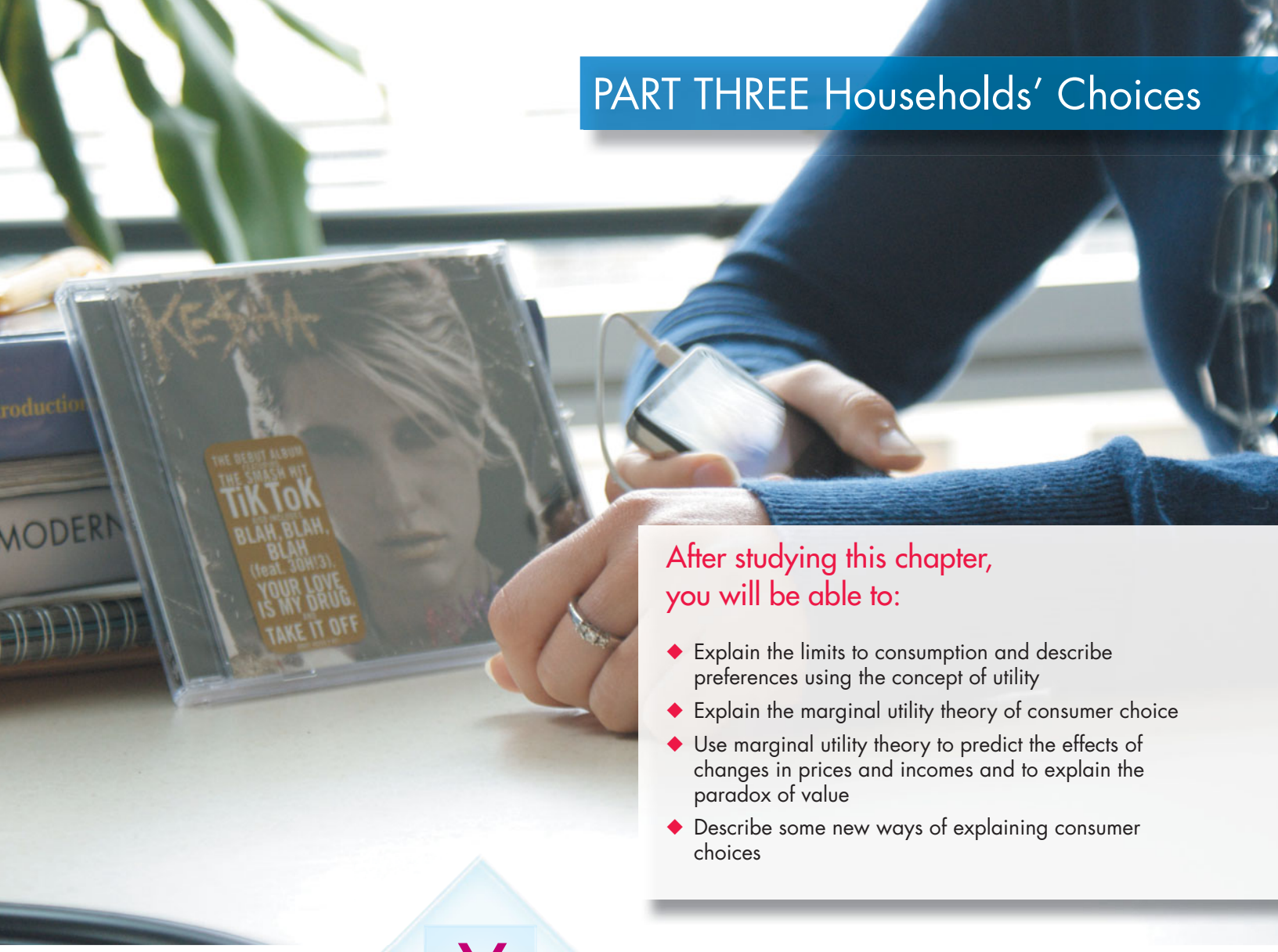


After studying this chapter, you will be able to:

- Explain the limits to consumption and describe preferences using the concept of utility
- Explain the marginal utility theory of consumer choice
- Use marginal utility theory to predict the effects of changes in prices and incomes and to explain the paradox of value
- Describe some new ways of explaining consumer choices

8 UTILITY AND DEMAND

You want Ke$ha's album *Animal*. Will you buy the CD version from Amazon for $11.88, or will you download it from the iTunes store for $7.99? Some people choose a physical CD, others a download. What determines our choices as buyers of recorded music? Also, how much better off are we because we can download an album for less than $10 and some songs for less than $1?

You know that diamonds are expensive and water is cheap. Doesn't that seem odd? Why do we place a higher value on useless diamonds than on essential-to-life water? You can think of many other examples of this paradox. For example, paramedics who save peoples lives get paid a tiny fraction of what a National Hockey League player earns. Do we really place less value on the people who take care of the injured and the sick than we place on those who provide us with entertaining hockey games?

The theory of consumer choice that you're going to study in this chapter answers questions like the ones we've just posed and *Reading Between the Lines* at the end of the chapter looks at the paramedic and hockey player paradox of value.

Consumption Choices

The choices that you make as a buyer of goods and services—your consumption choices—are influenced by many factors. We can summarize them under two broad headings:

- Consumption possibilities
- Preferences

Consumption Possibilities

Your consumption possibilities are all the things that you can afford to buy. You can afford many different combinations of goods and services, but they are all limited by your income and by the prices that you must pay. For example, you might decide to spend a big part of your income on a gym membership and personal trainer and little on movies and music, or you might spend lots on movies and music and use the free gym at school.

The easiest way to describe consumption possibilities is to consider a model consumer who buys only two items. That's what we'll now do. We'll study the consumption possibilities of Lisa, who buys only movies and soda.

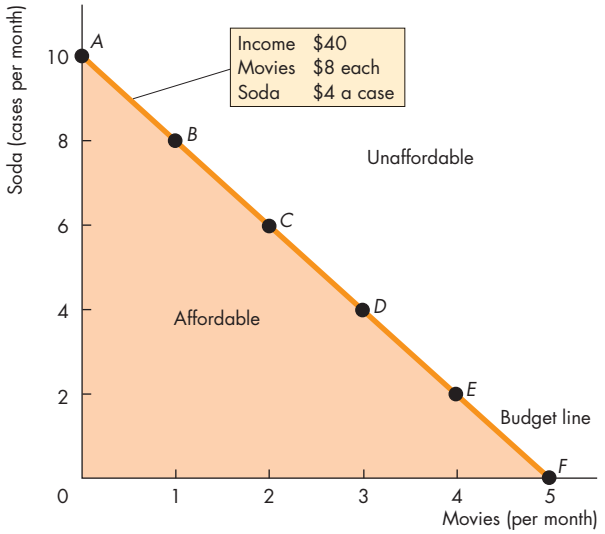
A Consumer's Budget Line Consumption possibilities are limited by income and by the prices of movies and soda. When Lisa spends all her income, she reaches the limits to her consumption possibilities. We describe this limit with a **budget line**, which marks the boundary between those combinations of goods and services that a household can afford to buy and those that it cannot afford.

Figure 8.1 illustrates Lisa's consumption possibilities of movies and soda and her budget line. Lisa has an income of $40 a month, the price of a movie is $8, and the price of soda is $4 a case. Rows *A* through *F* in the table show six possible ways of allocating $40 to these two goods. For example, in row *A* Lisa buys 10 cases of soda and sees no movies; in row *F* she sees 5 movies and buys no soda; and in row *C* she sees 2 movies and buys 6 cases of soda.

Points *A* through *F* in the graph illustrate the possibilities presented in the table, and the line passing through these points is Lisa's budget line.

The budget line constrains choices: It marks the boundary between what is affordable and unaffordable. Lisa can afford all the points on the budget line and inside it. Points outside the line are unaffordable.

FIGURE 8.1 Lisa's Budget Line



	Movies		Soda	
Possibility	Quantity	Expenditure (dollars)	Cases	Expenditure (dollars)
A	0	0	10	40
B	1	8	8	32
C	**2**	**16**	**6**	**24**
D	3	24	4	16
E	4	32	2	8
F	5	40	0	0

The graph and the table show six possible ways in which Lisa can allocate $40 to movies and soda. In row *C* and at point *C*, she sees 2 movies and buys 6 cases of soda. The line *AF* is Lisa's budget line and is a boundary between what she can afford and what she cannot afford. Her choices must lie along the line *AF* or inside the orange area.

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Changes in Consumption Possibilities Consumption possibilities change when income or prices change. A rise in income shifts the budget line outward but leaves its slope unchanged. A change in a price changes the slope of the line[1]. Our goal is to predict the effects of such changes on consumption choices. To do so, we must determine the choice a consumer makes. The budget line shows what is possible; preferences determine which possibility is chosen. We'll now describe a consumer's preferences.

[1] Chapter 9 explains an alternative model of consumer choice and pp. 203–204 provides some detail on how changes in income and prices change the budget line.

Preferences

Lisa's income and the prices that she faces limit her consumption choices, but she still has lots of choice. The choice that she makes depends on her **preferences**—a description of her likes and dislikes.

You saw one way that economists use to describe preferences in Chapter 2 (p. 34), the concept of *marginal benefit* and the *marginal benefit curve*. But you also saw in Chapter 5 (p. 108) that a marginal benefit curve is also a demand curve. The goal of a theory of consumer choice is to derive the demand curve from a deeper account of how consumers make their buying plans. That is, we want to *explain what determines demand and marginal benefit.*

To achieve this goal, we need a deeper way of describing preferences. One approach to this problem uses the idea of utility, and defines **utility** as the benefit or satisfaction that a person gets from the consumption of goods and services. We distinguish two utility concepts:

- Total utility
- Marginal utility

Total Utility The total benefit that a person gets from the consumption of all the different goods and services is called **total utility**. Total utility depends on the level of consumption—more consumption generally gives more total utility.

To illustrate the concept of total utility, think about Lisa's choices. We tell Lisa that we want to measure her utility from movies and soda. We can use any scale that we wish to measure her total utility and we give her two starting points: (1) We will call the total utility from no movies and no soda zero utility; and (2) We will call the total utility she gets from seeing 1 movie a month 50 units.

We then ask Lisa to tell us, using the same scale, how much she would like 2 movies, and more, up to 10 movies a month. We also ask her to tell us, on the same scale, how much she would like 1 case of soda a month, 2 cases, and more, up to 10 cases a month.

In Table 8.1, the columns headed "Total utility" show Lisa's answers. Looking at those numbers, you can say a lot about how much Lisa likes soda and movies. She says that 1 case of soda gives her 75 units of utility—50 percent more than the utility that she gets from seeing 1 movie. You can also see that her total utility from soda climbs more slowly than her total utility from movies. This difference turns on the second utility concept: *marginal utility*.

TABLE 8.1 Lisa's Utility from Movies and Soda

Movies			Soda		
Quantity (per month)	Total utility	Marginal utility	Cases (per month)	Total utility	Marginal utility
0	0	50	0	0	75
1	50	40	1	75	48
2	90	32	2	123	36
3	122	28	3	159	24
4	150	26	4	183	22
5	176	24	5	205	20
6	200	22	6	225	13
7	222	20	7	238	10
8	242	17	8	248	7
9	259	16	9	255	5
10	275		10	260	

Marginal Utility We define **marginal utility** as the *change* in total utility that results from a one-unit increase in the quantity of a good consumed.

In Table 8.1, the columns headed "Marginal utility" show Lisa's marginal utility from movies and soda. You can see that if Lisa increases the soda she buys from 1 to 2 cases a month, her total utility from soda increases from 75 units to 123 units. For Lisa, the marginal utility from the second case each month is 48 units (123 – 75).

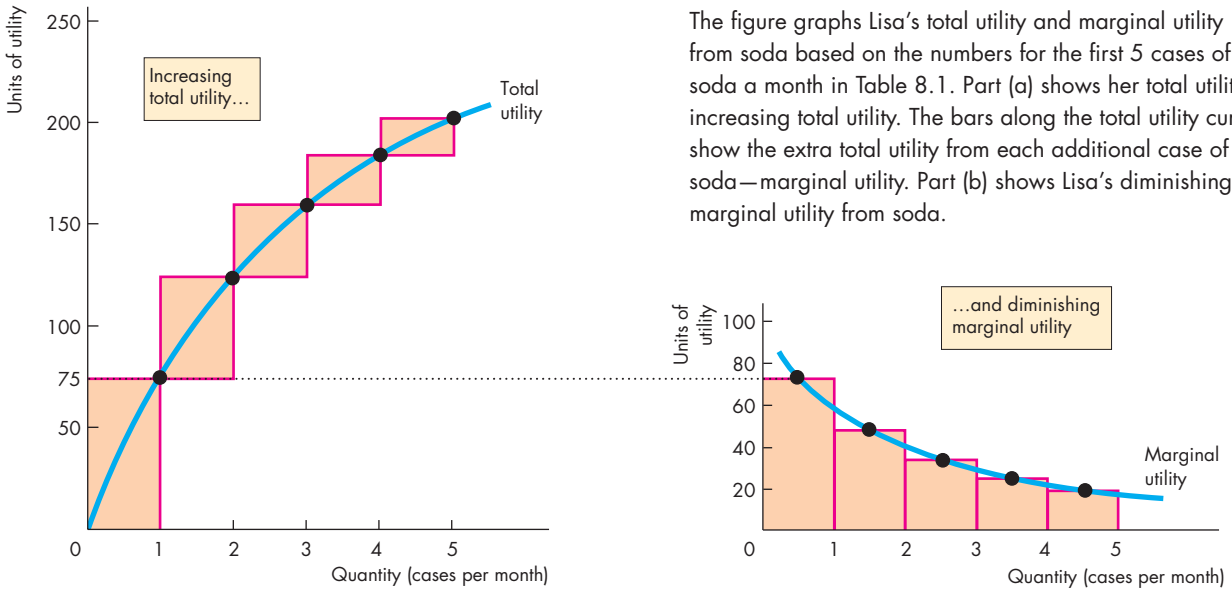
The marginal utility numbers appear midway between the quantities of soda because it is the *change* in the quantity she buys from 1 to 2 cases that produces the marginal utility of 48 units.

Marginal utility is *positive,* but it *diminishes* as the quantity of a good consumed increases.

Positive Marginal Utility All the things that people enjoy and want more of have a positive marginal utility. Some objects and activities can generate negative marginal utility—and lower total utility. Two examples are hard labor and polluted air. But all the goods and services that people value and that we are thinking about here have positive marginal utility: Total utility increases as the quantity consumed increases.

Diminishing Marginal Utility As Lisa sees more movies, her total utility from movies increases but her marginal utility from movies decreases. Similarly, as she

FIGURE 8.2 Total Utility and Marginal Utility



The figure graphs Lisa's total utility and marginal utility from soda based on the numbers for the first 5 cases of soda a month in Table 8.1. Part (a) shows her total utility—increasing total utility. The bars along the total utility curve show the extra total utility from each additional case of soda—marginal utility. Part (b) shows Lisa's diminishing marginal utility from soda.

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consumes more soda, her total utility from soda increases but her marginal utility from soda decreases.

The tendency for marginal utility to decrease as the consumption of a good increases is so general and universal that we give it the status of a *principle*—the principle of **diminishing marginal utility**.

You can see Lisa's diminishing marginal utility by calculating a few numbers. Her marginal utility from soda decreases from 75 units from the first case to 48 units from the second case and to 36 units from the third. Her marginal utility from movies decreases from 50 units for the first movie to 40 units for the second and 32 units for the third. Lisa's marginal utility diminishes as she buys more of each good.

Your Diminishing Marginal Utility You've been studying all day and into the evening, and you've been too busy finishing an assignment to shop for soda. A friend drops by with a can of soda. The utility you get from that soda is the marginal utility from your first soda of the day—from *one* can. On another day you've been on a soda binge. You've been working on an assignment, but you've guzzled 10 cans of soda while doing so, and are now totally wired. You are happy enough to have one more can, but the thrill that you get from it is not very large. It is the marginal utility from the *eleventh* can in a day.

Graphing Lisa's Utility Schedules Figure 8.2(a) illustrates Lisa's total utility from soda. The more soda Lisa consumes in a month, the more total utility she gets. Her total utility curve slopes upward.

Figure 8.2(b) illustrates Lisa's marginal utility from soda. It is a graph of the marginal utility numbers in Table 8.1. This graph shows Lisa's diminishing marginal utility from soda. Her marginal utility curve slopes downward as she consumes more soda.

We've described Lisa's consumption possibilities and preferences. Your next task is to see how Lisa chooses what to consume.

REVIEW QUIZ

1. Explain how a consumer's income and the prices of goods limit consumption possibilities.
2. What is utility and how do we use the concept of utility to describe a consumer's preferences?
3. What is the distinction between total utility and marginal utility?
4. What is the key assumption about marginal utility?

You can work these questions in Study Plan 8.1 and get instant feedback. myeconlab

Utility-Maximizing Choice

Consumers want to get the most utility possible from their limited resources. They make the choice that maximizes utility. To discover this choice, we combine the constraint imposed by the budget and the consumer's preferences and find the point on the budget line that gives the consumer the maximum attainable utility. Let's find Lisa's utility-maximizing choice.

A Spreadsheet Solution

Lisa's most direct way of finding the quantities of movies and soda that maximize her utility is to make a table in a spreadsheet with the information and calculations shown in Table 8.2. Let's see what that table tells us.

Find the Just-Affordable Combinations Table 8.2 shows the combinations of movies and soda that Lisa can afford and that exhaust her $40 income. For example, in row *A*, Lisa buys only soda and at $4 a case she can buy 10 cases. In row *B*, Lisa sees 1 movie and buys 8 cases of soda. She spends $8 on the movie. At $4 a case, she spends $32 on soda and can buy 8 cases. The combination in row *B* just exhausts her $40. The combinations shown in the table are the same as those plotted on her budget line in Fig. 8.1.

We noted that the budget line shows that Lisa can also afford any combination *inside* the budget line. The quantities in those combinations would be smaller than the ones shown in Table 8.2 and they do not exhaust her $40. But smaller quantities don't maximize her utility. Why? The marginal utilities of movies and soda are positive, so the more of each that Lisa buys, the more total utility she gets.

Find the Total Utility for Each Just-Affordable Combination Table 8.2 shows the total utility that Lisa gets from the just-affordable quantities of movies and soda. The second and third columns show the numbers for movies and fourth and fifth columns show those for soda. The center column adds the total utility from movies to the total utility from soda. This number, the total utility from movies *and* soda, is what Lisa wants to maximize.

In row A of the table, Lisa sees no movies and buys 10 cases of soda. She gets no utility from movies and 260 units of utility from soda. Her total utility from movies and soda (the center column) is 260 units.

TABLE 8.2 Lisa's Utility-Maximizing Choice

	Movies $8		Total utility from movies and soda	Soda $4	
	Quantity (per month)	Total utility		Total utility	Cases (per month)
A	0	0	260	260	10
B	1	50	298	248	8
C	**2**	**90**	**315**	**225**	**6**
D	3	122	305	183	4
E	4	150	273	123	2
F	5	176	176	0	0

In row C of the table, Lisa sees 2 movies and buys 6 cases of soda. She gets 90 units of utility from movies and 225 units of utility from soda. Her total utility from movies and soda is 315 units. This combination of movies and soda maximizes Lisa's total utility. That is, given the prices of movies and soda, Lisa's best choice when she has $40 to spend is to see 2 movies and buy 6 cases of soda.

If Lisa sees 1 movie, she can buy 8 cases of soda, but she gets only 298 units of total utility—17 units less than the maximum attainable. If she sees 3 movies, she can buy only 4 cases of soda. She gets 305 units of total utility—10 units less than the maximum attainable.

Consumer Equilibrium We've just described Lisa's consumer equilibrium. A **consumer equilibrium** is a situation in which a consumer has allocated all of his or her available income in the way that maximizes his or her total utility, given the prices of goods and services. Lisa's consumer equilibrium is 2 movies and 6 cases of soda.

To find Lisa's consumer equilibrium, we did something that an economist might do but that a consumer is not likely to do: We measured her total utility from all the affordable combinations of movies and soda and then, by inspection of the numbers, selected the combination that gives the highest total utility. There is a more natural way of finding a consumer's equilibrium—a way that uses the idea that choices are made at the margin, as you first met in Chapter 1. Let's look at this approach.

Choosing at the Margin

When you go shopping you don't do utility calculations. But you do decide how to allocate your budget, and you do so in a way that you think is best for you. If you could make yourself better off by spending a few more dollars on an extra unit of one item and the same number of dollars less on something else, you would make that change. So, when you've allocated your budget in the best possible way, you can't make yourself better off by spending more on one item and less on others.

Marginal Utility per Dollar Economists interpret your best possible choice by using the idea of marginal utility per dollar. *Marginal utility* is the increase in total utility that results from consuming *one more unit* of a good. **Marginal utility per dollar** is the *marginal utility* from a good that results from spending *one more dollar* on it.

The distinction between these two marginal concepts is clearest for a good that is infinitely divisible, such as gasoline. You can buy gasoline by the smallest fraction of a gallon and literally choose to spend one more or one less dollar at the pump. The increase in total utility that results from spending one more dollar at the pump is the marginal utility per dollar from gasoline. When you buy a movie ticket or a case of soda, you must spend your dollars in bigger lumps. To buy our marginal movie ticket or case of soda, you must spend the price of one unit and your total utility increases by the marginal utility from that item. So to calculate the marginal utility per dollar for movies (or soda), we must divide marginal utility from the good by its price.

Call the marginal utility from movies MU_M and the price of a movie P_M. Then the *marginal utility per dollar from movies* is

$$MU_M/P_M.$$

Call the marginal utility from soda MU_S and the price of a case of soda P_S. Then the *marginal utility per dollar from soda* is

$$MU_S/P_S.$$

By comparing the marginal utility per dollar from all the goods that a person buys, we can determine whether the budget has been allocated in the way that maximizes total utility.

Let's see how we use the marginal utility per dollar to define a utility-maximizing rule.

Utility-Maximizing Rule A consumer's total utility is maximized by following the rule:

- Spend all the available income
- Equalize the marginal utility per dollar for all goods

Spend All the Available Income Because more consumption brings more utility, only those choices that exhaust income can maximize utility. For Lisa, combinations of movies and soda that leave her with money to spend don't give her as much total utility as those that exhaust her $40 per month income.

Equalize the Marginal Utility per Dollar The basic idea behind this rule is to move dollars from good *A* to good *B* if doing so increases the utility from good *A* by more than it decreases the utility from good *B*. Such a utility-increasing move is possible if the marginal utility per dollar from good *A* exceeds that from good *B*.

But buying more of good *A* decreases its marginal utility. And buying less of good *B* increases its marginal utility. So by moving dollars from good *A* to good *B*, total utility rises, but the gap between the marginal utilities per dollar gets smaller.

As long as the gap exists—as long as the marginal utility per dollar from good *A* exceeds that from good *B*—total utility can be increased by spending more on *A* and less on *B*. But when enough dollars have been moved from *B* to *A* to make the two marginal utilities per dollar equal, total utility cannot be increased further. Total utility is maximized.

Lisa's Marginal Calculation Let's apply the basic idea to Lisa. To calculate Lisa's marginal utility per dollar, we divide her marginal utility numbers for each quantity of each good by the price of the good. The table in Fig. 8.3 shows these calculations for Lisa, and the graph illustrates the situation on Lisa's budget line. The rows of the table are three of her affordable combinations of movies and soda.

Too Much Soda and Too Few Movies In row *B*, Lisa sees 1 movie a month and consumes 8 cases of soda a month. Her marginal utility from seeing 1 movie a month is 50 units. Because the price of a movie is $8, Lisa's marginal utility per dollar from movies is 50 units divided by $8, or 6.25 units of utility per dollar.

Lisa's marginal utility from soda when she consumes 8 cases of soda a month is 10 units. Because the price of soda is $4 a case, Lisa's marginal utility

per dollar from soda is 10 units divided by $4, or 2.50 units of utility per dollar.

When Lisa sees 1 movie and consumes 8 cases of soda a month, her marginal utility per dollar from soda is *less than* her marginal utility per dollar from movies. That is,

$$MU_S/P_S < MU_M/P_M.$$

If Lisa spent an extra dollar on movies and a dollar less on soda, her total utility would increase. She would get 6.25 units from the extra dollar spent on movies and lose 2.50 units from the dollar less spent on soda. Her total utility would increase by 3.75 units (6.25 – 2.50).

Too Little Soda and Too Many Movies In row *D*, Lisa sees 3 movies a month and consumes 4 cases of soda. Her marginal utility from seeing the third movie a month is 32 units. At a price of $8 a movie, Lisa's marginal utility per dollar from movies is 32 units divided by $8, or 4 units of utility per dollar.

Lisa's marginal utility from soda when she buys 4 cases a month is 24 units. At a price of $4 a case, Lisa's marginal utility per dollar from soda is 24 units divided by $4, or 6 units of utility per dollar.

When Lisa sees 3 movies and consumes 4 cases of soda a month, her marginal utility from soda *exceeds* her marginal utility from movies. That is,

$$MU_S/P_S > MU_M/P_M.$$

If Lisa spent an extra dollar on soda and a dollar less on movies, her total utility would increase. She would get 6 units from the extra dollar spent on soda and she would lose 4 units from the dollar less spent on movies. Her total utility would increase by 2 units (6 – 4).

Utility-Maximizing Movies and Soda In Fig. 8.3, if Lisa moves from row *B* to row *C*, she increases the movies she sees from 1 to 2 a month and decreases the soda she consumes from 8 to 6 cases a month. Her marginal utility per dollar from movies falls to 5 and her marginal utility per dollar from soda rises to 5.

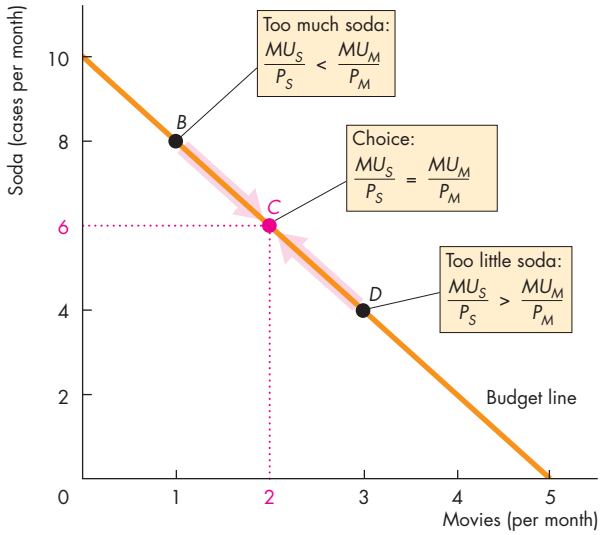
Similarly, if Lisa moves from row *D* to row *C*, she decreases the movies she sees from 3 to 2 a month and increases the soda she consumes from 4 to 6 cases a month. Her marginal utility per dollar from movies rises to 5 and her marginal utility per dollar from soda falls to 5.

When Lisa sees 2 movies and consumes 6 cases of soda a month, her marginal utility per dollar from soda *equals* her marginal utility per dollar from movies. That is,

$$MU_S/P_S = MU_M/P_M.$$

Lisa can't move from this allocation of her budget without making herself worse off.

FIGURE 8.3 Equalizing Marginal Utilities per Dollar



	Movies ($8 each)			Soda ($4 per case)		
	Quantity	Marginal utility	Marginal utility per dollar	Cases	Marginal utility	Marginal utility per dollar
B	1	50	6.25	8	10	2.50
C	**2**	40	**5.00**	***6***	20	**5.00**
D	3	32	4.00	4	24	6.00

The graph shows Lisa's budget line and identifies three points on it. The rows of the table describe these points.

At point *B* (row *B*), with 1 movie and 8 cases of soda, Lisa's marginal utility per dollar from soda is less than that from movies: Buy less soda and see more movies.

At point *D* (row *D*), with 3 movies and 4 cases of soda, Lisa's marginal utility per dollar from soda is greater than that from movies: Buy more soda and see fewer movies.

At point *C* (row *C*), with 2 movies and 6 cases of soda, Lisa's marginal utility per dollar from soda is equal to that from movies: Lisa's utility is maximized.

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The Power of Marginal Analysis

The method we've just used to find Lisa's utility-maximizing choice of movies and soda is an example of the power of marginal analysis. Lisa doesn't need a computer and a spreadsheet program to maximize utility. She can achieve this goal by comparing the marginal gain from having more of one good with the marginal loss from having less of another good.

The rule that she follows is simple: If the marginal utility per dollar from movies exceeds the marginal utility per dollar from soda, see more movies and buy less soda; if the marginal utility per dollar from soda exceeds the marginal utility per dollar from movies, buy more soda and see fewer movies.

More generally, if the marginal gain from an action exceeds the marginal loss, take the action. You will meet this principle time and again in your study of economics, and you will find yourself using it when you make your own economic choices, especially when you must make big decisions.

Revealing Preferences

When we introduced the idea of utility, we arbitrarily chose 50 units as Lisa's total utility from 1 movie, and we pretended that we asked Lisa to tell us how many units of utility she got from different quantities of soda and movies.

You're now about to discover that we don't need to ask Lisa to tell us her preferences. We can figure them out for ourselves by observing what she buys at various prices.

Also, the units in which we measure Lisa's preferences don't matter. Any arbitrary units will work. In this respect, utility is like temperature. Predictions about the freezing point of water don't depend on the temperature scale; and predictions about a household's consumption choice don't depend on the units of utility.

Lisa's Preferences In maximizing total utility by making the marginal utility per dollar equal for all goods, the units in which utility is measured do not matter.

You've seen that when Lisa maximizes her total utility, her marginal utility per dollar from soda, MU_S/P_S, equals her marginal utility per dollar from movies, MU_M/P_M. That is,

$$MU_S/P_S = MU_M/P_M.$$

Multiply both sides of this equation by the price of soda, P_S, to obtain

$$MU_S = MU_M \times (P_S/P_M).$$

This equation says that the marginal utility from soda, MU_S, is equal to the marginal utility from movies, MU_M, multiplied by the ratio of the price of soda, P_S, to the price of a movie, P_M.

The ratio P_S/P_M is the relative price of soda in terms of movies: It is the number of movies that must be forgone to get 1 case of soda. It is also the opportunity cost of soda. (See Chapter 2, p. 31 and Chapter 3, p. 56.)

For Lisa, when P_M = \$8 and P_S = \$4 we observe that in a month she goes to the movies twice and buys 6 cases of soda. So we know that her MU_S from 6 cases of soda equals her MU_M from 2 movies multiplied by \$4/\$8 or 0.5. That is, for Lisa, the marginal utility from 6 cases of soda equals one-half of the marginal utility from 2 movies.

If we observe the choices that Lisa makes at more prices, we can find more rows in her utility schedule. By her choices, Lisa reveals her preferences.

Units of Utility Don't Matter Lisa's marginal utility from 2 movies is a half of her marginal utility from 6 cases of soda. So if the marginal utility from the second movie is 40 units, then the marginal utility from the sixth case of soda is 20 units. But if we call the marginal utility from the second movie 50 units, then the marginal utility from the sixth case of soda is 25 units. The units of utility are arbitrary.

REVIEW QUIZ

1. Why does a consumer spend the entire budget?
2. What is the marginal utility per dollar and how is it calculated?
3. What two conditions are met when a consumer is maximizing utility?
4. Explain why equalizing the marginal utility per dollar for all goods maximizes utility.

You can work these questions in Study Plan 8.2 and get instant feedback. myeconlab

You now understand the marginal utility theory of consumer choices. Your next task is to see what the theory predicts.

Predictions of Marginal Utility Theory

We're now going to use marginal utility theory to make some predictions. You will see that marginal utility theory predicts the law of demand. The theory also predicts that a fall in the price of a substitute of a good decreases the demand for the good and that for a normal good, a rise in income increases demand. All these effects, which in Chapter 3 we simply assumed, are predictions of marginal utility theory.

To derive these predictions, we will study the effects of three events:

- A fall in the price of a movie
- A rise in the price of soda
- A rise in income

A Fall in the Price of a Movie

With the price of a movie at $8 and the price of soda at $4, Lisa is maximizing utility by seeing 2 movies and buying 6 cases of soda each month. Then, with no change in her $40 income and no change in the price of soda, the price of a movie falls from $8 to $4. How does Lisa change her buying plans?

Finding the New Quantities of Movies and Soda

You can find the effect of a fall in the price of a movie on the quantities of movies and soda that Lisa buys in a three-step calculation.

1. Determine the just-affordable combinations of movies and soda at the new prices.
2. Calculate the new marginal utilities per dollar from the good whose price has changed.
3. Determine the quantities of movies and soda that make their marginal utilities per dollar equal.

Affordable Combinations The lower price of a movie means that Lisa can afford more movies or more soda. Table 8.3 shows her new affordable combinations. In row *A*, if she continues to see 2 movies a month, she can now afford 8 cases of soda and in row *B*, if she continues to buy 6 cases of soda, she can now afford 4 movies. Lisa can afford any of the combinations shown in the rows of Table 8.3.

The next step is to find her new marginal utilities per dollar from movies.

New Marginal Utilities per Dollar from Movies A person's preferences don't change just because a price has changed. With no change in her preferences, Lisa's marginal utilities in Table 8.3 are the same as those in Table 8.1. But because the price of a movie has changed, the marginal utility *per dollar* from movies changes. In fact, with a halving of the price of a movie from $8 to $4, the marginal utility per dollar from movies has doubled.

The numbers in Table 8.3 show Lisa's new marginal utility per dollar from movies for each quantity of movies. The table also shows Lisa's marginal utility per dollar from soda for each quantity.

Equalizing the Marginal Utilities per Dollar You can see that if Lisa continues to see 2 movies a month and buy 6 cases of soda, her marginal utility per dollar from movies (row *A*) is 10 units and her marginal utility per dollar from soda (row *B*) is 5 units. Lisa is buying too much soda and too few movies. If she spends a dollar more on movies and a dollar less on soda, her total utility increases by 5 units (10 – 5).

If Lisa continues to buy 6 cases of soda and decreases the number of movies to 4 (row *B*), her

TABLE 8.3 How a Change in the Price of Movies Affects Lisa's Choices

	Movies ($4 each)			Soda ($4 per case)		
	Quantity	Marginal utility	Marginal utility per dollar	Cases	Marginal utility	Marginal utility per dollar
	0	0		10	5	1.25
	1	50	12.50	9	7	1.75
A	**2**	40	**10.00**	8	10	2.50
	3	32	8.00	7	13	3.25
B	4	28	7.00	**6**	20	**5.00**
	5	26	6.50	5	22	5.50
C	**6**	24	**6.00**	**4**	24	**6.00**
	7	22	5.50	3	36	9.00
	8	20	5.00	2	48	12.00
	9	17	4.25	1	75	18.75
	10	16	4.00	0	0	

marginal utility per dollar from movies falls to 7 units, but her marginal utility per dollar from soda is 5 units. Lisa is still buying too much soda and seeing too few movies. If she spends a dollar more on movies and a dollar less on soda, her total utility increases by 2 units (7 – 5).

But if Lisa sees 6 movies and buys 4 cases of soda a month (row *C*), her marginal utility per dollar from movies (6 units) equals her marginal utility per dollar from soda and she is maximizing utility. If Lisa moves from this allocation of her budget in either direction, her total utility decreases.

Lisa's increased purchases of movies results from a substitution effect—she substitutes the now lower-priced movies for soda—and an income effect—she can afford more movies.

A Change in the Quantity Demanded Lisa's increase in the quantity of movies that she sees is a change in the quantity demanded. It is the change in the quantity of movies that she plans to see each month when the price of a movie changes and all other influences on buying plans remain the same. We illustrate a change in the quantity demanded by a movement along a demand curve.

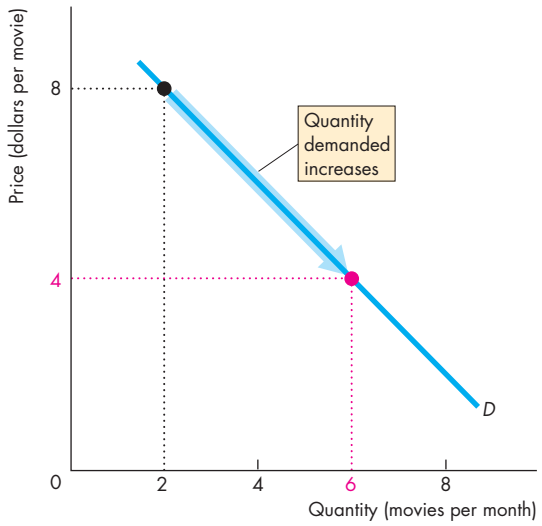
Figure 8.4(a) shows Lisa's demand curve for movies. When the price of a movie is $8, Lisa sees 2 movies a month. When the price of a movie falls to $4, she sees 6 movies a month. Lisa moves downward along her demand curve for movies.

The demand curve traces the quantities that maximize utility at each price, with all other influences remaining the same. You can also see that utility-maximizing choices generate a downward-sloping demand curve. Utility maximization with diminishing marginal utility implies the law of demand.

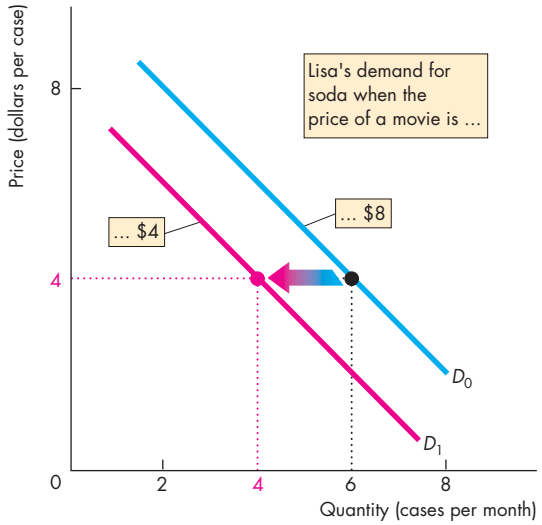
A Change in Demand The decrease in the quantity of soda that Lisa buys is the change in the quantity of soda that she plans to buy at a given price of soda when the price of a movie changes. It is a change in her demand for soda. We illustrate a change in demand by a shift of a demand curve.

Figure 8.4(b) shows Lisa's demand curve for soda. The price of soda is fixed at $4 a case. When the price of a movie is $8, Lisa buys 6 cases of soda on demand curve D_0. When the price of a movie falls to $4, Lisa buys 4 cases of soda on demand curve D_1. The fall in the price of a movie decreases Lisa's demand for soda. Her demand curve for soda shifts leftward. For Lisa, soda and movies are substitutes.

FIGURE 8.4 A Fall in the Price of a Movie



(a) Demand for movies



(b) Demand for soda

When the price of a movie falls and the price of soda remains the same, the quantity of movies demanded by Lisa increases, and in part (a), Lisa moves along her demand curve for movies. Also, when the price of a movie falls, Lisa's demand for soda decreases, and in part (b), her demand curve for soda shifts leftward. For Lisa, soda and movies are substitutes.

myeconlab animation

A Rise in the Price of Soda

Now suppose that with the price of a movie at $4, the price of soda rises from $4 to $8 a case. How does this price change influence Lisa's buying plans? We find the answer by repeating the three-step calculation with the new price of soda.

Table 8.4 shows Lisa's new affordable combinations. In row *A*, if she continues to buy 4 cases of soda a month she can afford to see only 2 movies; and in row *B*, if she continues to see 6 movies a month, she can afford only 2 cases of soda.

Table 8.4 show Lisa's marginal utility per dollar from soda for each quantity of soda when the price is $8 a case. The table also shows Lisa's marginal utility per dollar from movies for each quantity.

If Lisa continues to buy 4 cases of soda (row *A*), her marginal utility per dollar from soda is 3. But she must cut the movies she sees to 2, which increases her marginal utility per dollar from movies to 10. Lisa is buying too much soda and too few movies. If she spends a dollar less on soda and a dollar more on movies, her utility increases by 7 units (10 – 3) .

But if Lisa sees 6 movies a month and cuts her soda to 2 cases (row *B*), her marginal utility per dollar from movies (6 units) equals her marginal utility per dollar from soda. She is maximizing utility.

Lisa's decreased purchases of soda results from an income effect—she can afford fewer cases and she buys fewer cases. But she continues to buy the same quantity of movies.

TABLE 8.4 How a Change in the Price of Soda Affects Lisa's Choices

	Movies ($4 each)			Soda ($8 per case)		
	Quantity	Marginal utility	Marginal utility per dollar	Cases	Marginal utility	Marginal utility per dollar
	0	0		5	22	2.75
A	2	40	10.00	**4**	24	**3.00**
	4	28	7.00	3	36	4.50
B	**6**	24	**6.00**	**2**	48	**6.00**
	8	20	5.00	1	75	9.38
	10	16	4.00	0	0	

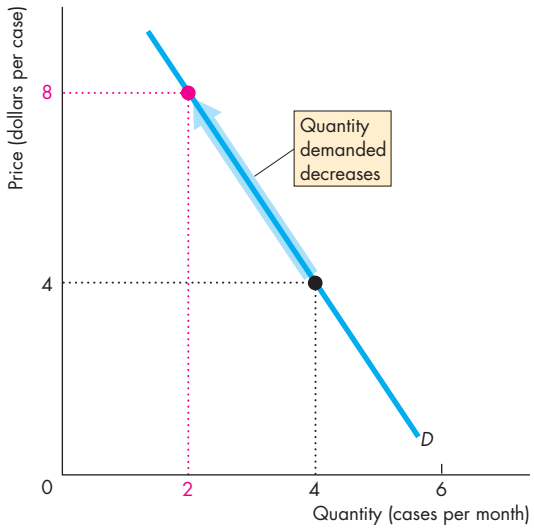
Lisa's Demand for Soda Now that we've calculated the effect of a change in the price of soda on Lisa's buying plans when income and the price of movies remain the same, we have found two points on her demand curve for soda: When the price of soda is $4 a case, Lisa buys 4 cases a month; and when the price of soda is $8 a case, she buys 2 cases a month.

Figure 8.5 shows these points on Lisa's demand curve for soda. It also shows the change in the quantity of soda demanded when the price of soda rises and all other influences on Lisa's buying plans remain the same.

In this example, Lisa continues to buy the same quantity of movies, but this outcome does not always occur. It is a consequence of Lisa's preferences. With different marginal utilities, she might have decreased or increased the quantity of movies that she sees when the price of soda changes.

You've seen that marginal utility theory predicts the law of demand—the way in which the quantity demanded of a good changes when its price changes. Next, we'll see how marginal utility theory predicts the effect of a change in income on demand.

FIGURE 8.5 A Rise in the Price of Soda



When the price of soda rises and the price of a movie and Lisa's income remain the same, the quantity of soda demanded by Lisa decreases. Lisa moves along her demand curve for soda.

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A Rise in Income

Suppose that Lisa's income increases from $40 to $56 a month and that the price of a movie is $4 and the price of soda is $4 a case. With these prices and with an income of $40 a month, Lisa sees 6 movies and buys 4 cases of soda a month (Table 8.3). How does the increase in Lisa's income from $40 to $56 change her buying plans?

Table 8.5 shows the calculations needed to answer this question. If Lisa continues to see 6 movies a month, she can now afford to buy 8 cases of soda (row *A*); if she continues to buy 4 cases of soda, she can now afford to see 10 movies (row *C*).

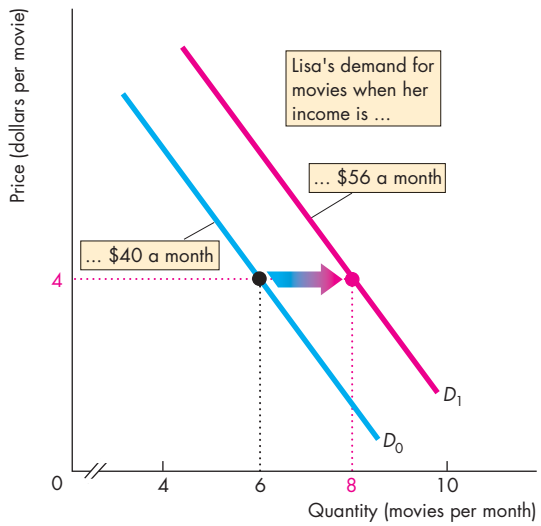
In row *A*, Lisa's marginal utility per dollar from movies is greater than her marginal utility per dollar from soda. She is buying too much soda and too few movies. In row *C*, Lisa's marginal utility per dollar from movies is less than her marginal utility per dollar from soda. She is buying too little soda and too many movies. But in row *B*, when Lisa sees 8 movies a month and buys 6 cases of soda, her marginal utility per dollar from movies equals that from soda. She is maximizing utility.

Figure 8.6 shows the effects of the rise in Lisa's income on her demand curves for movies and soda. The price of each good is $4. When Lisa's income rises to $56 a month, she sees 2 more movies and buys 2 more cases of soda. Her demand curves for both movies and soda shift rightward—her demand for both movies and soda increases. With a larger income, the consumer always buys more of a *normal* good. For Lisa, movies and soda are normal goods.

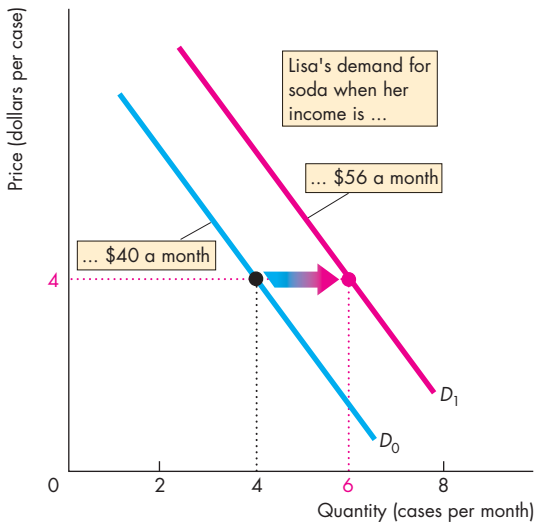
TABLE 8.5 Lisa's Choices with an Income of $56 a Month

	Movies ($4 each)			Soda ($4 per case)		
	Quantity	Marginal utility	Marginal utility per dollar	Cases	Marginal utility	Marginal utility per dollar
	4	28	7.00	10	5	1.25
	5	26	6.50	9	7	1.75
A	**6**	24	**6.00**	8	10	2.50
	7	22	5.50	7	13	3.25
B	**8**	20	**5.00**	**6**	20	**5.00**
	9	17	4.25	5	22	5.50
C	10	16	4.00	**4**	24	**6.00**

FIGURE 8.6 The Effects of a Rise in Income



(a) Demand for movies



(b) Demand for soda

When Lisa's income increases, her demand for movies and her demand for soda increase. Lisa's demand curves for movies, in part (a), and for soda, in part (b), shift rightward. For Lisa, movies and soda are normal goods.

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The Paradox of Value

The price of water is low and the price of a diamond is high, but water is essential to life while diamonds are used mostly for decoration. How can valuable water be so cheap while a relatively useless diamond is so expensive? This so-called *paradox of value* has puzzled philosophers for centuries. Not until the theory of marginal utility had been developed could anyone give a satisfactory answer.

The Paradox Resolved The paradox is resolved by distinguishing between *total* utility and *marginal* utility. The total utility that we get from water is enormous. But remember, the more we consume of something, the smaller is its marginal utility.

We use so much water that its marginal utility—the benefit we get from one more glass of water or another 30 seconds in the shower—diminishes to a small value.

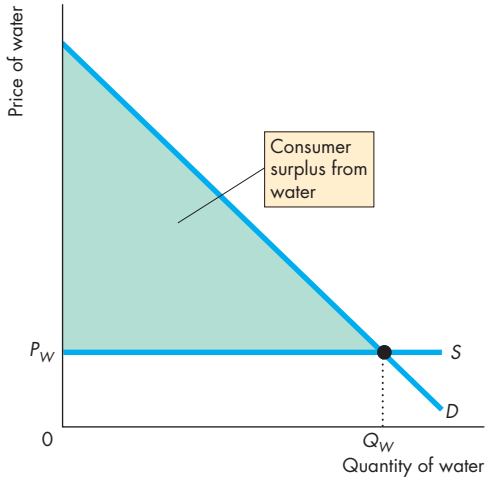
Diamonds, on the other hand, have a small total utility relative to water, but because we buy few diamonds, they have a high marginal utility.

When a household has maximized its total utility, it has allocated its income in the way that makes the marginal utility per dollar equal for all goods. That is, the marginal utility from a good divided by the price of the good is equal for all goods.

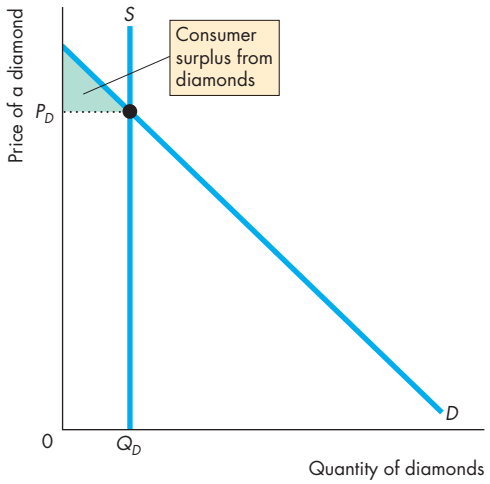
This equality of marginal utilities per dollar holds true for diamonds and water: Diamonds have a high price and a high marginal utility. Water has a low price and a low marginal utility. When the high marginal utility from diamonds is divided by the high price of a diamond, the result is a number that equals the low marginal utility from water divided by the low price of water. The marginal utility per dollar is the same for diamonds and water.

Value and Consumer Surplus Another way to think about the paradox of value and illustrate how it is resolved uses *consumer surplus*. Figure 8.7 explains the paradox of value by using this idea. The supply of water in part (a) is perfectly elastic at price P_W, so the quantity of water consumed is Q_W and the large green area shows the consumer surplus from water. The supply of diamonds in part (b) is perfectly inelastic at the quantity Q_D, so the price of a diamond is P_D and the small green area shows the consumer surplus from diamonds. Water is cheap, but brings a large consumer surplus; diamonds are expensive, but bring a small consumer surplus.

FIGURE 8.7 The Paradox of Value



(a) Water



(b) Diamonds

Part (a) shows the demand for and supply of water. Supply is perfectly elastic at the price P_W. At this price, the quantity of water consumed is Q_W and the large green triangle shows consumer surplus. Part (b) shows the demand for and supply of diamonds. Supply is perfectly inelastic at the quantity Q_D. At this quantity, the price of a diamond is P_D and the small green triangle shows consumer surplus. Water is valuable—has a large consumer surplus—but cheap. Diamonds are less valuable than water—have a smaller consumer surplus—but are expensive.

myeconlab animation

Temperature: An Analogy

Utility is similar to temperature—both are abstract concepts. You can't *observe* temperature. You can observe water turning to steam if it is hot enough or turning to ice if it is cold enough. You can also construct an instrument—a thermometer—that can help you to predict when such changes will occur. We call the scale on the thermometer *temperature* and we call the units of temperature *degrees*. But like the units of utility, these degree units are arbitrary. We can use Celsius units or Fahrenheit units or some other units.

The concept of utility helps us to make predictions about consumption choices in much the same way that the concept of temperature helps us to make predictions about physical phenomena.

Admittedly, marginal utility theory does not enable us to predict how buying plans change with the same precision that a thermometer enables us to predict when water will turn to ice or steam. But the theory provides important insights into buying plans and has some powerful implications. It helps us to understand why people buy more of a good or service when its price falls and why people buy more of most goods when their incomes increase. It also resolves the paradox of value.

We're going to end this chapter by looking at some new ways of studying individual economic choices and consumer behavior.

REVIEW QUIZ

1. When the price of a good falls and the prices of other goods and a consumer's income remain the same, explain what happens to the consumption of the good whose price has fallen and to the consumption of other goods.
2. Elaborate on your answer to the previous question by using demand curves. For which good does demand change and for which good does the quantity demanded change?
3. If a consumer's income increases and if all goods are normal goods, explain how the quantity bought of each good changes.
4. What is the paradox of value and how is the paradox resolved?
5. What are the similarities between utility and temperature?

You can work these questions in Study Plan 8.3 and get instant feedback. myeconlab

Economics in Action

Maximizing Utility from Recorded Music

In 2007, Americans spent $10 billion on recorded music, down from $14 billion in 2000. But the combined quantity of discs and downloads bought increased from 1 billion in 2000 to 1.8 billion in 2007 and the average price of a unit of recorded music fell from $14 to $5.50.

The average price fell because the mix of formats bought changed dramatically. In 2000, we bought 940 million CDs; in 2007, we bought only 500 million CDs and downloaded 1.2 billion music files.

Figure 1 shows the longer history of the changing formats of recorded music.

The music that we buy isn't just one good—it is several goods. Singles and albums are different goods; downloads and discs are different goods; and downloads to a computer and downloads to a cell phone are different goods. There are five major categories and the table shows the quantities of each that we bought in 2007 (excluding DVDs and cassettes).

Format	Singles (millions in 2007)	Albums (millions in 2007)
Disc	3	500
Download	800	40
Mobile	400	–

Source of data: Recording Industry Association of America.

Most people buy all their music in digital form, but many still buy physical CDs and some people buy both downloads and CDs.

We get utility from the singles and albums that we buy, and the more songs and albums we have, the more utility we get. But our marginal utility from songs and albums decreases as the quantity that we own increases.

We also get utility from convenience. A song that we can buy with a mouse click and play with the spin of a wheel is more convenient both to buy and to use than a song on a CD. The convenience of songs downloaded over the Internet means that, song for song, we get more utility from a song downloaded than we get from a song on a physical CD.

But most albums are still played at home on a CD player. So for most people, a physical CD is a more convenient medium for delivering an album. Album for album, people on average get more utility from a CD than from a download.

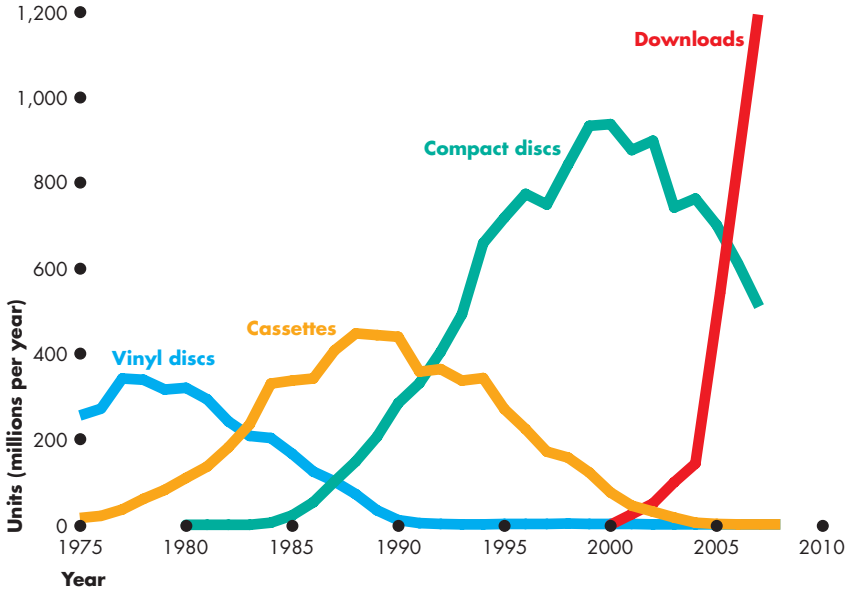


Figure 1 Changing Formats of Recorded Music
Graph from www.swivel.com.

In the 1970s, recorded music came on vinyl discs. Cassettes gradually replaced vinyl, then compact discs (CDs) gradually replaced cassettes, and today, digital files downloaded to computers and mobile devices are replacing physical CDs.

When we decide how many singles and albums to download and how many to buy on CD, we compare the marginal utility per dollar from each type of music in each format. We make the marginal utility per dollar from each type of music in each format equal, as the equations below show.

The market for single downloads has created an enormous consumer surplus. The table shows that the quantity of single downloads demanded at 99 cents each was 800 million in 2007, and the quantity of singles on a disc demanded at $4.75 a disc was 3 million in 2007. If we assume that $4.75 is the most that anyone would pay for a single download (probably an underestimate), the demand curve for single downloads is that shown in Fig. 2.

With the price of a single download at $0.99, consumer surplus (the area of the green triangle in Fig. 2) is $1.5 billion.

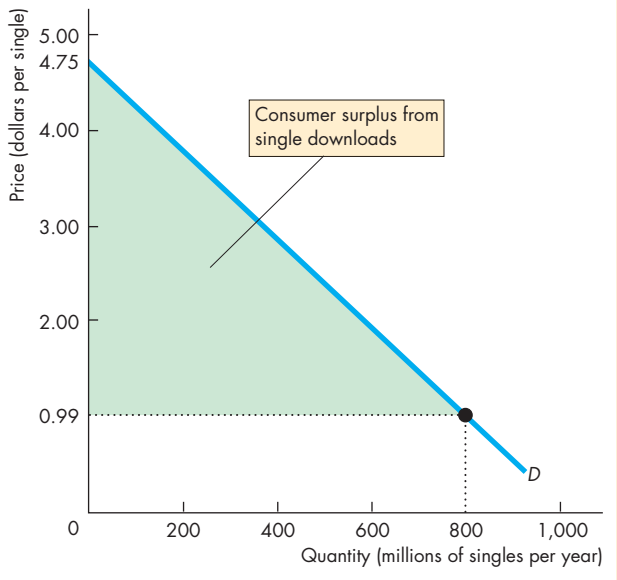


Figure 2 The Demand for Single Downloads

$$\frac{MU_{\text{single downloads}}}{P_{\text{single downloads}}} = \frac{MU_{\text{album downloads}}}{P_{\text{album downloads}}} = \frac{MU_{\text{physical singles}}}{P_{\text{physical singles}}} = \frac{MU_{\text{physical albums}}}{P_{\text{physical albums}}} = \frac{MU_{\text{mobile}}}{P_{\text{mobile}}}$$

$$\frac{MU_{\text{single downloads}}}{\$0.99} = \frac{MU_{\text{album downloads}}}{\$10} = \frac{MU_{\text{physical singles}}}{\$4.75} = \frac{MU_{\text{physical albums}}}{\$15} = \frac{MU_{\text{mobile}}}{\$2.50}$$

New Ways of Explaining Consumer Choices

When William Stanley Jevons developed marginal utility theory in the 1860s, he would have loved to look inside people's brains and "see" their utility. But he believed that the human brain was the ultimate black box that could never be observed directly. For Jevons, and for most economists today, the purpose of marginal utility theory is to explain our *actions*, not what goes on inside our brains.

Economics has developed over the past 150 years with little help from and paying little attention to advances being made in psychology. Both economics and psychology seek to explain human behavior, but they have developed different ways of attacking the challenge.

A few researchers *have* paid attention to the potential payoff from exploring economic problems by using the tools of psychology. These researchers, some economists and some psychologists, think that marginal utility theory is based on a view of how people make choices that attributes too much to reason and rationality. They propose an alternative approach based on the methods of psychology.

Other researchers, some economists and some neuroscientists, are using new tools to look inside the human brain and open up Jevons' "black box."

This section provides a very brief introduction to these new and exciting areas of economics. We'll explore the two related research agendas:

- Behavioral economics
- Neuroeconomics

Behavioral Economics

Behavioral economics studies the ways in which limits on the human brain's ability to compute and implement rational decisions influences economic behavior—both the decisions that people make and the consequences of those decisions for the way markets work.

Behavioral economics starts with observed behavior. It looks for anomalies—choices that do not seem to be rational. It then tries to account for the anomalies by using ideas developed by psychologists that emphasize features of the human brain that limit rational choice.

In behavioral economics, instead of being rational utility maximizers, people are assumed to have three impediments that prevent rational choice: bounded rationality, bounded willpower, and bounded self-interest.

Bounded Rationality Bounded rationality is rationality that is limited by the computing power of the human brain. We can't always work out the rational choice.

For Lisa, choosing between movies and soda, it seems unlikely that she would have much trouble figuring out what to buy. But toss Lisa some uncertainty and the task becomes harder. She's read the reviews of "Ironman 2" on Fandango, but does she really want to see that movie? How much marginal utility will it give her? Faced with uncertainty, people might use rules of thumb, listen to the views of others, and make decisions based on gut instinct rather than on rational calculation.

Bounded Willpower Bounded willpower is the less-than-perfect willpower that prevents us from making a decision that we know, at the time of implementing the decision, we will later regret.

Lisa might be feeling particularly thirsty when she passes a soda vending machine. Under Lisa's rational utility-maximizing plan, she buys her soda at the discount store, where she gets it for the lowest possible price. Lisa has already bought her soda for this month, but it is at home. Spending $1 on a can now means giving up a movie later this month.

Lisa's rational choice is to ignore the temporary thirst and stick to her plan. But she might not possess the willpower to do so—sometimes she will and sometimes she won't.

Bounded Self-Interest Bounded self-interest is the limited self-interest that results in sometimes suppressing our own interests to help others.

A hurricane hits the Florida coast and Lisa, feeling sorry for the victims, donates $10 to a fund-raiser. She now has only $30 to spend on movies and soda this month. The quantities that she buys are not, according to her utility schedule, the ones that maximize her utility.

The main applications of behavioral economics are in two areas: finance, where uncertainty is a key factor in decision making, and savings, where the future

is a key factor. But one behavior observed by behavioral economists is more general and might affect your choices. It is called the endowment effect.

The Endowment Effect The endowment effect is the tendency for people to value something more highly simply because they own it. If you have allocated your income to maximize utility, then the price you would be willing to accept to give up something that you own (for example, your coffee mug) should be the same as the price you are willing to pay for an identical one.

In experiments, students seem to display the endowment effect: The price they are willing to pay for a coffee mug that is identical to the one they own is less than the price they would be willing to accept to give up the coffee mug that they own. Behavioral economists say that this behavior contradicts marginal utility theory.

Neuroeconomics

Neuroeconomics is the study of the activity of the human brain when a person makes an economic decision. The discipline uses the observational tools and ideas of neuroscience to obtain a better understanding of economic decisions.

Neuroeconomics is an experimental discipline. In an experiment, a person makes an economic decision and the electrical or chemical activity of the person's brain is observed and recorded using the same type of equipment that neurosurgeons use to diagnose brain disorders.

The observations provide information about which regions of the brain are active at different points in the process of making an economic decision.

Observations show that some economic decisions generate activity in the area of the brain (called the prefrontal cortex) where we store memories, analyze data, and anticipate the consequences of our actions. If people make rational utility-maximizing decisions, it is in this region of the brain that the decision occurs.

But observations also show that some economic decisions generate activity in the region of the brain (called the hippocampus) where we store memories of anxiety and fear. Decisions that are influenced by activity in this part of the brain might not be rational and be driven by fear or panic.

Neuroeconomists are also able to observe the amount of a brain hormone (called dopamine), the quantity of which increases in response to pleasurable events and decreases in response to disappointing events. These observations might one day enable neuroeconomists to actually measure utility and shine a bright light inside what was once believed to be the ultimate black box.

Controversy

The new ways of studying consumer choice that we've briefly described here are being used more widely to study business decisions and decisions in financial markets, and this type of research is surely going to become more popular.

But behavioral economics and neuroeconomics generate controversy. Most economists hold the view of Jevons that the goal of economics is to explain the decisions that we observe people making and not to explain what goes on inside people's heads.

Most economists would prefer to probe apparent anomalies more deeply and figure out why they are not anomalies after all.

Economists also point to the power of marginal utility theory and its ability to explain consumer choice and demand as well as resolve the paradox of value.

REVIEW QUIZ

1. Define behavioral economics.
2. What are the three limitations on human rationality that behavioral economics emphasizes?
3. Define neuroeconomics.
4. What do behavioral economics and neuroeconomics seek to achieve?

You can work these questions in Study Plan 8.4 and get instant feedback. myeconlab

You have now completed your study of the marginal utility theory and some new ideas about how people make economic choices. You can see marginal utility theory in action once again in *Reading Between the Lines* on pp. 196–197, where it is used to explain why paramedics who save people's lives earn so much less than hockey players who merely provide entertainment.

A Paradox of Value: Paramedics and Hockey Players

Salaries, Strong Recruitment Ease Area Paramedic Shortage

The Washington Post
April 4, 2008

To curb a critical shortage, fire departments across the Washington region have pursued paramedics like star athletes in recent years, enticing them with signing bonuses, handsome salaries and the promise of fast-track career paths.

Montgomery County hired a marketing expert and launched a national recruiting drive, reaching out in particular to women and minorities. Fairfax County offered top starting salaries, now totaling about $57,000—as much as 50 percent higher than some other local jurisdictions, though Fairfax paramedics generally work longer hours. ...

Excerpted from "Salaries, Strong Recruitment Ease Area Paramedic Shortage" by William McCaffrey. *The Washington Post*, April 4, 2008.

Ducks Give Perry $26.6 Million Deal

The Daily News of Los Angeles
July 2, 2008

The Ducks' first free-agent signing might also be their last, their biggest and their most expected.

Within the first hour of the NHL's free agency period, Corey Perry signed a five-year, $26.625 million contract that will keep the 23-year-old in Anaheim until 2013. Both parties had expressed an interest in completing the deal for several months but it wasn't possible until Tuesday, when the Ducks had enough room for long-term contracts under the salary cap.

"I really wanted to stay in Anaheim," Perry said. "It's home now and I didn't want to leave here. It's a great place to play hockey and it just shows how well the organization is run."

Including an $8 million signing bonus spread over its duration, the contract will pay Perry $4.5 million in 2008–09, then $6.5 million, $5.375 million, $5.375 million, and $4.875 million, respectively, over the final four years. ...

Reprinted with permission from the San Bernadino Sun.

ESSENCE OF THE STORIES

- In Washington, the starting salary for a paramedic is $57,000 per year.
- Corey Perry has a 5-year contract with the Anaheim Ducks that will earn him $26.6 million.

ECONOMIC ANALYSIS

- If resources are used efficiently, the marginal utility per dollar from the services of a paramedic, MU_P/P_P, equals the marginal utility per dollar from the services of a hockey player, MU_H/P_H. That is,

$$\frac{MU_P}{P_P} = \frac{MU_H}{P_H}.$$

- A paramedic in Washington earns $57,000 a year, but the national average paramedic wage is $27,000 a year.
- Corey Perry earns $26.6 million over 5 years, or $5.32 million a year on average.
- If we put these numbers into the above formula, we get

$$\frac{MU_P}{\$27{,}000} = \frac{MU_H}{\$5{,}320{,}000}.$$

Equivalently,

$$\frac{MU_H}{MU_P} = 197.$$

- Is the marginal utility from Corey Perry's services really 197 times that from the paramedic's services?
- The answer is no. A paramedic might serve about 8 people a day, or perhaps 2,000 in a year; a hockey player like Corey Perry serves millions of people a year.
- If a paramedic serves 2,000 people a year, then the price of a paramedic's service per customer served is $27,000/2,000, which equals $13.50.
- If Corey Perry serves 1,000,000 people a year, then the price of Corey Perry's service per customer served is $5,320,000/1,000,000, which equals $5.32.
- Using these prices of the services per customer, a paramedic is worth 2.5 times as much as a hockey player—the marginal utility from the services of a paramedic is 2.5 times that from a hockey player.
- Figure 1 shows the market for paramedics. The equilibrium quantity is 200,000 workers, and the average wage rate is $27,000 a year.
- Figure 2 shows the market for professional hockey players. The equilibrium quantity is 750 players and the average wage rate is $2,000,000 a year. (Corey Perry earns more than the average player.)

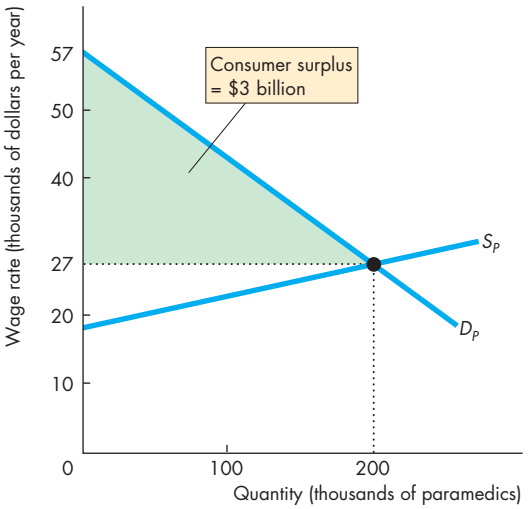


Figure 1 The value of paramedics

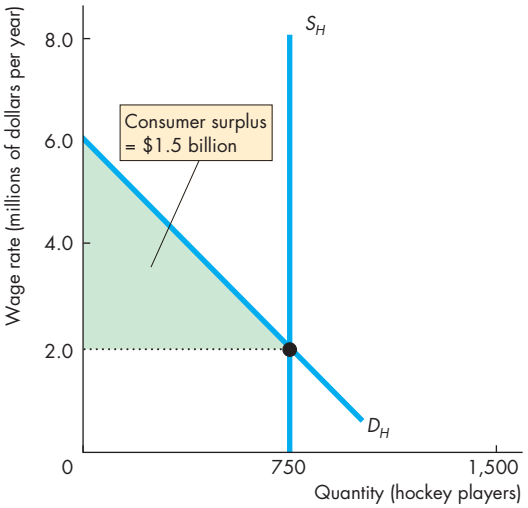


Figure 2 The value of hockey players

- Not only is the marginal utility from a paramedic greater than that from a hockey player, but paramedics also create a greater consumer surplus.

SUMMARY

Key Points

Consumption Choices (pp. 180–182)

- A household's consumption choices are determined by its consumption possibilities and preferences.
- A budget line defines a household's consumption possibilities.
- A household's preferences can be described by a utility schedule that lists the total utility and marginal utility derived from various quantities of goods and services consumed.
- The principle of diminishing marginal utility is that the marginal utility from a good or service decreases as consumption of the good or service increases.

Working Problems 1 to 5 will give you a better understanding of consumption choices.

Utility-Maximizing Choice (pp. 183–186)

- A consumer's objective is to maximize total utility.
- Total utility is maximized when all the available income is spent and when the marginal utility per dollar from all goods is equal.
- If the marginal utility per dollar for good *A* exceeds that for good *B*, total utility increases if the quantity purchased of good *A* increases and the quantity purchased of good *B* decreases.

Working Problems 6 to 11 will give you a better understanding of a consumer's utility-maximizing choice.

Predictions of Marginal Utility Theory (pp. 187–193)

- Marginal utility theory predicts the law of demand. That is, other things remaining the same, the higher the price of a good, the smaller is the quantity demanded of that good.
- Marginal utility theory also predicts that, other things remaining the same, an increase in the consumer's income increases the demand for a normal good.
- Marginal utility theory resolves the paradox of value.
- Total value is *total* utility or consumer surplus. But price is related to *marginal* utility.
- Water, which we consume in large amounts, has a high total utility and a large consumer surplus, but the price of water is low and the marginal utility from water is low.
- Diamonds, which we buy in small quantities, have a low total utility and a small consumer surplus, but the price of a diamond is high and the marginal utility from diamonds is high.

Working Problems 12 to 21 will give you a better understanding of the predictions of marginal utility theory.

New Ways of Explaining Consumer Choices (pp. 194–195)

- Behavioral economics studies limits on the ability of the human brain to compute and implement rational decisions.
- Bounded rationality, bounded willpower, and bounded self-interest are believed to explain some choices.
- Neuroeconomics uses the ideas and tools of neuroscience to study the effects of economic events and choices inside the human brain.

Working Problems 22 and 23 will give you a better understanding of the new ways of explaining consumer choices.

Key Terms

Behavioral economics, 194
Budget line, 180
Consumer equilibrium, 183
Diminishing marginal utility, 182
Marginal utility, 181
Marginal utility per dollar, 184
Neuroeconomics, 195
Preferences, 181
Total utility, 181
Utility, 181

STUDY PLAN PROBLEMS AND APPLICATIONS

myeconlab You can work Problems 1 to 23 in MyEconLab Chapter 8 Study Plan and get instant feedback.

Consumption Choices (Study Plan 8.1)

Jerry has $12 a week to spend on yogurt and magazines. The price of yogurt is $2, and the price of a magazine is $4.

1. List the combinations of yogurt and magazines that Jerry can afford. Draw a graph of Jerry's budget line with the quantity of magazines plotted on the *x*-axis.
2. Describe how Jerry's consumption possibilities change if, other things remaining the same, (i) the price of a magazine falls and (ii) Jerry's income increases.

Use the following data to work Problems 3 to 9.

Max enjoys windsurfing and snorkeling. Max has $35 a day to spend, and he can spend as much time as he likes on his leisure pursuits. The price of renting equipment for windsurfing is $10 an hour and for snorkeling is $5 an hour. The table shows the total utility Max gets from each activity.

Hours per day	Total utility from windsurfing	Total utility from snorkeling
1	120	40
2	220	76
3	300	106
4	360	128
5	396	140
6	412	150
7	422	158

3. Calculate Max's marginal utility from windsurfing at each number of hours per day. Does Max's marginal utility from windsurfing obey the principle of diminishing marginal utility?
4. Calculate Max's marginal utility from snorkeling at each number of hours per day. Does Max's marginal utility from snorkeling obey the principle of diminishing marginal utility?
5. Which does Max enjoy more: his 6th hour of windsurfing or his 6th hour of snorkeling?

Utility-Maximizing Choice (Study Plan 8.2)

6. Make a table that shows the various combinations of hours spent windsurfing and snorkeling that Max can afford.
7. In your table in Problem 6, add two columns and list Max's marginal utility per dollar from windsurfing and from snorkeling.
8. a. How many hours does Max windsurf and how many hours does he snorkel to maximize his utility?
   b. If Max spent a dollar more on windsurfing and a dollar less on snorkeling than in part (a), by how much would his total utility change?
   c. If Max spent a dollar less on windsurfing and a dollar more on snorkeling than in part (a), by how much would his total utility change?
9. Explain why, if Max equalized the marginal utility per hour from windsurfing and from snorkeling, he would *not* maximize his utility.
10. **Schools Get a Lesson in Lunch Line Economics**

    Sharp rises in the cost of milk, grain, and fresh fruits and vegetables are hitting cafeterias across the country, forcing cash-strapped schools to raise prices or serve more economical dishes. For example, Fairfax schools serve oranges —14¢ each—instead of grapes, which are 25¢ a serving.

    Source: *The Washington Post*, April 14, 2008

    Assume that a Fairfax school has a $14 daily fruit budget.

    a. How many oranges a day can the school afford to serve if it serves no grapes? How many servings of grapes can the school afford each day if it serves no oranges?
    b. If the school provides 50 oranges a day and maximizes utility, how many servings of grapes does it provide? If the marginal utility from an orange is 14 units, what is the marginal utility from a serving of grapes?
11. **Can Money Buy Happiness?**

    Whoever said money can't buy happiness isn't spending it right. There must be some connection, but once your basic human needs are met, does more money buy more happiness? An increase in income from $20,000 a year to $50,000 makes you twice as likely to be happy, but the payoff from more than $90,000 is slight.

    Source: CNN, July 18, 2006

a. What does the fundamental assumption of marginal utility theory suggest about the connection between money and happiness?

b. Explain why this news clip is consistent with marginal utility theory.

Predictions of Marginal Utility Theory

(Study Plan 8.3)

Use the data in Problem 3 to work Problems 12 to 16.

12. Max is offered a special deal: The price of renting windsurfing equipment is cut to $5 an hour. How many hours does Max spend windsurfing and how many hours does he spend snorkeling?
13. Draw Max's demand curve for rented windsurfing equipment. Over the price range from $5 to $10 an hour, is Max's demand for windsurfing equipment elastic or inelastic?
14. How does Max's demand for snorkeling equipment change when the price of windsurfing equipment falls? What is Max's cross elasticity of demand for snorkeling with respect to the price of windsurfing? Are windsurfing and snorkeling substitutes or complements for Max?
15. If Max's income increases from $35 to $55 a day, how does his demand for rented windsurfing equipment change? Is windsurfing a normal good or an inferior good for Max? Explain.
16. If Max's income increases from $35 to $55 a day, how does his demand for rented snorkeling equipment change? Is snorkeling a normal good or an inferior good for Max? Explain.

Use the following news clip to work Problems 17 and 18.

Compared to Other Liquids, Gasoline is Cheap

In 2008, when gasoline hit $4 a gallon, motorists complained, but they didn't complain about $1.59 for a 20-oz Gatorade and $18 for 16 mL of HP ink.

Source: *The New York Times*, May 27, 2008

The prices per gallon are $10.17 for Gatorade and $4,294.58 for printer ink.

17. a. What does marginal utility theory predict about the marginal utility per dollar from gasoline, Gatorade, and printer ink?
    b. What do the prices per gallon tell you about the marginal utility from a gallon of gasoline, Gatorade, and printer ink?
18. a. What do the prices per unit reported in the news clip tell you about the marginal utility from a gallon of gasoline, a 20-oz bottle of Gatorade, and a cartridge of printer ink?
    b. How can the paradox of value be used to explain why the fluids listed in the news clip might be less valuable than gasoline, yet far more expensive?

Use the following news clip to work Problems 19 to 21.

Exclusive Status: It's in The Bag; $52,500 Purses. 24 Worldwide. 1 in Washington.

Forget your Coach purse. Put away your Kate Spade. Even Hermes's famous Birkin bag seems positively discount. The Louis Vuitton Tribute Patchwork is this summer's ultimate status bag, ringing in at $52,500, and the company is offering only five for sale in North America and 24 worldwide.

Source: *The Washington Post*, August 21, 2007

19. Use marginal utility theory to explain the facts reported in the news clip.
20. If Louis Vuitton offered 500 Tribute Patchwork bags in North America and 2,400 worldwide, what do you predict would happen to the price that buyers would be willing to pay and what would happen to the consumer surplus?
21. If the Tribute Patchwork bag is copied and thousands are sold illegally, what do you predict would happen to the price that buyers would be willing to pay for a genuine bag and what would happen to the consumer surplus?

New Ways of Explaining Consumer Choices

(Study Plan 8.4)

Use the following news clip to work Problems 22 and 23.

Eating Away the Innings in Baseball's Cheap Seats

Baseball and gluttony, two of America's favorite pastimes, are merging and taking hold at Major League Baseball stadiums: all-you-can-eat seats. Some fans try to "set personal records" during their first game in the section, but by their second or third time in such seats they eat normally, just as they would at a game.

Source: *USA Today*, March 6, 2008

22. a. What conflict might exist between utility-maximization and setting "personal records" for eating?
    b. What does the fact that fans eat less at subsequent games indicate about the marginal utility from ballpark food as the quantity consumed increases?
23. a. How can setting personal records for eating be reconciled with marginal utility theory?
    b. Which ideas of behavioral economics are consistent with the information in the news clip?

ADDITIONAL PROBLEMS AND APPLICATIONS

myeconlab These problems are available in MyEconLab if assigned by your instructor.

Consumption Choices

24. Tim buys 2 pizzas and sees 1 movie a week when he has $16 to spend. The price of a movie ticket is $8, and the price of a pizza is $4. Draw Tim's budget line. If the price of a movie ticket falls to $4, describe how Tim's consumption possibilities change.

Use the following information to work Problems 25 to 32.

Cindy has $70 a month to spend, and she can spend as much time as she likes playing golf and tennis. The price of an hour of golf is $10, and the price of an hour of tennis is $5. The table shows Cindy's marginal utility from each sport.

Hours per month	Marginal utility from golf	Marginal utility from tennis
1	80	40
2	60	36
3	40	30
4	30	10
5	20	5
6	10	2
7	6	1

25. Make a table that shows Cindy's affordable combinations of hours playing golf and tennis. If Cindy increases her expenditure to $100, describe how her consumption possibilities change.

Utility-Maximizing Choice

26. a. When Cindy has $70 to spend on golf and tennis, how many hours of golf and how many hours of tennis does she play to maximize her utility?
    b. Compared to part (a), if Cindy spent a dollar more on golf and a dollar less on tennis, by how much would her total utility change?
    c. Compared to part (a), if Cindy spent a dollar less on golf and a dollar more on tennis, by how much would her total utility change?
27. Explain why, if Cindy equalized the marginal utility per hour of golf and tennis, she would *not* maximize her utility.

Predictions of Marginal Utility Theory

28. Cindy's tennis club raises its price of an hour of tennis to $10. The price of golf remains at $10 an hour and Cindy continues to spend $70 on tennis and golf.
    a. List the combinations of hours spent playing golf and tennis that Cindy can now afford.
    b. Along with the combinations in part (a), list Cindy's marginal utility per dollar from golf and from tennis.
    c. How many hours does Cindy now spend playing golf and how many hours does she spend playing tennis?
29. Use your answers to Problems 26a and 28 to draw Cindy's demand curve for tennis. Over the price range of $5 to $10 an hour of tennis, is Cindy's demand for tennis elastic or inelastic?
30. Use your answers to Problems 26a and 28 to explain how Cindy's demand for golf changed when the price of an hour of tennis increased. What is Cindy's cross elasticity of demand for golf with respect to the price of tennis? Are tennis and golf substitutes or complements for Cindy?
31. Cindy loses her math tutoring job and the amount she has to spend on golf and tennis falls to $35 a month. How does Cindy's demand for golf change? For Cindy, is golf a normal good or an inferior good? Is tennis a normal good or an inferior good?
32. Cindy takes a Club Med vacation, the cost of which includes unlimited sports activities. With no extra charge for golf and tennis, Cindy allocates a total of 4 hours a day to these activities.
    a. How many hours does Cindy play golf and how many hours does she play tennis?
    b. What is Cindy's marginal utility from golf and from tennis?
    c. Why does Cindy equalize the marginal utilities rather than the marginal utility per dollar from golf and from tennis?
33. **Blu-Ray Format Expected to Dominate, but When?**

    Blu-ray stomped HD DVD to become the standard format for high-definition movie discs, but years may pass before it can claim victory over the good old DVD. The people who bought $2,000, 40-inch TVs are the ones that will lead the charge. Everyone else will come along when

the price falls. Blu-ray machine prices are now starting to drop and Wal-Mart Stores Inc. began stocking a $298 Magnavox model. That's cheaper than most alternatives, but a hefty price hike from a typical $50 DVD player.

Source: CNN, June 2, 2008

a. What does marginal utility theory predict about the marginal utility from a Magnavox Blu-ray machine compared to the marginal utility from a typical DVD player?
b. What will have to happen to the marginal utility from a Blu-ray machine before it is able to "claim victory over the good old DVD"?

34. Ben spends $50 a year on 2 bunches of flowers and $50 a year on 10,000 gallons of tap water. Ben is maximizing utility and his marginal utility from water is 0.5 unit per gallon.
a. Are flowers or water more valuable to Ben?
b. Explain how Ben's expenditure on flowers and water illustrates the paradox of value.

New Ways of Explaining Consumer Choices

Use the following news clip to work Problems 35 to 37.

Putting a Price on Human Life

Researchers at Stanford and the University of Pennsylvania estimated that a healthy human life is worth about $129,000. Using Medicare records on treatment costs for kidney dialysis as a benchmark, the authors tried to pinpoint the threshold beyond which ensuring another "quality" year of life was no longer financially worthwhile. The study comes amid debate over whether Medicare should start rationing health care on the basis of cost effectiveness.

Source: *Time*, June 9, 2008

35. Why might Medicare ration health care according to treatment that is "financially worthwhile" as opposed to providing as much treatment as is needed by a patient, regardless of costs?
36. What conflict might exist between a person's valuation of his or her own life and the rest of society's valuation of that person's life?
37. How does the potential conflict between self-interest and the social interest complicate setting a financial threshold for Medicare treatments?

Economics in the News

38. After you have studied *Reading Between the Lines* (pp. 196–197) answer the following questions.
a. If a wave of natural disasters put paramedics in the news and a large number of people decide to try to get jobs as paramedics, how does
(i) The marginal utility of the services of a paramedic change?
(ii) Consumer surplus in the market for the services of paramedics change?
b. If television advertising revenues during hockey games double, how does
(i) The marginal utility of the services of a hockey player change?
(ii) Consumer surplus in the market for the services of hockey players change?

39. **Five Signs You Have Too Much Money**

When a bottle of water costs $38, it's hard not to agree that bottled water is a fool's drink. The drink of choice among image-conscious status seekers and high-end tee-totalers in L.A. is Bling H2O. It's not the water that accounts for the cost of the $38, but the "limited edition" bottle decked out in Swarovski crystals.

Source: CNN, January 17, 2006

a. Assuming that the price of a bottle of Bling H2O is $38 in all the major U.S. cities, what might its popularity in Los Angeles reveal about consumers' incomes or preferences in Los Angeles relative to other U.S. cities?
b. Why might the marginal utility from a bottle of Bling H2O decrease more rapidly than the marginal utility from ordinary bottled water?

Use the following news clip to work Problems 40 and 41.

How to Buy Happiness. Cheap

At any given point in time, the rich tend to be a bit happier than the poor, but across-the-board increases in living standards don't seem to make people happier. The average American's income has grown about 80% since 1972, but the percentage describing themselves as "very happy" (roughly a third) has barely changed over the years. As living standards increase, most of us respond by raising our own standards: Things that once seemed luxuries now are necessities. As a result, we're working harder than ever to buy stuff that satisfies us less and less.

Source: CNN, October 1, 2004

40. According to the news clip, how do widespread increases in living standards influence total utility?
41. a. What does the news clip imply about how the total utility from consumption changes over time?
b. What does the news clip imply about how the marginal utility from consumption changes over time?