one in which people ignore costs they ought to take into account. In another common pitfall, the reverse is true: People are influenced by costs they ought to ignore. *The only costs that should influence a decision about whether to take an action are those that we can avoid by not taking the action.* As a practical matter, however, many decision makers appear to be influenced by **sunk costs**—costs that are beyond recovery at the moment a decision is made. For example, money spent on a nontransferable, nonrefundable airline ticket is a sunk cost.

sunk cost a cost that is beyond recovery at the moment a decision must be made

Because sunk costs must be borne *whether or not an action is taken,* they are irrelevant to the decision of whether to take the action. The sunk-cost pitfall (the mistake of being influenced by sunk costs) is illustrated clearly in the following example.

EXAMPLE 1.4 **How much should you eat at an all-you-can-eat restaurant?**

Sangam, an Indian restaurant in Philadelphia, offers an all-you-can-eat lunch buffet for $5. Customers pay $5 at the door, and no matter how many times they refill their plates, there is no additional charge. One day, as a goodwill gesture, the owner of the restaurant tells 20 randomly selected guests that their lunch is on the house. The remaining guests pay the usual price. If all diners are rational, will there be any difference in the average quantity of food consumed by people in these two groups?

Having eaten their first helping, diners in each group confront the following question: "Should I go back for another helping?" For rational diners, if the benefit of doing so exceeds the cost, the answer is yes; otherwise it is no. Note that at the moment of decision about a second helping, the $5 charge for the lunch is a sunk cost. Those who paid it have no way to recover it. Thus, for both groups, the (extra) cost of another helping is exactly zero. And since the people who received the free lunch were chosen at random, there is no reason to suppose that their appetites or incomes are different from those of other diners. The benefit of another helping

thus should be the same, on average, for people in both groups. And since their respective costs and benefits of an additional helping are the same, the two groups should eat the same number of helpings, on average.

Psychologists and economists have experimental evidence, however, that people in such groups do *not* eat similar amounts.[1] In particular, those for whom the luncheon charge is not waived tend to eat substantially more than those for whom the charge is waived. People in the former group seem somehow determined to "get their money's worth." Their implicit goal is apparently to minimize the average cost per bite of the food they eat. Yet minimizing average cost is not a particularly sensible objective. It brings to mind the man who drove his car on the highway at night, even though he had nowhere to go, because he wanted to boost his average fuel economy. The irony is that diners who are determined to get their money's worth usually end up eating too much, as evidenced later by their regrets about having gone back for their last helpings.

The fact that the cost-benefit criterion failed the test of prediction in this example does nothing to invalidate its advice about what people *should* do. If you are letting sunk costs influence your decisions, you can do better by changing your behavior.

PITFALL 4: FAILURE TO UNDERSTAND THE AVERAGE–MARGINAL DISTINCTION

Often we are confronted with the choice of whether or not to engage in an activity (for example, whether or not to shop downtown). But in many situations, the issue is not whether to pursue the activity at all, but rather the *extent* to which it should be pursued. We can apply the cost-benefit principle in such situations by repeatedly asking the question "Should I increase the level at which I am currently pursuing the activity?"

In attempting to answer this question, the focus should always be on the benefit and cost of an *additional* unit of activity. To emphasize this focus, economists refer to the cost of an additional unit of activity as the **marginal cost** of the activity. Similarly, the benefit of an additional unit of the activity is the **marginal benefit** of the activity.

marginal cost the increase in total cost that results from carrying out one additional unit of an activity

marginal benefit the increase in total benefit that results from carrying out one additional unit of an activity

When the problem is to discover the proper level at which to pursue an activity, the cost-benefit rule is to keep increasing the level as long as marginal benefit of the activity exceeds its marginal cost. As the following example illustrates, however, people often fail to apply this rule correctly.

EXAMPLE 1.5

Should NASA expand the space shuttle program from four launches per year to five?

Professor Kösten Banifoot, a prominent supporter of the National Aeronautics and Space Administration's (NASA) space shuttle program, estimated that the gains from the program are currently $24 billion per year (an average of $6 billion per launch) and that its costs are currently $20 billion per year (an average of $5 billion per launch). On the basis of these estimates, Professor Banifoot testified before Congress that NASA should definitely expand the space shuttle program. Should Congress follow his advice?

To discover whether expanding the program makes economic sense, we must compare the marginal cost of a launch to its marginal benefit. The professor's

[1]See, for example, Richard Thaler, "Toward a Positive Theory of Consumer Choice," *Journal of Economic Behavior and Organization* **1,** no. 1 (1980).

average cost the total cost of undertaking *n* units of an activity divided by *n*

average benefit the total benefit of undertaking *n* units of an activity divided by *n*

estimates, however, tell us only the **average cost** and **average benefit** of the program—which are, respectively, the total cost of the program divided by the number of launches and the total benefit divided by the number of launches. Knowing the average benefit and average cost per launch for all shuttles launched thus far is simply not useful for deciding whether to expand the program. Of course, the average cost of the launches undertaken so far *might* be the same as the cost of adding another launch. But it might also be either higher or lower than the marginal cost of a launch. The same statement holds true regarding average and marginal benefits.

Suppose, for the sake of discussion, that the benefit of an additional launch is in fact the same as the average benefit per launch thus far, $6 billion. Should NASA add another launch? Not if the cost of adding the fifth launch would be more than $6 billion. And the fact that the average cost per launch is only $5 billion simply does not tell us anything about the marginal cost of the fifth launch.

Suppose, for example, that the relationship between the number of shuttles launched and the total cost of the program is as described in Table 1.1. The average cost per launch (third column) when there are four launches would then be $20 billion/4 = $5 billion per launch, just as Professor Banifoot testified. But note in the second column of the table that adding a fifth launch would raise costs from $20 billion to $32 billion, making the marginal cost of the fifth launch $12 billion. So if the benefit of an additional launch is $6 billion, increasing the number of launches from four to five would make absolutely no economic sense.

TABLE 1.1
How Total Cost Varies with the Number of Launches

Number of launches	Total cost ($ billions)	Average cost ($ billion/launch)
0	0	0
1	3	3
2	7	3.5
3	12	4
4	20	5
5	32	6.4

The following example illustrates how to apply the cost-benefit principle correctly in this case.

EXAMPLE 1.6 **How many space shuttles should NASA launch?**

NASA must decide how many space shuttles to launch. The benefit of each launch is estimated to be $6 billion, and the total cost of the program again depends on the number of launches in the manner shown in Table 1.1. How many shuttles should NASA launch?

NASA should continue to launch shuttles as long as the marginal benefit of the program exceeds its marginal cost. In this example, the marginal benefit is constant at $6 billion per launch, regardless of the number of shuttles launched. NASA should thus keep launching shuttles as long as the marginal cost per launch is less than or equal to $6 billion.

TABLE 1.2
How Marginal Cost Varies with the Number of Launches

Number of launches	Total cost ($ billion)	Marginal cost ($ billion/launch)
0	0	
		3
1	3	
		4
2	7	
		5
3	12	
		8
4	20	
		12
5	32	

Applying the definition of marginal cost to the total cost entries in the second column of Table 1.1 yields the marginal cost values in the third column of Table 1.2. (Because marginal cost is the change in total cost that results when we change the number of launches by one, we place each marginal cost entry midway between the rows showing the corresponding total cost entries.) Thus, for example, the marginal cost of increasing the number of launches from one to two is $4 billion, the difference between the $7 billion total cost of two launches and the $3 billion total cost of one launch.

As we see from a comparison of the $6 billion marginal benefit per launch with the marginal cost entries in the third column of Table 1.2, the first three launches satisfy the cost-benefit test, but the fourth and fifth launches do not. NASA should thus launch three space shuttles.

EXERCISE 1.4

If the marginal benefit of each launch had been not $6 billion but $9 billion, how many shuttles should NASA have launched?

The cost-benefit framework emphasizes that the only relevant costs and benefits in deciding whether to pursue an activity further are *marginal* costs and benefits—measures that correspond to the *increment* of activity under consideration. In many contexts, however, people seem more inclined to compare the *average* cost and benefit of the activity. As Example 1.5 made clear, increasing the level of an activity may not be justified, even though its average benefit at the current level is significantly greater than its average cost.

Here's an exercise that further illustrates the importance of the average–marginal distinction.

EXERCISE 1.5

Should a basketball team's best player take all the team's shots?

A professional basketball team has a new assistant coach. The assistant notices that one player scores on a higher percentage of his shots than other players. Based on this information, the assistant suggests to the head coach that the star player should take *all* the shots. That way, the assistant reasons, the team will score more points and win more games.

On hearing this suggestion, the head coach fires his assistant for incompetence. What was wrong with the assistant's idea?

RECAP | **FOUR IMPORTANT DECISION PITFALLS**

1. **The pitfall of measuring costs or benefits proportionally.** Many decision makers treat a change in cost or benefit as insignificant if it constitutes only a small proportion of the original amount. Absolute dollar amounts, not proportions, should be employed to measure costs and benefits.
2. **The pitfall of ignoring opportunity costs.** When performing a cost-benefit analysis of an action, it is important to account for all relevant *opportunity costs,* defined as the values of the most highly valued alternatives that must be forgone in order to carry out the action. A resource (such as a frequent-flyer coupon) may have a high opportunity cost, even if you originally got it "for free," if its best alternative use has high value. The identical resource may have a low opportunity cost, however, if it has no good alternative uses.
3. **The pitfall of not ignoring sunk costs.** When deciding whether to perform an action, it is important to ignore sunk costs—those costs that cannot be avoided even if the action is not taken. Even though a ticket to a concert may have cost you $100, if you have already bought it and cannot sell it to anyone else, the $100 is a sunk cost and should not influence your decision about whether to go to the concert.
4. **The pitfall of using average instead of marginal costs and benefits.** Decision makers often have ready information about the total cost and benefit of an activity, and from these it is simple to compute the activity's average cost and benefit. A common mistake is to conclude that an activity should be increased if its average benefit exceeds its average cost. The cost-benefit principle tells us that the level of an activity should be increased if, and only if, its *marginal* benefit exceeds its *marginal* cost.

Some costs and benefits, especially marginal costs and benefits and opportunity costs, are important for decision making, while others, like sunk costs and average costs and benefits, are essentially irrelevant. This conclusion is implicit in our original statement of the cost-benefit principle (an action should be taken if, and only if, the extra benefits of taking it exceed the extra costs). When we encounter additional examples of decision pitfalls, we will flag them by inserting the icon for the cost-benefit principle in the margin.

NORMATIVE ECONOMICS VERSUS POSITIVE ECONOMICS

The examples discussed in the preceding section make the point that people *sometimes* choose irrationally. We must stress that our purpose in discussing these examples was not to suggest that people *generally* make irrational choices. On the contrary, most people appear to choose sensibly most of the time, especially when their decisions are important or familiar ones. The economist's focus on rational choice thus offers not only useful advice about making better decisions, but also a basis for predicting and explaining human behavior. We used the cost-benefit approach in this way when discussing how rising faculty salaries have led to larger class sizes. And as we will see, similar reasoning helps to explain human behavior in virtually every other domain.

normative economic principle
one that says how people should behave

The cost-benefit principle is an example of a **normative economic principle,** one that provides guidance about how we *should* behave. For example, according to the

cost-benefit principle, we should ignore sunk costs when making decisions about the future. As our discussion of the various decision pitfalls make clear, however, the cost-benefit principle is not always a **descriptive economic principle,** one that describes how we actually *will* behave. As we saw, the cost-benefit principle can be tricky to implement, and people sometimes fail to heed its prescriptions.

Positive economic principle one that predicts how people will behave

That said, we stress that knowing the relevant costs and benefits surely does enable us to predict how people will behave much of the time. If the benefit of an action goes up, it is generally reasonable to predict that people will be more likely to take that action. And conversely, if the cost of an action goes up, the safest prediction will be that people will be less likely to take that action. This point is so important that we designate it as the incentive principle.

The Incentives Matter Principle: A person (or a firm or a society) is more likely to take an action if its benefit rises, and less likely to take it if its cost rises. In short, incentives matter.

The incentives matter principle, or incentive principle for short, is a positive economic principle. It stresses that the relevant costs and benefits usually help us predict behavior, but at the same time does not insist that people will behave rationally in each instance. For example, if the price of heating oil were to rise sharply, we would invoke the cost-benefit principle to say that people *should* turn their thermostats down, and invoke the incentive principle to predict that average thermostat settings *will* in fact go down in most cases.

ECONOMICS: MICRO AND MACRO

By convention, we use the term **microeconomics** to describe the study of individual choices and of group behavior in individual markets. **Macroeconomics,** by contrast, is the study of the performance of national economies and of the policies that governments use to try to improve that performance. Macroeconomics tries to understand the determinants of such things as the national unemployment rate, the overall price level, and the total value of national output.

microeconomics the study of individual choice under scarcity and its implications for the behavior of prices and quantities in individual markets

macroeconomics the study of the performance of national economies and the policies that governments use to try to improve that performance

Our focus in this chapter is on issues that confront the individual decision maker, whether that individual confronts a personal decision, a family decision, a business decision, a government policy decision, or indeed any other type of decision. Further on, we'll consider economic models of groups of individuals, such as all buyers or all sellers in a specific market. Later still we will turn to broader economic issues and measures.

No matter which of these levels is our focus, however, our thinking will be shaped by the fact that although economic needs and wants are effectively unlimited, the material and human resources that can be used to satisfy them are finite. Clear thinking about economic problems must therefore always take into account the idea of trade-offs—the idea that having more of one good thing usually means having less of another. Our economy and our society are shaped to a substantial degree by the choices people have made when faced with trade-offs.

THE APPROACH OF THIS TEXT

Choosing the number of students to register in each class is just one of many important decisions in planning an introductory economics course. Another decision, to which the scarcity principle applies just as strongly, concerns which of many different topics to include on the course syllabus. There is a virtually inexhaustible set of topics and issues that might be covered in an introductory course, but only limited time in which to cover them. There is no free lunch. Covering some topics inevitably means omitting others.

All textbook authors are necessarily forced to pick and choose. A textbook that covered *all* the issues ever written about in economics would take up more than a whole floor of your campus library. It is our firm view that most introductory textbooks try to cover far too much. One reason that each of us was drawn to the study of economics was that a relatively short list of the discipline's core ideas can explain a great deal of the behavior and events we see in the world around us. So rather than cover a large number of ideas at a superficial level, our strategy is to focus on this short list of core ideas, returning to each entry again and again, in many different contexts. This strategy will enable you to internalize these ideas remarkably well in the brief span of a single course. And the benefit of learning a small number of important ideas well will far outweigh the cost of having to ignore a host of other, less important ideas.

So far, we've already encountered three core ideas: the scarcity principle, the cost-benefit principle, and the incentive principle. As these core ideas reemerge in the course of our discussions, we'll call your attention to them. And shortly after a *new* core idea appears, we'll highlight it by formally restating it.

A second important element in the philosophy of this text is our belief in the importance of active learning. In the same way that you can learn Spanish only by speaking and writing it, or tennis only by playing the game, you can learn economics only by *doing* economics. And because we want you to learn how to do economics, rather than just to read or listen passively as the authors or your instructor does economics, we will make every effort to encourage you to stay actively involved.

For example, instead of just telling you about an idea, we will usually first motivate the idea by showing you how it works in the context of a specific example. Often, these examples will be followed by exercises for you to try, as well as applications that show the relevance of the idea to real life. Try working the exercises *before* looking up the answers (which are at the back of the corresponding chapter).

Think critically about the applications: Do you see how they illustrate the point being made? Do they give you new insight into the issue? Work the problems at the end of the chapters, and take extra care with those relating to points that you do not fully understand. Apply economic principles to the world around you. (We'll say more about this when we discuss economic naturalism below.) Finally, when you come across an idea or example that you find interesting, tell a friend about it. You'll be surprised to discover how much the mere act of explaining it helps you understand and remember the underlying principle. The more actively you can become engaged in the learning process, the more effective your learning will be.

ECONOMIC NATURALISM

With the rudiments of the cost-benefit framework under your belt, you are now in a position to become an "economic naturalist," someone who uses insights from economics to help make sense of observations from everyday life. People who have studied biology are able to observe and marvel at many details of nature that would otherwise have escaped their notice. For example, on a walk in the woods in early April the novice may see only trees whereas the biology student notices many different species of trees and understands why some are already into leaf while others still lie dormant. Likewise, the novice may notice that in some animal species males are much larger than females, but the biology student knows that pattern occurs only in species in which males take several mates. Natural selection favors larger males in those species because their greater size helps them prevail in the often bloody contests among males for access to females. By contrast, males tend to be roughly the same size as females in monogamous species, in which there is much less fighting for mates.

In similar fashion, learning a few simple economic principles enables us to see the mundane details of ordinary human existence in a new light. Whereas the

uninitiated often fail even to notice these details, the economic naturalist not only sees them, but becomes actively engaged in the attempt to understand them. Let's consider a few examples of questions economic naturalists might pose for themselves.

ECONOMIC NATURALIST 1.1

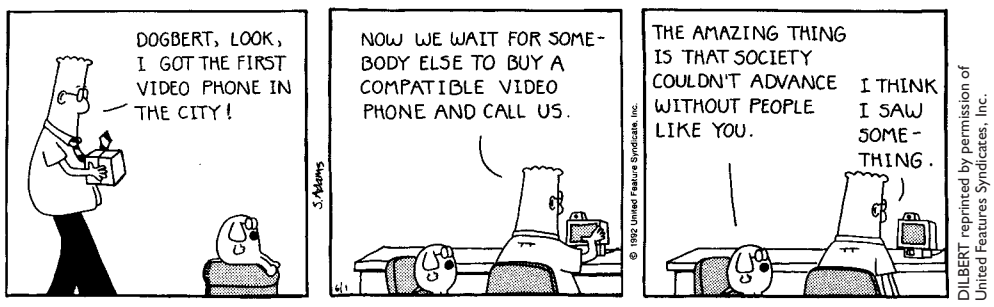
Why do many hardware manufacturers include more than $1,000 worth of "free" software with a computer selling for only slightly more than that?

The software industry is different from many others in the sense that its customers care a great deal about product compatibility. When you and your classmates are working on a project together, for example, your task will be much simpler if you all use the same word-processing program. Likewise, an executive's life will be easier at tax time if her financial software is the same as her accountant's.

The implication is that the benefit of owning and using any given software program increases with the number of other people who use that same product. This unusual relationship gives the producers of the most popular programs an enormous advantage and often makes it hard for new programs to break into the market.

Recognizing this pattern, the Intuit Corporation offered computer makers free copies of *Quicken*, its personal financial-management software. Computer makers, for their part, were only too happy to include the program, since it made their new computers more attractive to buyers. *Quicken* soon became the standard for personal financial-management programs. By giving away free copies of the program, Intuit "primed the pump," creating an enormous demand for upgrades of *Quicken* and for more advanced versions of related software. Thus, *TurboTax* and *Macintax,* Intuit's personal income-tax software, have become the standards for tax-preparation programs.

Inspired by this success story, other software developers have jumped onto the bandwagon. Most hardware now comes bundled with a host of free software programs. Some software developers are even rumored to *pay* computer makers to include their programs!



The free-software example illustrates a case in which the *benefit* of a product depends on the number of other people who own that product. As the next example demonstrates, the *cost* of a product may also depend on the number of others who own it.

ECONOMIC NATURALIST 1.2

Why don't auto manufacturers make cars without heaters?

Virtually every new car sold in the United States today has a heater. But not every car has a CD player. Why this difference?

One might be tempted to answer that although everyone *needs* a heater, people can get along without CD players. Yet heaters are of little use in places like Hawaii and southern California. What is more, cars produced as recently as the 1950s did *not* all have heaters. (The classified ad that led one young economic naturalist to his first car, a 1955 Pontiac, boasted that the vehicle had a radio, heater, and whitewall tires.)

Although heaters cost extra money to manufacture and are not useful in all parts of the country, they do not cost *much* money and are useful on at least a few days each year in most parts of the country. As time passed and people's incomes grew, manufacturers found that people were ordering fewer and fewer cars without heaters. At some point it actually became cheaper to put heaters in *all* cars, rather than bear the administrative expense of making some cars with heaters and others without. No doubt a few buyers would still order a car without a heater if they could save some money in the process. But catering to these customers is just no longer worth it.

Similar reasoning explains why certain cars today cannot be purchased without a CD player. Buyers of the 2006 BMW 745i, for example, got a CD player whether they wanted one or not. Most buyers of this car, which sells for approximately $75,000, have high incomes, so the overwhelming majority of them would have chosen to order a CD player had it been sold as an option. Because of the savings made possible when all cars are produced with the same equipment, it would have actually cost BMW more to supply cars for the few who would want them without CD players.

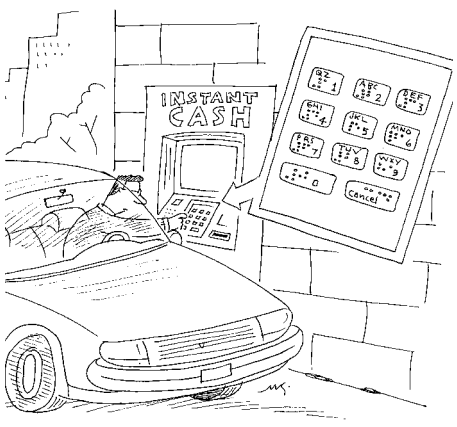
Buyers of the least-expensive makes of car have much lower incomes on average than BMW 745i buyers. Accordingly, most of them have more pressing alternative uses for their money than to buy CD players for their cars, and this explains why many inexpensive makes continue to offer CD players only as options. But as incomes continue to grow, new cars without CD players will eventually disappear.

The insights afforded by the preceding example suggest an answer to the following strange question:

Why do the keypad buttons on drive-up automatic teller machines have Braille dots?

Braille dots on elevator buttons and on the keypads of walk-up automatic teller machines enable blind people to participate more fully in the normal flow of daily activity. But even though blind people can do many remarkable things, they cannot drive automobiles on public roads. Why, then, do the manufacturers of automatic teller machines install Braille dots on the machines at drive-up locations?

ECONOMIC NATURALIST 1.3



Why do the keypad buttons on drive-up automatic teller machines have Braille dots?

The answer to this riddle is that once the keypad molds have been manufactured, the cost of producing buttons with Braille dots is no higher than the cost of producing smooth buttons. Making both would require separate sets of molds and two different types of inventory. If the patrons of drive-up machines found buttons with Braille dots harder to use, there might be a reason to incur these extra costs. But since the dots pose no difficulty for sighted users, the best and cheapest solution is to produce only keypads with dots.

The preceding example was suggested by Cornell student Bill Tjoa, in response to the following assignment:

EXERCISE 1.6

In 500 words or less, use cost-benefit analysis to explain some pattern of events or behavior you have observed in your own environment.

There is probably no more useful step you can take in your study of economics than to perform several versions of the assignment in Exercise 1.6. Students who do so almost invariably become lifelong economic naturalists. Their mastery of economic concepts not only does not decay with the passage of time; it actually grows stronger. We urge you, in the strongest possible terms, to make this investment!

SUMMARY

- Economics is the study of how people make choices under conditions of scarcity and of the results of those choices for society. Economic analysis of human behavior begins with the assumption that people are rational—that they have well-defined goals and try to achieve them as best they can. In trying to achieve their goals, people normally face trade-offs: Because material and human resources are limited, having more of one good thing means making do with less of some other good thing.

- Our focus in this chapter has been on how rational people make choices among alternative courses of action. Our basic tool for analyzing these decisions is cost-benefit analysis. The cost-benefit principle says that a person should take an action if, and only if, the benefit of that action is at least as great as its cost. The benefit of an action is defined as the largest dollar amount the person would be willing to pay in order to take the action. The cost of an action is defined as the dollar value of everything the person must give up in order to take the action.

- Often the question is not whether to pursue an activity but rather how many units of it to pursue. In these cases, the rational person pursues additional units as long as the marginal benefit of the activity (the benefit from pursuing an additional unit of it) exceeds its marginal cost (the cost of pursuing an additional unit of it).

- In using the cost-benefit framework, we need not presume that people choose rationally all the time. Indeed, we identified four common pitfalls that plague decision makers in all walks of life: a tendency to treat small proportional changes as insignificant, a tendency to ignore opportunity costs, a tendency not to ignore sunk costs, and a tendency to confuse average and marginal costs and benefits.

- Microeconomics is the study of individual choices and of group behavior in individual markets, while macroeconomics is the study of the performance of national economies and of the policies that governments use to try to improve economic performance.

CORE PRINCIPLES

The Scarcity Principle (also called the No-Free-Lunch Principle)
Although we have boundless needs and wants, the resources available to us are limited. So having more of one good thing usually means having less of another.

The Cost-Benefit Principle
An individual (or a firm, or a society) should take an action if, and only if, the extra benefits from taking the action are at least as great as the extra costs.

The Incentive Principle
A person (or a firm or a society) is more likely to take an action if its benefit rises, and less likely to take it if its cost rises.

KEY TERMS

average benefit (••)
average cost (••)
economic surplus (•)
economics (•)
macroeconomics (••)
marginal benefit (••)
marginal cost (••)
microeconomics (••)
normative economic principle (••)
opportunity cost (•)
positive economic principle (•)
rational person (•)
sunk cost (••)

REVIEW QUESTIONS

1. A friend of yours on the tennis team says, "Private tennis lessons are definitely better than group lessons." Explain what you think he means by this statement. Then use the cost-benefit principle to explain why private lessons are not necessarily the best choice for everyone.

2. True or false: Your willingness to drive downtown to save $30 on a new appliance should depend on what fraction of the total selling price $30 is. Explain.

3. Why might someone who is trying to decide whether to see a movie be more likely to focus on the $9 ticket

earlier. Sarah also just arrived at the theater planning to buy a ticket to see the same play when she discovered that she had lost a $10 bill from her wallet. If both Martha and Sarah are rational and both still have enough money to pay for a ticket, is one of them more likely than the other to go ahead and see the play anyway?

8.* You and your friend Joe have identical tastes. At 2 p.m., you go to the local Ticketmaster outlet and buy a $30 ticket to a basketball game to be played that night in Syracuse, 50 miles north of your home in Ithaca. Joe plans to attend the same game, but because he cannot get to the Ticketmaster outlet, he plans to buy his ticket at the game. Tickets sold at the game cost only $25, because they carry no Ticketmaster surcharge. (Many people nonetheless pay the higher price at Ticketmaster, to be sure of getting good seats.) At 4 p.m., an unexpected snowstorm begins, making the prospect of the drive to Syracuse much less attractive than before (but assuring the availability of good seats). If both you and Joe are rational, is one of you more likely to attend the game than the other?

9.* For each long-distance call anywhere in the continental United States, a new phone service will charge users 30 cents per minute for the first 2 minutes and 2 cents per minute for additional minutes in each call. Tom's current phone service charges 10 cents per minute for all calls, and his calls are never shorter than 7 minutes. If Tom's dorm switches to the new phone service, what will happen to the average length of his calls?

10.* The meal plan at university A lets students eat as much as they like for a fixed fee of $500 per semester. The average student there eats 250 pounds of food per semester. University B charges $500 for a book of meal tickets that entitles the student to eat 250 pounds of food per semester. If the student eats more than 250 pounds, he or she pays $2 for each additional pound; if the student eats less, he or she gets a $2 per pound refund. If students are rational, at which university will average food consumption be higher? Explain briefly.

ANSWERS TO IN-CHAPTER EXERCISES

1.1 The benefit of buying the game downtown is again $10 but the cost is now $12, so your economic surplus from buying it downtown would be $10 − $12 = −$2. Since your economic surplus from making the trip would be negative, you should buy at the campus store.

1.2 Saving $100 is $10 more valuable than saving $90, even though the percentage savings is much greater in the case of the Chicago ticket.

1.3 Since you now have no alternative use for your coupon, the opportunity cost of using it to pay for the Fort Lauderdale trip is zero. That means your economic surplus from the trip will be $1,350 − $1,000 = $350 > 0, so you should use your coupon and go to Fort Lauderdale.

1.4 The marginal benefit of the fourth launch is $9 billion, which exceeds its marginal cost of $8 billion, so the fourth launch should be added. But the fifth launch should not, since its marginal cost ($12 billion) exceeds its marginal benefit ($9 billion).

1.5 If the star player takes one more shot, some other player must take one less. the fact that the star player's *average* success rate is higher than the other player's does not mean that the probability of making his *next* shot (the marginal benefit of having him shoot once more) is higher than the probability of another player making his next shot. Indeed, if the best player took all his team's shots, the other team would focus its defensive effort entirely on him, in which case letting others shoot would definitely pay.

*Problems marked with an asterisk (*) are more difficult.