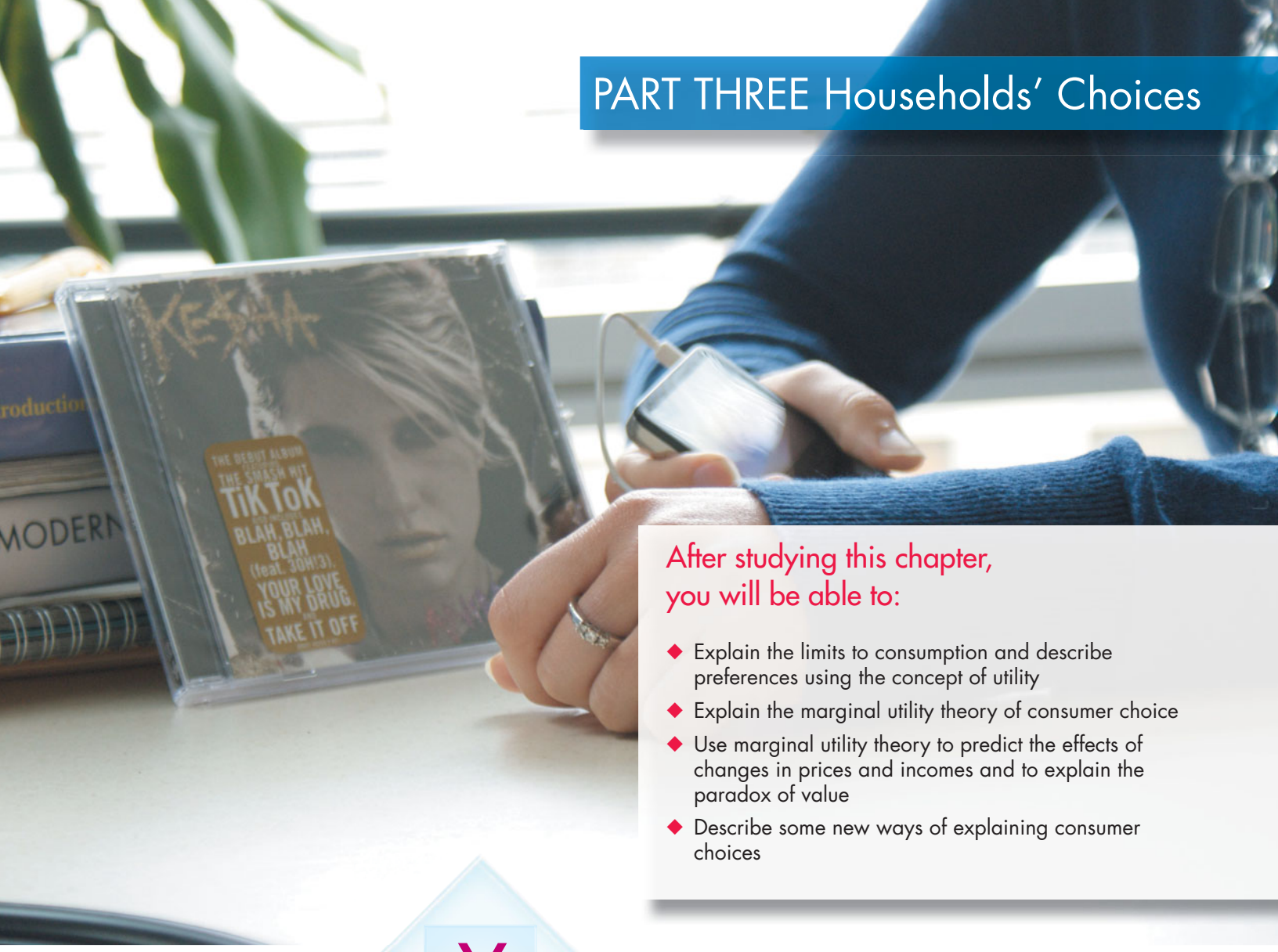


After studying this chapter, you will be able to:

- 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.

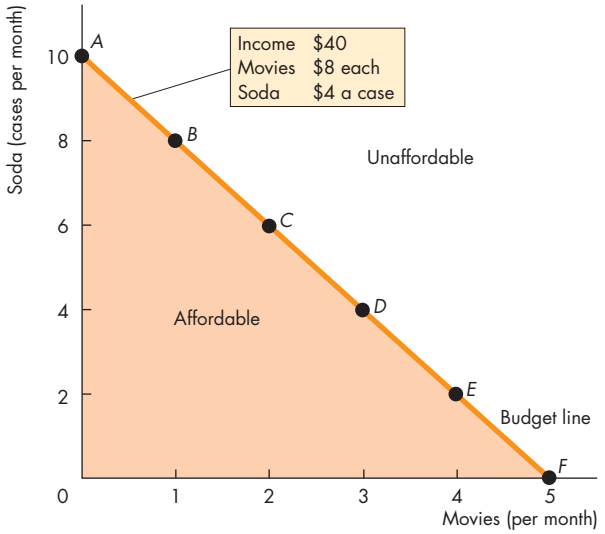
A Consumer's Budget Line Consumption possibilities are limited by income and by the prices of movies and soda. When Lisa spends all her income, she reaches the limits to her consumption possibilities. We describe this limit with a **budget line**, which marks the boundary between those combinations of 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).

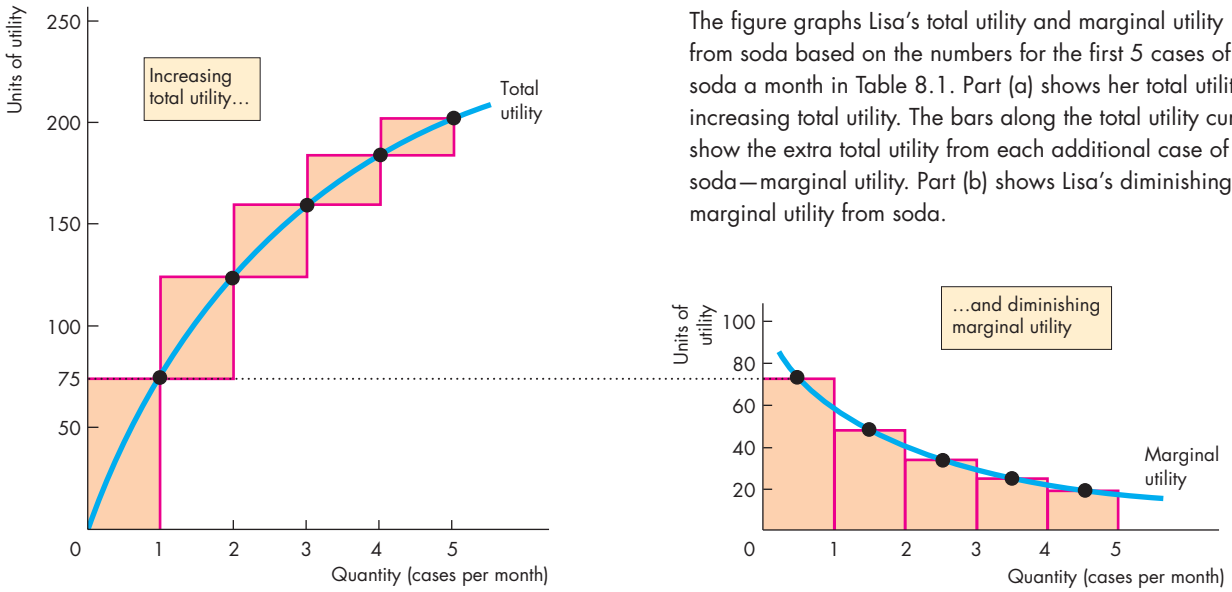
The marginal utility numbers appear midway between the quantities of soda because it is the *change* in the quantity she buys from 1 to 2 cases that produces the marginal utility of 48 units.

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.

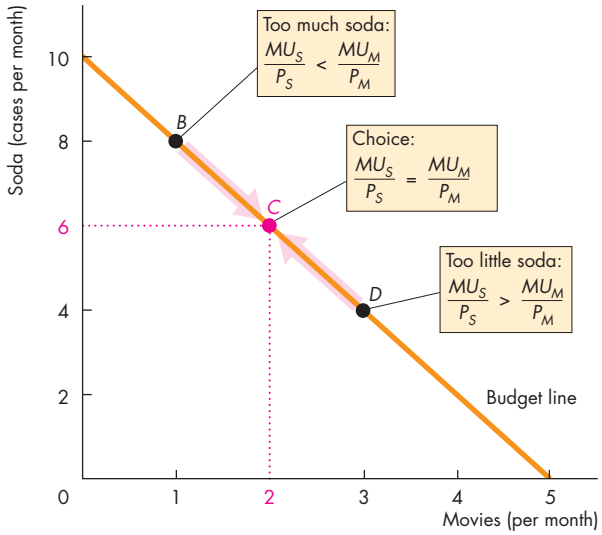
Similarly, if Lisa moves from row *D* to row *C*, she decreases the movies she sees from 3 to 2 a month and increases the soda she consumes from 4 to 6 cases a month. Her marginal utility per dollar from movies rises to 5 and her marginal utility per dollar from soda falls to 5.

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.