6

AFTER READING THIS CHAPTER, YOU SHOULD BE ABLE TO:

1 **Define and explain the relationship between total utility, marginal utility, and the law of diminishing marginal utility.**

2 **Describe how rational consumers maximize utility by comparing the marginal utility-to-price ratios of all the products they could possibly purchase.**

3 **Explain how a demand curve can be derived by observing the outcomes of price changes in the utility-maximization model.**

4 **Discuss how the utility-maximization model helps highlight the income and substitution effects of a price change.**

5 **Relate how behavioral economics and prospect theory shed light on many consumer behaviors.**

6 **(Appendix) Relate how the indifference curve model of consumer behavior derives demand curves from budget lines, indifference curves, and utility maximization.**

Consumer Behavior

If you were to compare the shopping carts of almost any two consumers, you would observe striking differences. Why does Paula have potatoes, peaches, and Pepsi in her cart, while Sam has sugar saltines, and 7-Up in his? Why didn't Paula also buy pasta and plums? Why didn't Sam have soup and spaghetti on his grocery list?

In this chapter, you will see how individual consumers allocate their incomes among the various goods and services available to them. Given a certain budget, how does a consumer decide which goods and services to buy? This chapter will develop a model to answer this question.

This chapter will also survey some of the recent insights about consumer behavior provided by the field of behavioral economics. These insights explain many of the less-rational and oftentimes quirky behaviors exhibited by consumers. Better yet, they also suggest concrete policies that individuals, companies, and governments can use to make consumers better off by working with—rather than against—people's behavioral quirks.

Law of Diminishing Marginal Utility

The simplest theory of consumer behavior rests squarely on the **law of diminishing marginal utility.** This principle, first discussed in Chapter 3, is that added satisfaction declines as a consumer acquires additional units of a given product. Although consumer wants in general may be insatiable, wants for particular items can be satisfied. In a specific span of time over which consumers' tastes remain unchanged, consumers can obtain as much of a particular good or service as they can afford. But the more of that product they obtain, the less they want still more of it.

Consider durable goods, for example. A consumer's desire for an automobile, when he or she has none, may be very strong. But the desire for a second car is less intense; and for a third or fourth, weaker and weaker. Unless they are collectors, even the wealthiest families rarely have more than a half-dozen cars, although their incomes would allow them to purchase a whole fleet of vehicles.

Terminology

Evidence indicates that consumers can fulfill specific wants with succeeding units of a product but that each added unit provides less utility than the last unit purchased. Recall that a consumer derives utility from a product if it can satisfy a want: **Utility** is want-satisfying power. The utility of a good or service is the satisfaction or pleasure one gets from consuming it. Keep in mind three characteristics of this concept:

- "Utility" and "usefulness" are not synonymous. Paintings by Picasso may offer great utility to art connoisseurs but are useless functionally (other than for hiding a crack on a wall).
- Utility is subjective. The utility of a specific product may vary widely from person to person. A lifted pickup truck may have great utility to someone who drives off-road but little utility to someone unable or unwilling to climb into the rig. Eyeglasses have tremendous utility to someone who has poor eyesight but no utility to a person with 20-20 vision.
- Utility is difficult to quantify. But for purposes of illustration we assume that people can measure satisfaction with units called *utils* (units of utility). For example, a particular consumer may get 100 utils of satisfaction from a smoothie, 10 utils of satisfaction from a candy bar, and 1 util of satisfaction from a stick of gum. These imaginary units of satisfaction are convenient for quantifying consumer behavior for explanatory purposes.

Total Utility and Marginal Utility

Total utility and marginal utility are related, but different, ideas. **Total utility** is the total amount of satisfaction or pleasure a person derives from consuming some specific quantity—for example, 10 units—of a good or service. **Marginal utility** is the *extra* satisfaction a consumer realizes from an additional unit of that product—for example, from the eleventh unit. Alternatively, marginal utility is the change in total utility that results from the consumption of 1 more unit of a product.

Figure 6.1 (Key Graph) and the accompanying table demonstrate the relation between total utility and marginal

CONSIDER THIS . . .

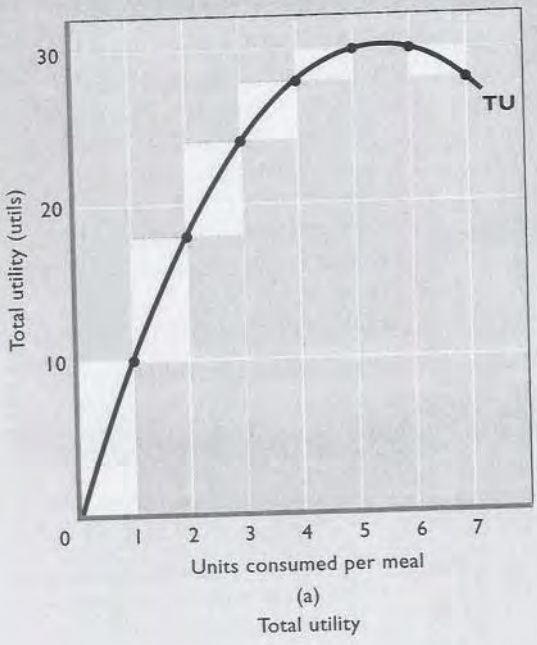
Vending Machines and Marginal Utility

Newspaper dispensing devices and soft-drink vending machines are similar in their basic operations. Both enable consumers to buy a product by inserting coins. But there is an important difference in the two devices. The newspaper dispenser opens to the full stack of papers and seemingly "trusts" the customer to take only a single copy, whereas the vending machine displays no such "trust," requiring the consumer to buy one can at a time. Why the difference?

The idea of diminishing marginal utility is key to solving this puzzle. Most consumers take only single copies from the newspaper box because the marginal utility of a second newspaper is nearly zero. They could grab a few extra papers and try to sell them on the street, but the revenue obtained would be small relative to their time and effort. So, in selling their product, newspaper publishers rely on "zero marginal utility of the second unit," not on "consumer honesty." Also, newspapers have little "shelf life"; they are obsolete the next day. In contrast, soft-drink sellers do not allow buyers to make a single payment and then take as many cans as they want. If they did, consumers would clean out the machine because the marginal utility of successive cans of soda diminishes slowly and buyers could take extra sodas and consume them later. Soft-drink firms thus vend their products on a pay-per-can basis.

In summary, newspaper publishers and soft-drink firms use alternative vending techniques because of the highly different rates of decline in marginal utility for their products. The newspaper seller uses inexpensive dispensers that open to the full stack of papers. The soft-drink seller uses expensive vending machines that limit the consumer to a single can at a time. Each vending technique is optimal under the particular economic circumstance.

key graph



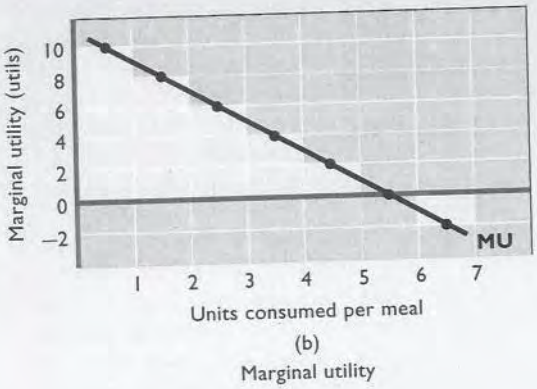


FIGURE 6.1 Total and marginal utility. Curves TU and MU are graphed from the data in the table. (a) As more of a product is consumed, total utility increases at a diminishing rate, reaches a maximum, and then declines. (b) Marginal utility, by definition, reflects the changes in total utility. Thus marginal utility diminishes with increased consumption, becomes zero when total utility is at a maximum, and is negative when total utility declines. As shown by the shaded rectangles in (a) and (b), marginal utility is the change in total utility associated with each additional taco. Or, alternatively, each new level of total utility is found by adding marginal utility to the preceding level of total utility.

(1) Tacos Consumed per Meal	(2) Total Utility, Utils	(3) Marginal Utility, Utils
0	0	
		10
1	10	
		8
2	18	
		6
3	24	
		4
4	28	
		2
5	30	
		0
6	30	
		−2
7	28	

QUICK QUIZ FOR FIGURE 6.1

1. Marginal utility:
   a. is the extra output a firm obtains when it adds another unit of labor.
   b. explains why product supply curves slope upward.
   c. typically rises as successive units of a good are consumed.
   d. is the extra satisfaction from the consumption of 1 more unit of some good or service.
2. Marginal utility in Figure 6.1b is positive, but declining, when total utility in Figure 6.1a is positive and:
   a. rising at an increasing rate.
   b. falling at an increasing rate.
   c. rising at a decreasing rate.
   d. falling at a decreasing rate.
3. When marginal utility is zero in graph (b), total utility in graph (a) is:
   a. also zero.
   b. neither rising nor falling.
   c. negative.
   d. rising, but at a declining rate.
4. Suppose the person represented by these graphs experienced a diminished taste for tacos. As a result the:
   a. TU curve would get steeper.
   b. MU curve would get flatter.
   c. TU and MU curves would shift downward.
   d. MU curve, but not the TU curve, would collapse to the horizontal axis.

Answers: 1. d; 2. c; 3. b; 4. c

utility. The curves reflect the data in the table. Column 2 shows the total utility associated with each level of consumption of tacos. Column 3 shows the marginal utility—the change in total utility—that results from the consumption of each successive taco. Starting at the origin in Figure 6.1a, observe that each of the first five units increases total utility (TU), but by a diminishing amount. Total utility reaches a maximum with the addition of the sixth unit and then declines.

ORIGIN OF THE IDEA
O 6.1
Diminishing marginal utility

So in Figure 6.1b marginal utility (MU) remains positive but diminishes through the first five units (because total utility increases at a declining rate). Marginal utility is zero for the sixth unit (because that unit doesn't change total utility). Marginal utility then becomes negative with the seventh unit and beyond (because total utility is falling). Figure 6.1b and table column 3 reveal that each successive taco yields less extra utility, meaning fewer utils, than the preceding taco.[1] That is, the table and graph illustrate the law of diminishing marginal utility.

INTERACTIVE GRAPHS
G 6.1
Total and marginal utility

Marginal Utility and Demand

The law of diminishing marginal utility explains why the demand curve for a given product slopes downward. If successive units of a good yield smaller and smaller amounts of marginal, or extra, utility, then the consumer will buy additional units of a product only if its price falls. The consumer for whom Figure 6.1 is relevant may buy two tacos at a price of $1 each. But because he or she obtains less marginal utility from additional tacos, the consumer will choose not to buy more at that price. The consumer would rather spend additional dollars on products that provide more utility, not less utility. Therefore, additional tacos with less utility are not worth buying unless the price declines. (When marginal utility becomes negative, Taco Bell would have to pay you to consume another taco!) Thus, diminishing marginal utility supports the idea that price must decrease in order for quantity demanded to increase. In other words, consumers behave in ways that make demand curves downsloping.

[1] Technical footnote: In Figure 6.1b we graphed marginal utility at half-units. For example, we graphed the marginal utility of 4 utils at $3\frac{1}{2}$ units because "4 utils" refers neither to the third nor the fourth unit per se but to the *addition* or *subtraction* of the fourth unit.

QUICK REVIEW 6.1

- Utility is the benefit or satisfaction a person receives from consuming a good or a service.
- The law of diminishing marginal utility indicates that gains in satisfaction become smaller as successive units of a specific product are consumed.
- Diminishing marginal utility provides a simple rationale for the law of demand.

Theory of Consumer Behavior

In addition to explaining the law of demand, the idea of diminishing marginal utility explains how consumers allocate their money incomes among the many goods and services available for purchase.

Consumer Choice and the Budget Constraint

For simplicity, we will assume that the situation for the typical consumer has the following dimensions.

- ***Rational behavior*** The consumer is a rational person, who tries to use his or her money income to derive the greatest amount of satisfaction, or utility, from it. Consumers want to get "the most for their money" or, technically, to maximize their total utility. They engage in **rational behavior.**
- ***Preferences*** Each consumer has clear-cut preferences for certain of the goods and services that are available in the market. Buyers also have a good idea of how much marginal utility they will get from successive units of the various products they might purchase.
- ***Budget constraint*** At any point in time the consumer has a fixed, limited amount of money income. Since each consumer supplies a finite amount of human and property resources to society, he or she earns only limited income. Thus, as noted in Chapter 1, every consumer faces a **budget constraint,** even consumers who earn millions of dollars a year. Of course, this budget limitation is more severe for a consumer with an average income than for a consumer with an extraordinarily high income.
- ***Prices*** Goods are scarce relative to the demand for them, so every good carries a price tag. We assume that the price of each good is unaffected by the amount of it that is bought by any particular person. After all, each person's purchase is a tiny part of total demand. Also, because the consumer has a limited number of dollars, he or she cannot buy everything wanted. This point drives home the reality of scarcity to each consumer.

So the consumer must compromise; he or she must choose the most personally satisfying mix of goods and services. Different individuals will choose different mixes.

Utility-Maximizing Rule

Of all the different combinations of goods and services a consumer can obtain within his or her budget, which specific combination will yield the maximum utility or satisfaction? *To maximize satisfaction, the consumer should allocate his or her money income so that the last dollar spent on each product yields the same amount of extra (marginal) utility.* We call this the **utility-maximizing rule.** When the consumer has "balanced his margins" using this rule, he has achieved **consumer equilibrium** and has no incentive to alter his expenditure pattern. In fact, any person who has achieved consumer equilibrium would be worse off—total utility would decline—if there were any alteration in the bundle of goods purchased, providing there is no change in taste, income, products, or prices.

TABLE 6.1 The Utility-Maximizing Combination of Apples and Oranges Obtainable with an Income of $10*

	(2) Apple (Product A): Price = $1		(3) Orange (Product B): Price = $2	
(1) Unit of Product	(a) Marginal Utility, Utils	(b) Marginal Utility per Dollar (MU/Price)	(a) Marginal Utility, Utils	(b) Marginal Utility per Dollar (MU/Price)
First	10	10	24	12
Second	8	8	20	10
Third	7	7	18	9
Fourth	6	6	16	8
Fifth	5	5	12	6
Sixth	4	4	6	3
Seventh	3	3	4	2

*It is assumed in this table that the amount of marginal utility received from additional units of each of the two products is independent of the quantity of the other product. For example, the marginal-utility schedule for apples is independent o the number of oranges obtained by the consumer.

Numerical Example

An illustration will help explain the utility-maximizing rule. For simplicity we limit our example to two products, but the analysis also applies if there are more. Suppose consumer Holly is analyzing which combination of two products she should purchase with her fixed daily income of $10. Let's suppose these products are apples and oranges.

Holly's preferences for apples and oranges and their prices are the basic data determining the combination that will maximize her satisfaction. Table 6.1 summarizes those data, with column 2a showing the amounts of marginal utility she will derive from each successive unit of A (apples) and with column 3a showing the same thing for product B (oranges). Both columns reflect the law of diminishing marginal utility, which, in this example, is assumed to begin with the second unit of each product purchased.

Marginal Utility per Dollar To see how the utility-maximizing rule works, we must put the marginal-utility information in columns 2a and 3a on a per-dollar-spent basis. A consumer's choices are influenced not only by the extra utility that successive apples will yield but also by how many dollars (and therefore how many oranges) she must give up to obtain additional apples.

The rational consumer must compare the extra utility from each product with its added cost (that is, its price). Switching examples for a moment, suppose that you prefer a pizza whose marginal utility is, say, 36 utils to a movie whose marginal utility is 24 utils. But if the pizza's price is $12 and the movie costs only $6, you would choose the movie rather than the pizza! Why? Because the margin utility per dollar spent would be 4 utils for the movie (= 2 utils/$6) compared to only 3 utils for the pizza (= 3 utils/$12). You could see two movies for $12 and, assumin that the marginal utility of the second movie is, say, 16 util your total utility would be 40 utils. Clearly, 40 units of satis faction (= 24 utils + 16 utils) from two movies are superic to 36 utils from the same $12 expenditure on one pizza.

To make the amounts of extra utility derived from dif ferently priced goods comparable, marginal utilities mus be put on a per-dollar-spent basis. We do this in columr 2b and 3b by dividing the marginal-utility data of columr 2a and 3a by the prices of apples and oranges—$1 and $2 respectively.

Decision-Making Process Table 6.1 shows Holly preferences on a unit basis and a per-dollar basis as well a the price tags of apples and oranges. With $10 to spend, i what order should Holly allocate her dollars on units c apples and oranges to achieve the highest amount of utilit within the $10 limit imposed by her income? And wha specific combination of the two products will she have ob tained at the time she uses up her $10?

Concentrating on columns 2b and 3b in Table 6.1, w find that Holly should first spend $2 on the first orang because its marginal utility per dollar of 12 utils is highe than the first apple's 10 utils. But now Holly finds herse indifferent about whether to buy a second orange or th first apple because the marginal utility per dollar of both

utils per dollar. So she buys both of them. Holly now has 1 apple and 2 oranges. Also, the last dollar she spent on each good yielded the same marginal utility per dollar (10). But this combination of apples and oranges does not represent the maximum amount of utility that Holly can obtain. It cost her only \$5 [= (1 × \$1) + (2 × \$2)], so she has \$5 remaining, which she can spend to achieve a still higher level of total utility.

Examining columns 2b and 3b again, we find that Holly should spend the next \$2 on a third orange because marginal utility per dollar for the third orange is 9 compared with 8 for the second apple. But now, with 1 apple and 3 oranges, she is again indifferent between a second apple and a fourth orange because both provide 8 utils per dollar. So Holly purchases 1 more of each. Now the last dollar spent on each product provides the same marginal utility per dollar (8), and Holly's money income of \$10 is exhausted.

The utility-maximizing combination of goods attainable by Holly is 2 apples and 4 oranges. By summing marginal-utility information from columns 2a and 3a, we find that Holly is obtaining 18 (= 10 + 8) utils of satisfaction from the 2 apples and 78 (= 24 + 20 + 18 + 16) utils of satisfaction from the 4 oranges. Her \$10, optimally spent, yields 96 (= 18 + 78) utils of satisfaction.

Table 6.2 summarizes our step-by-step process for maximizing Holly's utility. Note that we have implicitly assumed that Holly spends her entire income. She neither borrows nor saves. However, saving can be regarded as a "commodity" that yields utility and can be incorporated into our analysis. In fact, we treat it that way in problem 4 at the end of this chapter.

Inferior Options Holly can obtain other combinations of apples and oranges with \$10, but none will yield as great total utility as do 2 apples and 4 oranges. As an example, she can obtain 4 apples and 3 oranges for \$10. But this combination yields only 93 utils, clearly inferior to the 96 utils provided by 2 apples and 4 oranges. True, there are other combinations apples and oranges (such as 4 apples and 5 oranges or 1 apple and 2 oranges) in which the marginal utility of the last dollar spent is the same for both goods. But all such combinations either are unobtainable with Holly's limited money income (as 4 apples and 5 oranges) or do not exhaust her money income (as 1 apple and 2 oranges) and therefore do not yield the maximum utility attainable.

WORKED PROBLEMS
W 6.1
Consumer choice

Algebraic Generalization

Economists generalize the utility-maximizing rule by saying that a consumer will maximize her satisfaction when she allocates her money income so that the last dollar spent on product A, the last on product B, and so forth, yield equal amounts of additional, or marginal, utility. The marginal utility per dollar spent on A is indicated by the MU of product A divided by the price of A (column 2b in Table 6.1), and the marginal utility per dollar spent on B by the MU of product B divided by the price of B (column 3b in Table 6.1). Our utility-maximizing rule merely requires that these ratios be equal for the last dollar spent on A and the last dollar spent on B. Algebraically,

$$\frac{\text{MU of product A}}{\text{Price of A}} = \frac{\text{MU of product B}}{\text{Price of B}}$$

And, of course, the consumer must exhaust her available income. Table 6.1 shows us that the combination of 2 units of A (apples) and 4 of B (oranges) fulfills these conditions in that

$$\frac{8 \text{ utils}}{\$1} = \frac{16 \text{ utils}}{\$2}$$

and the consumer's \$10 income is all spent.

TABLE 6.2 Sequence of Purchases to Achieve Consumer Equilibrium, Given the Data in Table 6.1

Choice Number	Potential Choices	Marginal Utility per Dollar	Purchase Decision	Income Remaining
1	First apple	10	First orange for \$2	\$8 = \$10 − \$2
	First orange	12		
2	First apple	10	First apple for \$1	\$5 = \$8 − \$3
	Second orange	10	and second orange for \$2	
3	Second apple	8	Third orange for \$2	\$3 = \$5 − \$2
	Third orange	9		
4	Second apple	8	Second apple for \$1	\$0 = \$3 − \$3
	Fourth orange	8	and fourth orange for \$2	

If the equation is not fulfilled, then some reallocation of the consumer's expenditures between A and B (from the low to the high marginal-utility-per-dollar product) will increase the consumer's total utility. For example, if the consumer spent \$10 on 4 of A (apples) and 3 of B (oranges), we would find that

$$\frac{\text{MU of A of 6 utils}}{\text{Price of A of \$1}} < \frac{\text{MU of B of 18 utils}}{\text{Price of B of \$2}}$$

Here the last dollar spent on A provides only 6 utils of satisfaction, while the last dollar spent on B provides 9 (= 18/\$2). So the consumer can increase total satisfaction by purchasing more of B and less of A. As dollars are reallocated from A to B, the marginal utility per dollar of A will increase while the marginal utility per dollar of B will decrease. At some new combination of A and B the two will be equal and consumer equilibrium will be achieved. Here that combination is 2 of A (apples) and 4 of B (oranges).

Utility Maximization and the Demand Curve

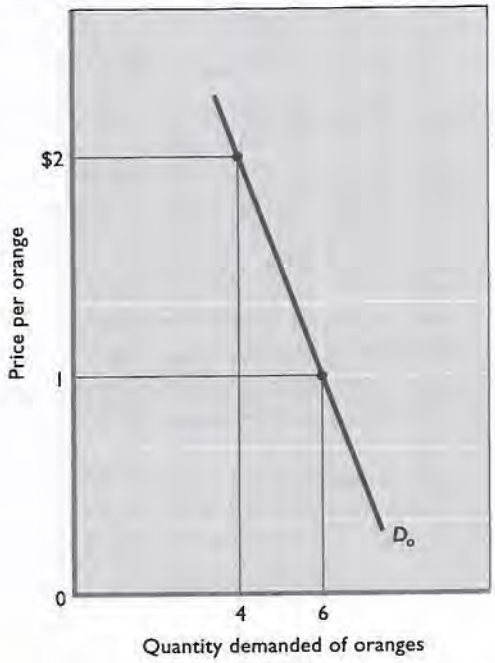
Once you understand the utility-maximizing rule, you can easily see why product price and quantity demanded are inversely related. Recall that the basic determinants of an individual's demand for a specific product are (1) preferences or tastes, (2) money income, and (3) the prices of other goods. The utility data in Table 6.1 reflect our consumer's preferences. We continue to suppose that her money income is \$10. And, concentrating on the construction of an individual demand curve for oranges, we assume that the price of apples, now representing all "other goods," is still \$1.

Deriving the Demand Schedule and Curve

We can derive a single consumer's demand schedule for oranges by considering alternative prices at which oranges might be sold and then determining the quantity the consumer will purchase. We already know one such price-quantity combination in the utility-maximizing example: Given tastes, income, and the prices of other goods, Holly will purchase 4 oranges at \$2.

Now let's assume the price of oranges falls to \$1. The marginal-utility-per-dollar data of column 3b in Table 6.1 will double because the price of oranges has been halved; the new data for column 3b are (by coincidence) identical to the data in column 3a. The doubling of the MU per dollar for each successive orange means that the purchase of 2 apples and 4 oranges is no longer an equilibrium combination. By applying the same reasoning we used previously, we now find that Holly's utility-maximizing combination is 4 apples and 6 oranges. As summarized in the table in Figure 6.2, Holly will purchase 6 oranges when the price of oranges is \$1. Using the data in this table, we can sketch the downward-sloping demand curve for oranges, D_o, shown in Figure 6.2. This exercise, then, clearly links the utility-maximizing behavior of a consumer and that person's downsloping demand curve for a particular product.

FIGURE 6.2 Deriving an individual demand curve. The consumer represented by the data in the table maximizes utility by purchasing 4 oranges at a price of \$2. The decline in the price of oranges to \$1 disrupts the consumer's initial utility-maximizing equilibrium. The consumer restores equilibrium by purchasing 6 rather than 4 oranges. Thus, a simple price-quantity schedule emerges, which locates two points on a downsloping demand curve.



Price per Orange	Quantity Demanded
\$2	4
1	6

Income and Substitution Effects

Recall from Chapter 3 that the **income effect** is the impact that a change in the price of a product has on a consumer's real income and consequently on the quantity

demanded of that good. In contrast, the **substitution effect** is the impact that a change in a product's price has on its relative expensiveness and consequently on the quantity demanded. Both effects help explain why a demand curve such as that in Figure 6.2 is downsloping.

Let's first look at the substitution effect. Recall that before the price of oranges declined, Holly was in equilibrium when purchasing 2 apples and 4 oranges because

$$\frac{\text{MU of apples of 8}}{\text{Price of apples of \$1}} = \frac{\text{MU of oranges of 16}}{\text{Price of oranges of \$2}}$$

But after the price of oranges declines from \$2 to \$1,

$$\frac{\text{MU of apples of 8}}{\text{Price of apples of \$1}} < \frac{\text{MU of oranges of 16}}{\text{Price of oranges of \$1}}$$

Clearly, the last dollar spent on oranges now yields greater utility (16 utils) than does the last dollar spent on apples (8 utils). This will lead Holly to switch, or substitute, purchases away from apples and towards oranges so as to restore consumer equilibrium. This substitution effect contributes to the inverse relationship between price and quantity that is found along her demand curve for oranges: When the price of oranges declines, the substitution effect causes Holly to buy more oranges.

What about the income effect? The decline in the price of oranges from \$2 to \$1 increases Holly's real income. Before the price decline, she maximized her utility and achieved consumer equilibrium by selecting 2 apples and 4 oranges. But at the lower \$1 price for oranges, Holly would have to spend only \$6 rather than \$10 to buy that particular combination of goods. That means that the lower price of oranges has freed up \$4 that can be spent on buying more apples, more oranges, or more of both. How many more of each fruit she ends up buying will be determined by applying the utility-maximizing rule to the new situation. But it is quite likely that the increase in real income caused by the reduction in the price of oranges will cause Holly to end up buying more oranges than before the price reduction. Any such increase in orange purchases is referred to as the income effect of the reduction in the price of oranges and it, too, helps to explain why demand curves are downward sloping: When the price of oranges falls, the income effect causes Holly to buy more oranges.

ORIGIN OF THE IDEA

O 6.2

Income and substitution effects

QUICK REVIEW 6.2

- The theory of consumer behavior assumes that, with limited income and a set of product prices, consumers make rational choices on the basis of well-defined preferences.
- A consumer maximizes utility by allocating income so that the marginal utility per dollar spent is the same for every good purchased.
- A downsloping demand curve can be derived by changing the price of one product in the consumer-behavior model and noting the change in the utility-maximizing quantity of that product demanded.
- By providing insights on the income effect and substitution effects of a price decline, the utility-maximization model helps explain why demand curves are downsloping.

Applications and Extensions

Many real-world phenomena can be explained by applying the theory of consumer behavior.

iPods

Every so often a new product totally captures consumers' imaginations. One such product is Apple's iPod, which debuted in November 2001. Less than six years later, Apple sold its 100 millionth unit. Furthermore, those units enabled Apple to sell more than 2.5 billion songs through its online iTunes Store.

The swift ascendancy of the iPod resulted mainly from a leapfrog in technology. Not only is the iPod much more compact than the portable digital CD player that it replaced, it can store and play back several thousand songs—whereas a single CD only has a 74-minute recording capacity. The improved portability and storage—and enhanced consumer satisfaction—caused a major shift in consumer demand away from the portable CD player and toward the iPod.

In the language of our analysis, Apple's introduction of the iPod severely disrupted consumer equilibrium. Consumers en masse concluded that iPods had a higher marginal-utility-to-price ratio (= MU/P) than the ratios for alternative products. They therefore shifted spending away from those other products and toward iPods as a way to increase total utility. Of course, for most people the marginal utility of a second or third iPod relative to price is quite low, so most consumers purchased only a single iPod. But Apple continued to enhance the iPod, enticing some of the buyers of older models to buy new models.

This example demonstrates a simple but important point: New products succeed by enhancing consumers' total utility. This "delivery of value" generates a revenue