CHAPTER 3

Consumer Behavior

CHAPTER OUTLINE

LIST OF EXAMPLES

Some time ago, General Mills introduced a new breakfast cereal. The new brand, Apple-Cinnamon Cheerios, was a sweetened and more flavorful variant on General Mills' classic Cheerios product. But before Apple-Cinnamon Cheerios could be extensively marketed, the company had to resolve an important problem: *How high a price should it charge?* No matter how good the cereal was, its profitability would depend on the company's pricing decision. Knowing that consumers would pay more for a new product was not enough. The question was *how much more.* General Mills, therefore, had to conduct a careful analysis of consumer preferences to determine the demand for Apple-Cinnamon Cheerios.

General Mills' problem in determining consumer preferences mirrors the more complex problem faced by the U.S. Congress in evaluating the federal Food Stamps program. The goal of the program is to give low-income households coupons that can be exchanged for food. But there has always been a problem in the program's design that complicates its assessment: To what extent do food stamps provide people with *more* food, as opposed to simply subsidizing the purchase of food that they would have bought anyway? In other words, has the program turned out to be little more than an income supplement that people spend largely on nonfood items instead of a solution to the nutritional problems of the poor? As in the cereal example, we need an analysis of consumer behavior. In this case, the federal government must determine how spending on food, as opposed to spending on other goods, is affected by changing income levels and prices.

Solving these two problems—one involving corporate policy and the other public policy—requires an understanding of the **theory of consumer behavior:** the explanation of how consumers allocate incomes to the purchase of different goods and services.

Consumer Behavior

How can a consumer with a limited income decide which goods and services to buy? This is a fundamental issue in microeconomics—one that we address in this chapter and the next. We will see how consumers allocate their incomes across goods and explain how these allocation decisions determine the demands for various goods and

• **theory of consumer behavior** Description of how consumers allocate incomes among different goods and services to maximize their well-being.

services. In turn, understanding consumer purchasing decisions will help us to understand how changes in income and prices affect the demand for goods and services and why the demand for some products is more sensitive than others to changes in prices and income.

Consumer behavior is best understood in three distinct steps:

1. **Consumer Preferences:** The first step is to find a practical way to describe the reasons people might prefer one good to another. We will see how a consumer's *preferences* for various goods can be described graphically and algebraically.
2. **Budget Constraints:** Of course, consumers also consider *prices*. In Step 2, therefore, we take into account the fact that consumers have limited incomes which restrict the quantities of goods they can buy. What does a consumer do in this situation? We find the answer to this question by putting consumer preferences and budget constraints together in the third step.
3. **Consumer Choices:** Given their preferences and limited incomes, consumers choose to buy combinations of goods that maximize their satisfaction. These combinations will depend on the prices of various goods. Thus, understanding consumer choice will help us understand *demand*—i.e., how the quantity of a good that consumers choose to purchase depends on its price.

These three steps are the basics of consumer theory, and we will go through them in detail in the first three sections of this chapter. Afterward, we will explore a number of other interesting aspects of consumer behavior. For example, we will see how one can determine the nature of consumer preferences from actual observations of consumer behavior. Thus, if a consumer chooses one good over a similarly priced alternative, we can infer that he or she prefers the first good. Similar kinds of conclusions can be drawn from the actual decisions that consumers make in response to changes in the prices of the various goods and services that are available for purchase.

At the end of this chapter, we will return to the discussion of real and nominal prices that we began in Chapter 1. We saw that the Consumer Price Index can provide one measure of how the well-being of consumers changes over time. In this chapter, we delve more deeply into the subject of purchasing power by describing a range of indexes that measure changes in purchasing power over time. Because they affect the benefits and costs of numerous social-welfare programs, these indexes are significant tools in setting government policy in the United States.

WHAT DO CONSUMERS DO? Before proceeding, we need to be clear about our assumptions regarding consumer behavior, and whether those assumptions are realistic. It is hard to argue with the proposition that consumers have preferences among the various goods and services available to them, and that they face budget constraints which put limits on what they can buy. But we might take issue with the proposition that consumers decide which combinations of goods and services to buy so as to maximize their satisfaction. Are consumers as rational and informed as economists often make them out to be?

We know that consumers do not always make purchasing decisions rationally. Sometimes, for example, they buy on impulse, ignoring or not

fully accounting for their budget constraints (and going into debt as a result). Sometimes consumers are unsure about their preferences or are swayed by the consumption decisions of friends and neighbors, or even by changes in mood. And even if consumers do behave rationally, it may not always be feasible for them to account fully for the multitude of prices and choices that they face daily.

Economists have recently been developing models of consumer behavior that incorporate more realistic assumptions about rationality and decision making. This area of research, called *behavioral economics*, has drawn heavily from findings in psychology and related fields. We will discuss some key results from behavioral economics in Chapter 5. At this point we simply want to make it clear that our basic model of consumer behavior necessarily makes some simplifying assumptions. But we also want to emphasize that this model has been extremely successful in explaining much of what we actually observe regarding consumer choice and the characteristics of consumer demand. As a result, this model is a basic "workhorse" of economics. It is used widely, not only in economics, but also in related fields such as finance and marketing.

3.1 Consumer Preferences

Given both the vast number of goods and services that our industrial economy provides for purchase and the diversity of personal tastes, how can we describe consumer preferences in a coherent way? Let's begin by thinking about how a consumer might compare different groups of items available for purchase. Will one group of items be preferred to another group, or will the consumer be indifferent between the two groups?

Market Baskets

We use the term *market basket* to refer to such a group of items. Specifically, a **market basket** is a list with specific quantities of one or more goods. A market basket might contain the various food items in a grocery cart. It might also refer to the quantities of food, clothing, and housing that a consumer buys each month. Many economists also use the word *bundle* to mean the same thing as market basket.

• **market basket (c**
List with specific qua
one or more goods.

How do consumers select market baskets? How do they decide, for example, how much food versus clothing to buy each month? Although selections may occasionally be arbitrary, as we will soon see, consumers usually select market baskets that make them as well off as possible.

Table 3.1 shows several market baskets consisting of various amounts of food and clothing purchased on a monthly basis. The number of food items can be measured in any number of ways: by total number of containers, by number of packages of each item (e.g., milk, meat, etc.), or by number of pounds or grams. Likewise, clothing can be counted as total number of pieces, as number of pieces of each type of clothing, or as total weight or volume. Because the method of measurement is largely arbitrary, we will simply describe the items in a market basket in terms of the total number of *units* of each commodity. Market basket *A*, for example, consists of 20 units of food and 30 units of clothing, basket *B* consists of 10 units of food and 50 units of clothing, and so on.

TABLE 3.1 ALTERNATIVE MARKET BASKETS

MARKET BASKET	UNITS OF FOOD	UNITS OF CLOTHING
A	20	30
B	10	50
D	40	20
E	30	40
G	10	20
H	10	40

Note: We will avoid the use of the letters *C* and *F* to represent market baskets, whenever market baskets might be confused with the number of units of food and clothing.

To explain the theory of consumer behavior, we will ask whether consumers *prefer* one market basket to another. Note that the theory assumes that consumers' preferences are consistent and make sense. We explain what we mean by these assumptions in the next subsection.

Some Basic Assumptions about Preferences

The theory of consumer behavior begins with three basic assumptions about people's preferences for one market basket versus another. We believe that these assumptions hold for most people in most situations.

1. **Completeness:** Preferences are assumed to be *complete*. In other words, consumers can compare and rank all possible baskets. Thus, for any two market baskets *A* and *B*, a consumer will prefer *A* to *B*, will prefer *B* to *A*, or will be indifferent between the two. By *indifferent* we mean that a person will be equally satisfied with either basket. Note that these preferences ignore costs. A consumer might prefer steak to hamburger but buy hamburger because it is cheaper.
2. **Transitivity:** Preferences are *transitive*. Transitivity means that if a consumer prefers basket *A* to basket *B* and basket *B* to basket *C*, then the consumer also prefers *A* to *C*. For example, if a Porsche is preferred to a Cadillac and a Cadillac to a Chevrolet, then a Porsche is also preferred to a Chevrolet. Transitivity is normally regarded as necessary for consumer consistency.
3. **More is better than less:** Goods are assumed to be desirable—i.e., to be *good*. Consequently, *consumers always prefer more of any good to less*. In addition, consumers are never satisfied or satiated; *more is always better, even if just a little better.*[1] This assumption is made for pedagogic reasons; namely, it simplifies the graphical analysis. Of course, some goods, such as air pollution, may be undesirable, and consumers will always prefer less. We ignore these "bads" in the context of our immediate discussion of consumer choice because most consumers would not choose to purchase them. We will, however, discuss them later in the chapter.

These three assumptions form the basis of consumer theory. They do not explain consumer preferences, but they do impose a degree of rationality and reasonableness on them. Building on these assumptions, we will now explore consumer behavior in greater detail.

[1]Thus some economists use the term *nonsatiation* to refer to this third assumption.

Indifference Curves

We can show a consumer's preferences graphically with the use of *indifference curves*. An **indifference curve** *represents all combinations of market baskets that provide a consumer with the same level of satisfaction.* That person is therefore *indifferent* among the market baskets represented by the points graphed on the curve.

• **indifference curve** Curve representing all combinations of market baskets that provide a consumer with the same level of satisfaction.

Given our three assumptions about preferences, we know that a consumer can always indicate either a preference for one market basket over another or indifference between the two. We can then use this information to rank all possible consumption choices. In order to appreciate this principle in graphic form, let's assume that there are only two goods available for consumption: food *F* and clothing *C*. In this case, all market baskets describe combinations of food and clothing that a person might wish to consume. As we have already seen, Table 3.1 provides some examples of baskets containing various amounts of food and clothing.

In order to graph a consumer's indifference curve, it helps first to graph his or her individual preferences. Figure 3.1 shows the same baskets listed in Table 3.1. The horizontal axis measures the number of units of food purchased each week; the vertical axis measures the number of units of clothing. Market basket *A*, with 20 units of food and 30 units of clothing, is preferred to basket *G* because *A* contains more food *and* more clothing (recall our third assumption that more is better than less). Similarly, market basket *E*, which contains even more food and even more clothing, is preferred to *A*. In fact, we can easily compare all market baskets in the two shaded areas (such as *E* and *G*) to *A* because they contain either more or less of both food and clothing. Note, however, that *B* contains more clothing but less food than *A*. Similarly, *D* contains more food but less clothing than *A*. Therefore, comparisons of market basket *A* with baskets *B*, *D*, and *H* are not possible without more information about the consumer's ranking.

This additional information is provided in Figure 3.2, which shows an indifference curve, labeled U_1, that passes through points *A*, *B*, and *D*. This curve indicates that the consumer is indifferent among these three market baskets. It tells us that in moving from market basket *A* to market basket *B*, the consumer feels neither better nor worse off in giving up 10 units of food to obtain 20 additional

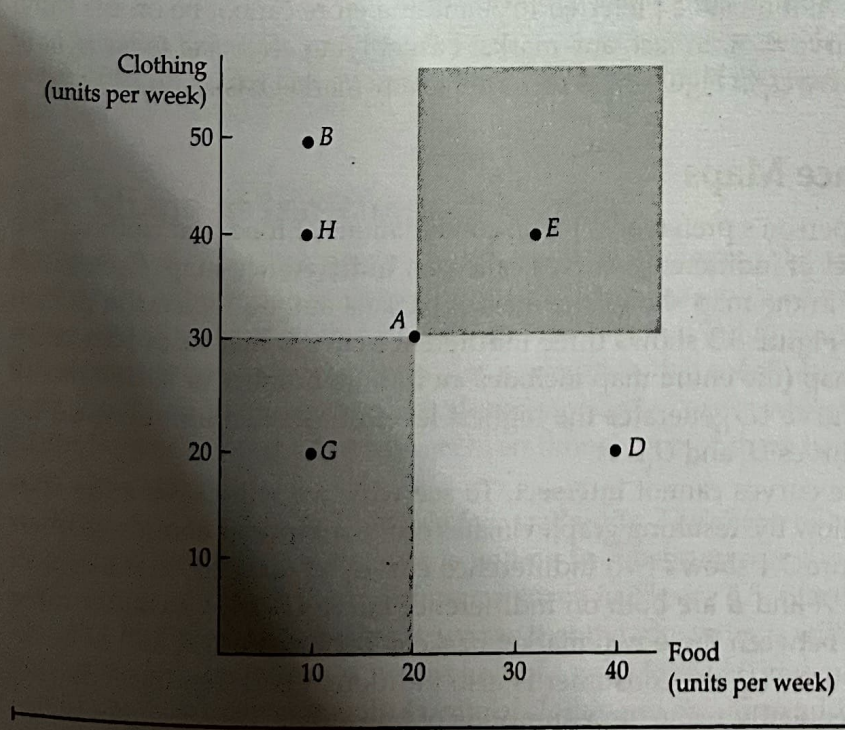

FIGURE 3.1
DESCRIBING INDIVIDUAL PREFERENCES

Because more of each good is preferred to less, we can compare market baskets in the shaded areas. Basket *A* is clearly preferred to basket *G*, while *E* is clearly preferred to *A*. However, *A* cannot be compared with *B*, *D*, or *H* without additional information.

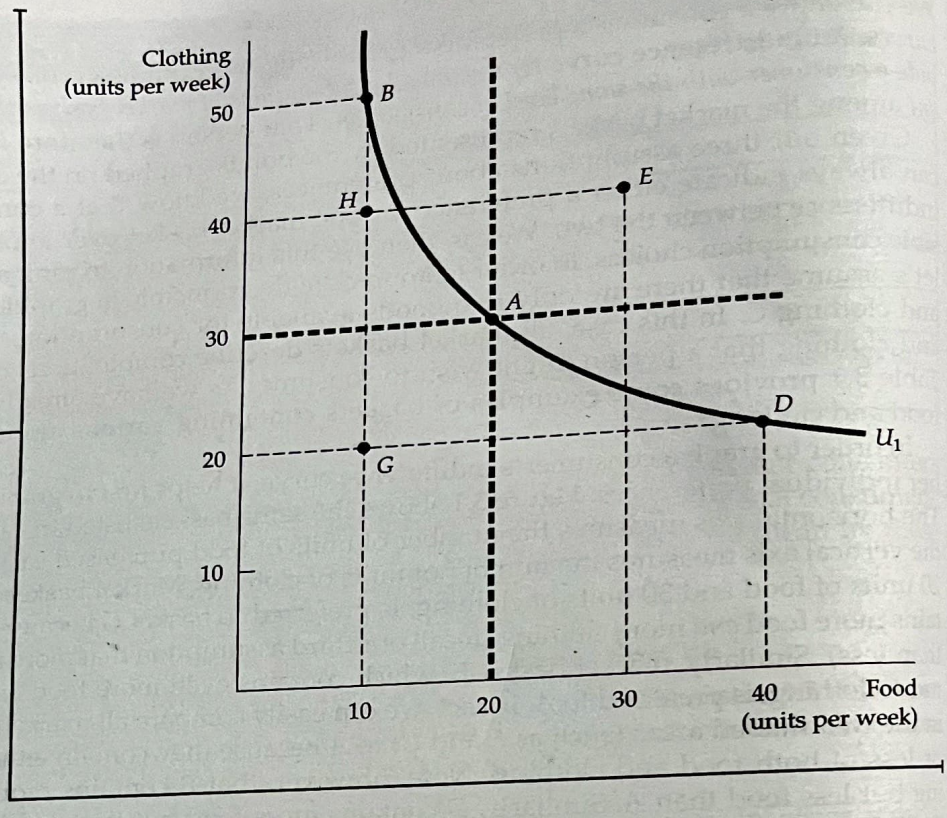

FIGURE 3.2
AN INDIFFERENCE CURVE

The indifference curve U_1 that passes through market basket A shows all baskets that give the consumer the same level of satisfaction as does market basket A; these include baskets B and D. Our consumer prefers basket E, which lies above U_1, to A, but prefers A to H or G, which lie below U_1.

units of clothing. Likewise, the consumer is indifferent between points A and D: He or she will give up 10 units of clothing to obtain 20 more units of food. On the other hand, the consumer prefers A to H, which lies below U_1.

Note that the indifference curve in Figure 3.2 slopes downward from left to right. To understand why this must be the case, suppose instead that it sloped upward from A to E. This would violate the assumption that more of any commodity is preferred to less. Because market basket E has more of both food and clothing than market basket A, it must be preferred to A and therefore cannot be on the same indifference curve as A. In fact, any market basket lying *above and to the right of* indifference curve U_1 in Figure 3.2 is preferred to any market basket on U_1.

Indifference Maps

• **indifference map** Graph containing a set of indifference curves showing the market baskets among which a consumer is indifferent.

To describe a person's preferences for *all* combinations of food and clothing, we can graph a set of indifference curves called an **indifference map.** Each indifference curve in the map shows the market baskets among which the person is indifferent. Figure 3.3 shows three indifference curves that form part of an indifference map (the entire map includes an infinite number of such curves). Indifference curve U_3 generates the highest level of satisfaction, followed by indifference curves U_2 and U_1.

Indifference curves cannot intersect. To see why, we will assume the contrary and see how the resulting graph violates our assumptions about consumer behavior. Figure 3.4 shows two indifference curves, U_1 and U_2, that intersect at A. Because A and B are both on indifference curve U_1, the consumer must be indifferent between these two market baskets. Because both A and D lie on indifference curve U_2, the consumer is also indifferent between these market baskets. Consequently, using the assumption of transitivity, the consumer is also

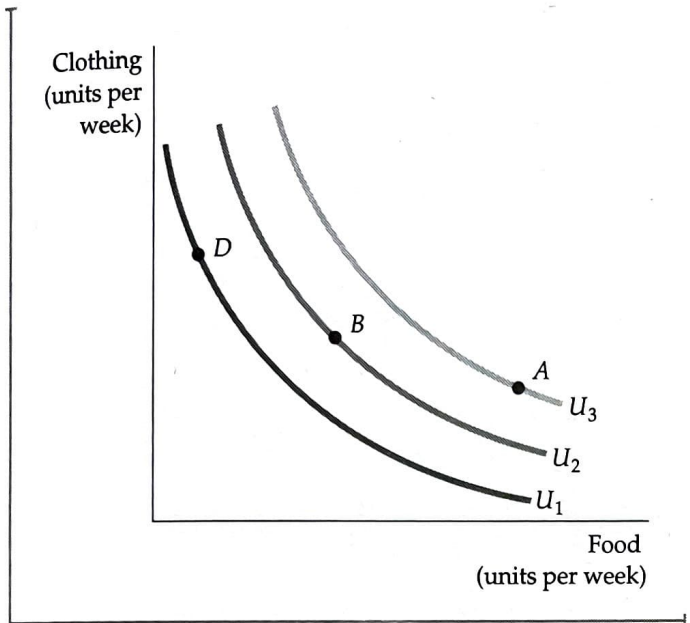

FIGURE 3.3
AN INDIFFERENCE MAP

An indifference map is a set of indifference curves that describes a person's preferences. Any market basket on indifference curve U_3, such as basket *A*, is preferred to any basket on curve U_2 (e.g., basket *B*), which in turn is preferred to any basket on U_1, such as *D*.

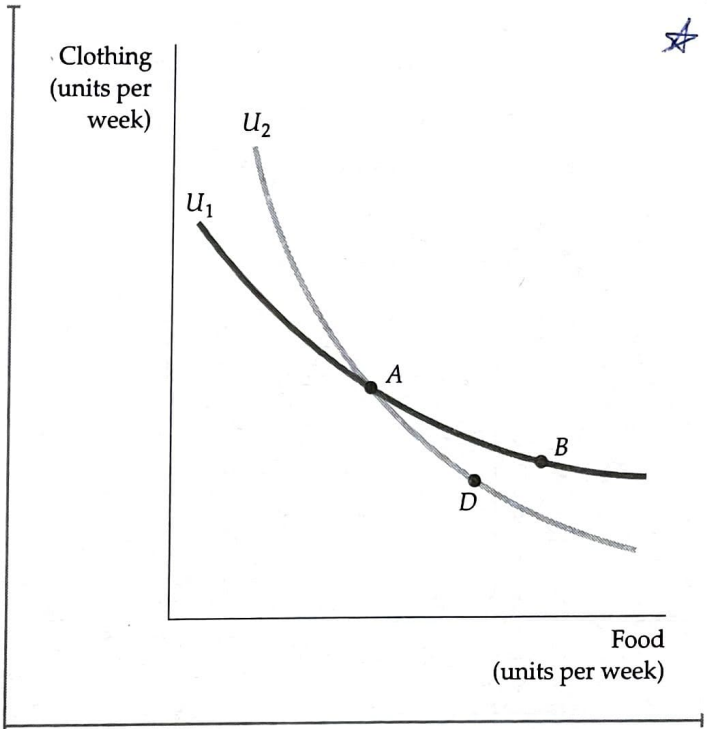

FIGURE 3.4
INDIFFERENCE CURVES CANNOT INTERSECT

If indifference curves U_1 and U_2 intersect, one of the assumptions of consumer theory is violated. According to this diagram, the consumer should be indifferent among market baskets *A*, *B*, and *D*. Yet *B* should be preferred to *D* because *B* has more of both goods.

indifferent between *B* and *D*. But this conclusion can't be true: Market basket *B* must be preferred to *D* because it contains more of both food and clothing. Thus, intersecting indifference curves contradicts our assumption that more is preferred to less.

Of course, there are an infinite number of nonintersecting indifference curves, one for every possible level of satisfaction. In fact, every possible market basket (each corresponding to a point on the graph) has an indifference curve passing through it.

The Shape of Indifference Curves

Recall that indifference curves are all downward sloping. In our example of food and clothing, when the amount of food increases along an indifference curve, the amount of clothing decreases. The fact that indifference curves slope downward follows directly from our assumption that more of a good is better than less. If an indifference curve sloped upward, a consumer would be indifferent between two market baskets even though one of them had more of *both* food and clothing.

As we saw in Chapter 1, people face trade-offs. The shape of an indifference curve describes how a consumer is willing to substitute one good for another. Look, for example, at the indifference curve in Figure 3.5. Starting at market basket *A* and moving to basket *B*, we see that the consumer is willing to give up 6 units of clothing to obtain 1 extra unit of food. However, in moving from *B* to *D*, he is willing to give up only 4 units of clothing to obtain an additional unit of

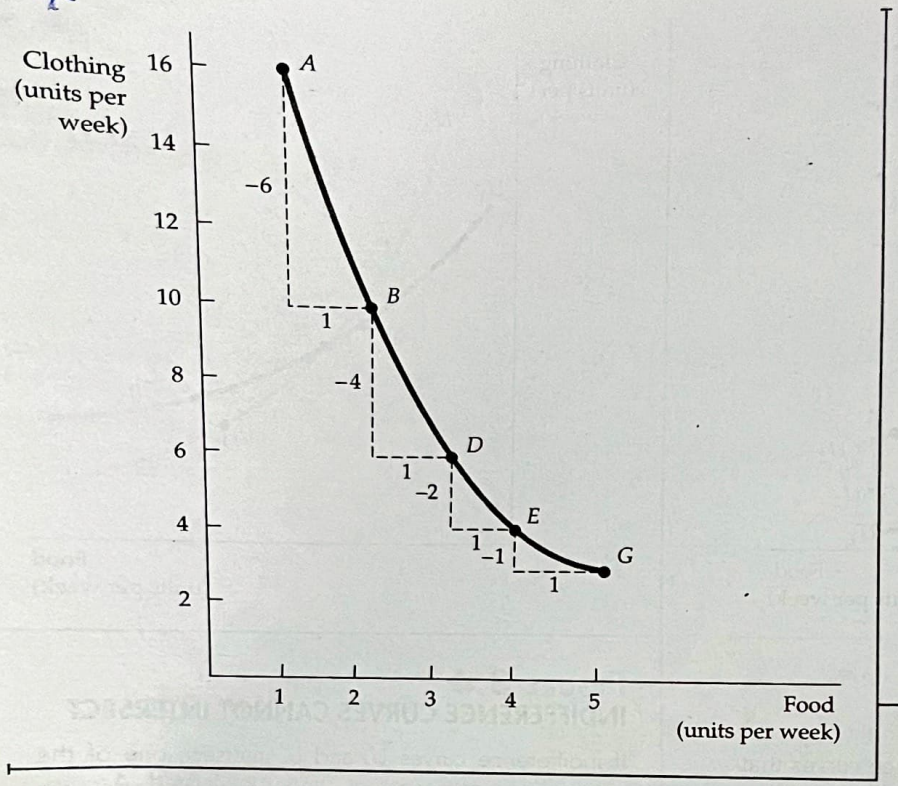

FIGURE 3.5
THE MARGINAL RATE OF SUBSTITUTION

The magnitude of the slope of an indifference curve measures the consumer's marginal rate of substitution (MRS) between two goods. In this figure, the MRS between clothing (*C*) and food (*F*) falls from 6 (between *A* and *B*) to 4 (between *B* and *D*) to 2 (between *D* and *E*) to 1 (between *E* and *G*). When the MRS diminishes along an indifference curve, the curve is convex.

food; in moving from *D* to *E*, he will give up only 2 units of clothing for 1 unit of food. The more clothing and the less food a person consumes, the more clothing he will give up in order to obtain more food. Similarly, the more food that a person possesses, the less clothing he will give up for more food.

The Marginal Rate of Substitution

marginal rate of substitution (MRS)
Maximum amount of a good that a consumer is willing to give up in order to obtain one additional unit of another good.

To quantify the amount of one good that a consumer will give up to obtain more of another, we use a measure called the **marginal rate of substitution (MRS)**. *The MRS of food F for clothing C is the maximum amount of clothing that a person is willing to give up to obtain one additional unit of food.* Suppose, for example, the MRS is 3. This means that the consumer will give up 3 units of clothing to obtain 1 additional unit of food. If the MRS is 1/2, the consumer is willing to give up only 1/2 unit of clothing. Thus, the MRS measures *the value that the individual places on 1 extra unit of a good in terms of another.*

Look again at Figure 3.5. Note that clothing appears on the vertical axis and food on the horizontal axis. When we describe the MRS, we must be clear about which good we are giving up and which we are getting more of. To be consistent throughout the book, we will define the MRS in terms of *the amount of the good on the vertical axis that the consumer is willing to give up in order to obtain 1 extra unit of the good on the horizontal axis.* Thus, in Figure 3.5 the MRS refers to the amount of clothing that the consumer is willing to give up to obtain an additional unit of food. If we denote the *change* in clothing by ΔC and the change in food by ΔF, the MRS can be written as $-\Delta C/\Delta F$. We add the negative sign to make the marginal rate of substitution a positive number. (Remember that ΔC is always negative; the consumer *gives up* clothing to obtain additional food.)

Thus the MRS at any point is equal in magnitude to the slope of the indifference curve. In Figure 3.5, for example, the MRS between points A and B is 6: The consumer is willing to give up 6 units of clothing to obtain 1 additional unit of food. Between points B and D, however, the MRS is 4: With these quantities of food and clothing, the consumer is willing to give up only 4 units of clothing to obtain 1 additional unit of food.

CONVEXITY Also observe in Figure 3.5 that the MRS falls as we move down the indifference curve. This is not a coincidence. This decline in the MRS reflects an important characteristic of consumer preferences. To understand this, we will add an additional assumption regarding consumer preferences to the three that we discussed earlier in this chapter (see page 94):

4. **Diminishing marginal rate of substitution:** Indifference curves are usually *convex*, or bowed inward. The term *convex* means that the slope of the indifference curve *increases* (i.e., becomes less negative) as we move down along the curve. In other words, *an indifference curve is convex if the MRS diminishes along the curve.* The indifference curve in Figure 3.5 is convex. As we have seen, starting with market basket A in Figure 3.5 and moving to basket B, the MRS of food F for clothing C is $-\Delta C/\Delta F = -(-6)/1 = 6$. However, when we start at basket B and move from B to D, the MRS falls to 4. If we start at basket D and move to E, the MRS is 2. Starting at E and moving to G, we get an MRS of 1. As food consumption increases, the slope of the indifference curve falls in magnitude. Thus the MRS also falls.[2]

Is it reasonable to expect indifference curves to be convex? Yes. As more and more of one good is consumed, we can expect that a consumer will prefer to give up fewer and fewer units of a second good to get additional units of the first one. As we move down the indifference curve in Figure 3.5 and consumption of food increases, the additional satisfaction that a consumer gets from still more food will diminish. Thus, he will give up less and less clothing to obtain additional food.

Another way of describing this principle is to say that consumers generally prefer balanced market baskets to market baskets that contain all of one good and none of another. Note from Figure 3.5 that a relatively balanced market basket containing 3 units of food and 6 units of clothing (basket D) generates as much satisfaction as another market basket containing 1 unit of food and 16 units of clothing (basket A). It follows that a balanced market basket containing, for example, 6 units of food and 8 units of clothing will generate a higher level of satisfaction.

Perfect Substitutes and Perfect Complements

The shape of an indifference curve describes the willingness of a consumer to substitute one good for another. An indifference curve with a different shape implies a different willingness to substitute. To see this principle, look at the two somewhat extreme cases illustrated in Figure 3.6.

In §2.1, we explain that two goods are *substitutes* when an increase in the price of one leads to an increase in the quantity demanded of the other.

[2] With nonconvex preferences, the MRS increases as the amount of the good measured on the horizontal axis increases along any indifference curve. This unlikely possibility might arise if one or both goods are addictive. For example, the willingness to substitute an addictive drug for other goods might increase as the use of the addictive drug increased.

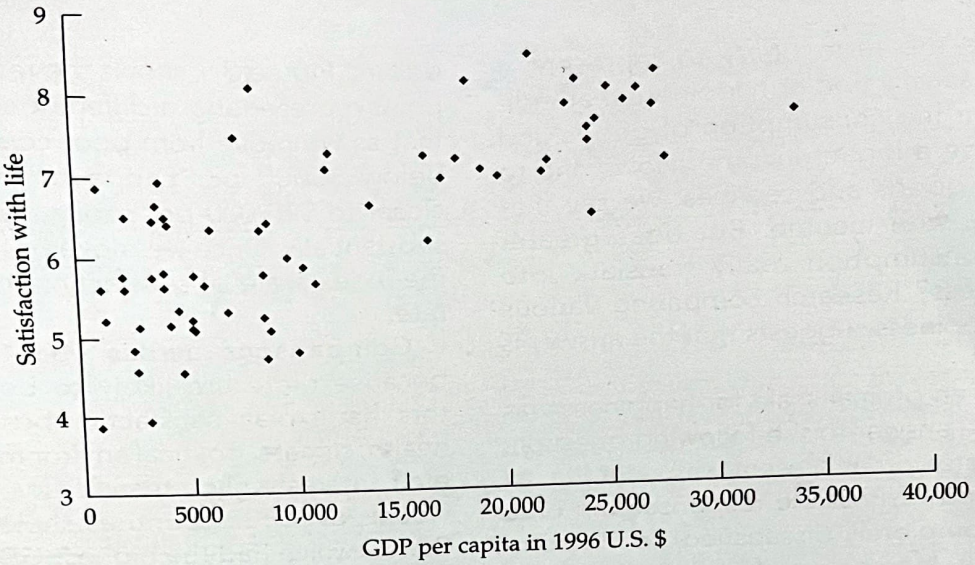

FIGURE 3.9
INCOME AND HAPPINESS

A cross-country comparison shows that individuals living in countries with higher GDP per capita are on average happier than those living in countries with lower per-capita GDP.

3.2 Budget Constraints

So far, we have focused only on the first element of consumer theory—consumer preferences. We have seen how indifference curves (or, alternatively, utility functions) can be used to describe how consumers value various baskets of goods. Now we turn to the second element of consumer theory: the **budget constraints** that consumers face as a result of their limited incomes.

• budget constraints consumers face ited incomes.

The Budget Line

To see how a budget constraint limits a consumer's choices, let's consider a situation in which a woman has a fixed amount of income, I, that can be spent on food and clothing. Let F be the amount of food purchased and C be the amount of clothing. We will denote the prices of the two goods P_F and P_C. In that case, $P_F F$ (i.e., price of food times the quantity) is the amount of money spent on food and $P_C C$ the amount of money spent on clothing.

• budget line All combinations of goods for which the total amount of money spent is equal to income.

The **budget line** indicates *all combinations of F and C for which the total amount of money spent is equal to income.* Because we are considering only two goods (and ignoring the possibility of saving), our hypothetical consumer will spend her entire income on food and clothing. As a result, the combinations of food and clothing that she can buy will all lie on this line:

$$P_F F + P_C C = I \qquad (3.1)$$

TABLE 3.2 MARKET BASKETS AND THE BUDGET LINE

MARKET BASKET	FOOD (*F*)	CLOTHING (*C*)	TOTAL SPENDING
A	0	40	$80
B	20	30	$80
D	40	20	$80
E	60	10	$80
G	80	0	$80

Suppose, for example, that our consumer has a weekly income of $80, the price of food is $1 per unit, and the price of clothing is $2 per unit. Table 3.2 shows various combinations of food and clothing that she can purchase each week with her $80. If her entire budget were allocated to clothing, the most that she could buy would be 40 units (at a price of $2 per unit), as represented by market basket *A*. If she spent her entire budget on food, she could buy 80 units (at $1 per unit), as given by market basket *G*. Market baskets *B*, *D*, and *E* show three additional ways in which her $80 could be spent on food and clothing.

Figure 3.10 shows the budget line associated with the market baskets given in Table 3.2. Because giving up a unit of clothing saves $2 and buying a unit of food costs $1, the amount of clothing given up for food along the budget line must be the same everywhere. As a result, the budget line is a straight line from point *A* to point *G*. In this particular case, the budget line is given by the equation $F + 2C = \$80$.

The intercept of the budget line is represented by basket *A*. As our consumer moves along the line from basket *A* to basket *G*, she spends less on clothing and more on food. It is easy to see that the extra clothing which must be given up to consume an additional unit of food is given by the ratio of the price of food to the price of clothing ($\$1/\$2 = 1/2$). Because clothing costs $2 per unit and food only $1 per unit, 1/2 unit of clothing must be given up to get 1 unit of food. In Figure 3.10, the slope of the line, $\Delta C/\Delta F = -1/2$, measures the relative cost of food and clothing.

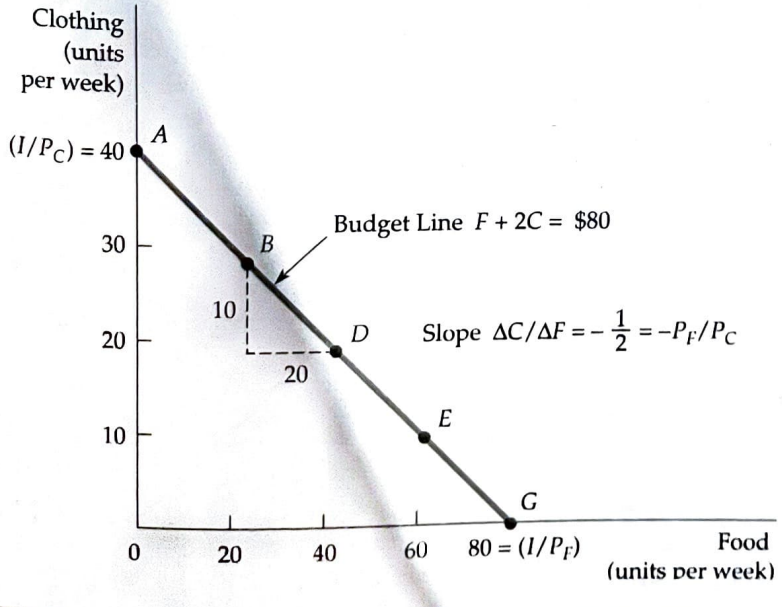

FIGURE 3.10
A BUDGET LINE

A budget line describes the combinations of goods that can be purchased given the consumer's income and the prices of the goods. Line *AG* (which passes through points *B*, *D*, and *E*) shows the budget associated with an income of $80, a price of food of P_F = $1 per unit, and a price of clothing of P_C = $2 per unit. The slope of the budget line (measured between points *B* and *D*) is $-P_F/P_C = -10/20 = -1/2$.

Using equation (3.1), we can see how much of C must be given up to consume more of F. We divide both sides of the equation by P_C and then solve for C:

$$C = (I/P_C) - (P_F/P_C)F \tag{3.2}$$

Equation (3.2) is the equation for a straight line; it has a vertical intercept of I/P_C and a slope of $-(P_F/P_C)$.

The slope of the budget line, $-(P_F/P_C)$, is *the negative of the ratio of the prices of the two goods*. The magnitude of the slope tells us the rate at which the two goods can be substituted for each other without changing the total amount of money spent. The vertical intercept (I/P_C) represents the maximum amount of C that can be purchased with income I. Finally, the horizontal intercept (I/P_F) tells us how many units of F can be purchased if all income were spent on F.

The Effects of Changes in Income and Prices

We have seen that the budget line depends both on income and on the prices of the goods, P_F and P_C. But of course prices and income often change. Let's see how such changes affect the budget line.

INCOME CHANGES What happens to the budget line when income changes? From the equation for the straight line (3.2), we can see that a change in income alters the vertical intercept of the budget line but does not change the slope (because the price of neither good changed). Figure 3.11 shows that if income is doubled (from \$80 to \$160), the budget line shifts outward, from budget line L_1 to budget line L_2. Note, however, that L_2 remains parallel to L_1. If she desires, our consumer can now double her purchases of both food and clothing. Likewise, if her income is cut in half (from \$80 to \$40), the budget line shifts inward, from L_1 to L_3.

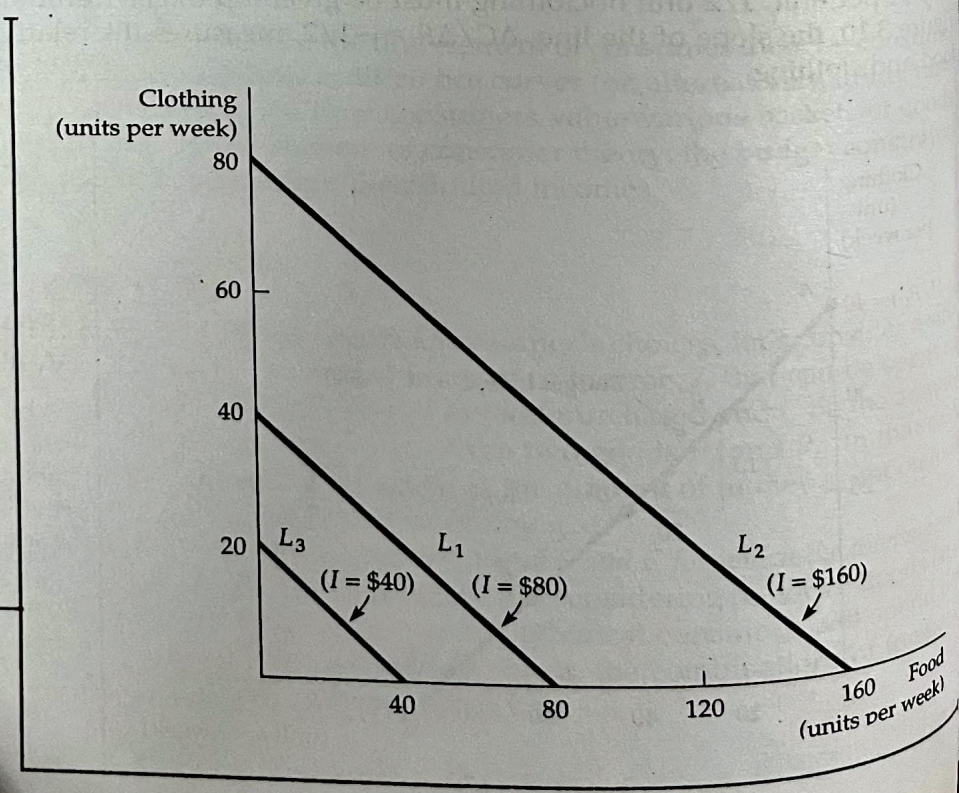

FIGURE 3.11
EFFECTS OF A CHANGE IN INCOME ON THE BUDGET LINE

A change in income (with prices unchanged) causes the budget line to shift parallel to the original line (L_1). When the income of \$80 (on L_1) is increased to \$160, the budget line shifts outward to L_2. If the income falls to \$40, the line shifts inward to L_3.

PRICE CHANGES What happens to the budget line if the price of one good changes but the price of the other does not? We can use the equation $C = (I/P_C) - (P_F/P_C)F$ to describe the effects of a change in the price of food on the budget line. Suppose the price of food falls by half, from \$1 to \$0.50. In that case, the vertical intercept of the budget line remains unchanged, although the slope changes from $-P_F/P_C = -\$1/\$2 = -\$1/2$ to $-\$0.50/\$2 = -\$1/4$. In Figure 3.12, we obtain the new budget line L_2 by rotating the original budget line L_1 outward, pivoting from the C-intercept. This rotation makes sense because a person who consumes only clothing and no food is unaffected by the price change. However, someone who consumes a large amount of food will experience an increase in his purchasing power. Because of the decline in the price of food, the maximum amount of food that can be purchased has doubled.

On the other hand, when the price of food doubles from \$1 to \$2, the budget line rotates inward to line L_3 because the person's purchasing power has diminished. Again, a person who consumed only clothing would be unaffected by the food price increase.

What happens if the prices of both food and clothing change, but in a way that leaves the *ratio* of the two prices unchanged? Because the slope of the budget line is equal to the ratio of the two prices, the slope will remain the same. The intercept of the budget line must shift so that the new line is parallel to the old one. For example, if the prices of both goods fall by half, then the slope of the budget line does not change. However, both intercepts double, and the budget line is shifted outward.

This exercise tells us something about the determinants of a consumer's *purchasing power*—her ability to generate utility through the purchase of goods and services. Purchasing power is determined not only by income, but also by prices. For example, our consumer's purchasing power can double either because her income doubles *or* because the prices of all the goods that she buys fall by half.

Finally, consider what happens if everything doubles—the prices of both food and clothing *and* the consumer's income. (This can happen in an inflationary economy.) Because both prices have doubled, the ratio of the prices has not changed; neither, therefore, has the slope of the budget line. Because the price of clothing has doubled along with income, the maximum amount of clothing that can be purchased (represented by the vertical intercept of the budget

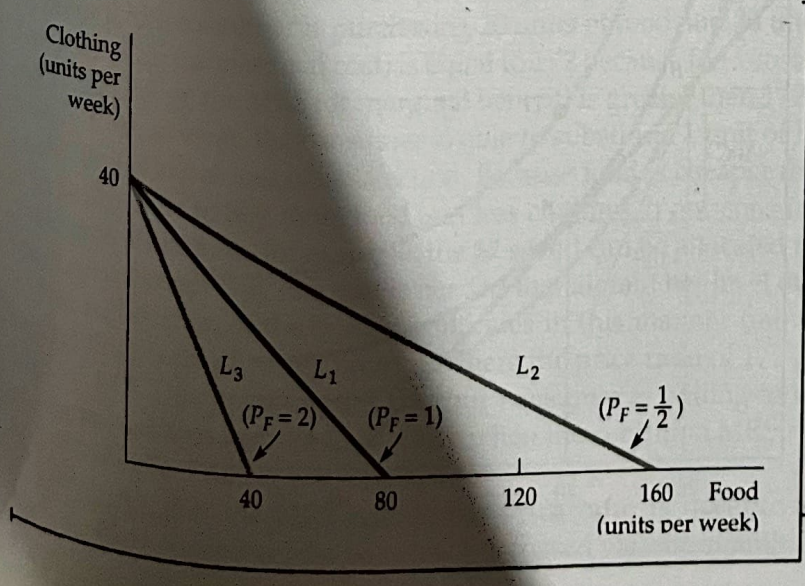

FIGURE 3.12
EFFECTS OF A CHANGE IN PRICE ON THE BUDGET LINE

A change in the price of one good (with income unchanged) causes the budget line to rotate about one intercept. When the price of food falls from \$1.00 to \$0.50, the budget line rotates outward from L_1 to L_2. However, when the price increases from \$1.00 to \$2.00, the line rotates inward from L_1 to L_3.

line) is unchanged. The same is true for food. Therefore, inflationary conditions in which all prices and income levels rise proportionately will not affect the consumer's budget line or purchasing power.

3.3 Consumer Choice

Given preferences and budget constraints, we can now determine how individual consumers choose how much of each good to buy. We assume that consumers make this choice in a rational way—that they choose goods to *maximize the satisfaction they can achieve, given the limited budget available to them.* The maximizing market basket must satisfy two conditions:

1. ***It must be located on the budget line.*** To see why, note that any market basket to the left of and below the budget line leaves some income unallocated—income which, if spent, could increase the consumer's satisfaction. Of course, consumers can—and often do—save some of their incomes for future consumption. In that case, the choice is not just between food and clothing, but between consuming food or clothing now and consuming food or clothing in the future. At this point, however, we will keep things simple by assuming that all income is spent now. Note also that any market basket to the right of and above the budget line cannot be purchased with available income. Thus, the only rational and feasible choice is a basket on the budget line.
2. ***It must give the consumer the most preferred combination of goods and services.***

These two conditions reduce the problem of maximizing consumer satisfaction to one of picking an appropriate point on the budget line.

In our food and clothing example, as with any two goods, we can graphically illustrate the solution to the consumer's choice problem. Figure 3.13 shows how

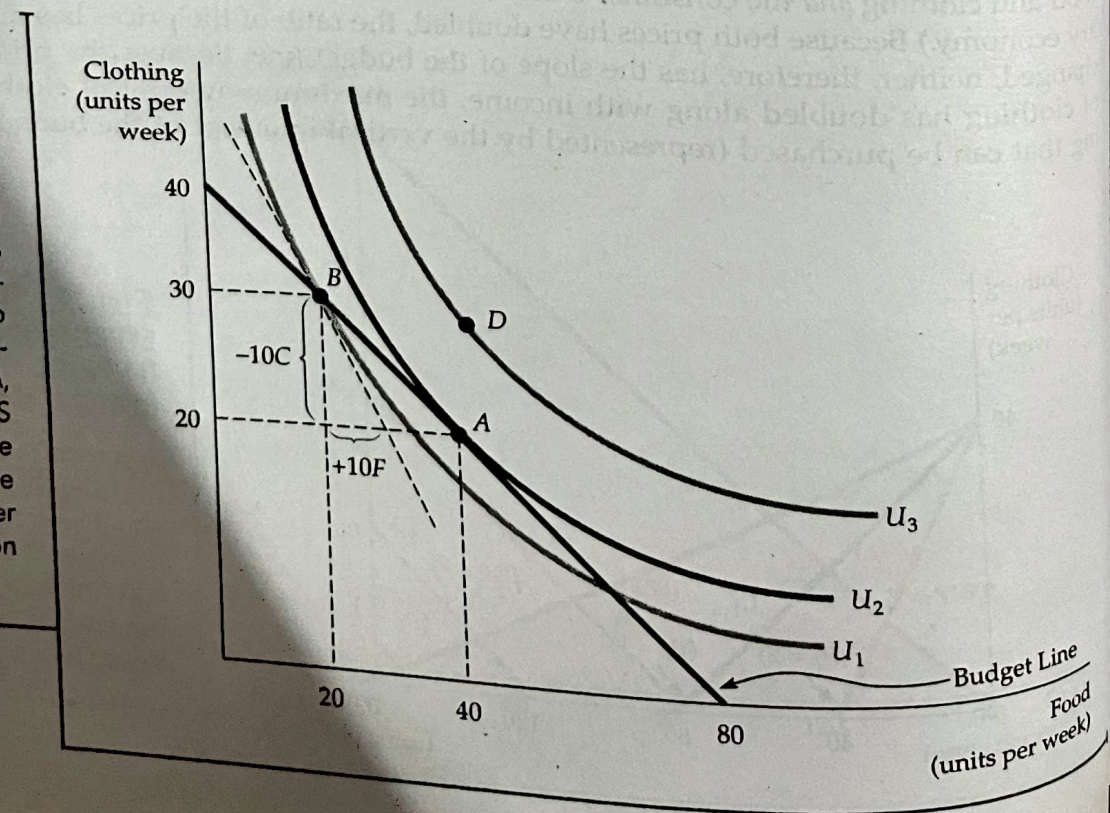

FIGURE 3.13 MAXIMIZING CONSUMER SATISFACTION

A consumer maximizes satisfaction by choosing market basket A. At this point, the budget line and indifference curve U_2 are tangent, and no higher level of satisfaction (e.g., market basket D) can be attained. At A, the point of maximization, the MRS between the two goods equals the price ratio. At B, however, because the MRS [−(−10/10) = 1] is greater than the price ratio (1/2), satisfaction is not maximized.

the problem is solved. Here, three indifference curves describe a consumer's preferences for food and clothing. Remember that of the three curves, the outermost curve, U_3, yields the greatest amount of satisfaction, curve U_2 the next greatest amount, and curve U_1 the least.

Note that point B on indifference curve U_1 is not the most preferred choice, because a reallocation of income in which more is spent on food and less on clothing can increase the consumer's satisfaction. In particular, by moving to point A, the consumer spends the same amount of money and achieves the increased level of satisfaction associated with indifference curve U_2. In addition, note that baskets located to the right and above indifference curve U_2, like the basket associated with D on indifference curve U_3, achieve a higher level of satisfaction but cannot be purchased with the available income. Therefore, A maximizes the consumer's satisfaction.

We see from this analysis that the basket which maximizes satisfaction must lie on the highest indifference curve that touches the budget line. Point A is the point of tangency between indifference curve U_2 and the budget line. At A, the slope of the budget line is exactly equal to the slope of the indifference curve. Because the MRS $(-\Delta C/\Delta F)$ is the negative of the slope of the indifference curve, we can say that satisfaction is maximized (given the budget constraint) at the point where

$$\text{MRS} = P_F/P_C \qquad \textbf{(3.3)}$$

This is an important result: Satisfaction is maximized when *the marginal rate of substitution* (of F for C) *is equal to the ratio of the prices* (of F to C). Thus the consumer can obtain maximum satisfaction by adjusting his consumption of goods F and C so that the MRS equals the price ratio.

The condition given in equation (3.3) illustrates the kinds of optimization conditions that arise in economics. In this instance, satisfaction is maximized when the **marginal benefit**—the benefit associated with the consumption of one additional unit of food—is equal to the **marginal cost**—the cost of the additional unit of food. The marginal benefit is measured by the MRS. At point A, it equals 1/2 (the magnitude of the slope of the indifference curve), which implies that the consumer is willing to give up 1/2 unit of clothing to obtain 1 unit of food. At the same point, the marginal cost is measured by the magnitude of the slope of the budget line; it too equals 1/2 because the cost of getting one unit of food is giving up 1/2 unit of clothing ($P_F = 1$ and $P_C = 2$ on the budget line).

- **marginal benefit** Benefit from the consumption of one additional unit of a good.
- **marginal cost** Cost of one additional unit of a good.

If the MRS is less or greater than the price ratio, the consumer's satisfaction has not been maximized. For example, compare point B in Figure 3.13 to point A. At point B, the consumer is purchasing 20 units of food and 30 units of clothing. The price ratio (or marginal cost) is equal to 1/2 because food costs \$1 and clothing \$2. However, the MRS (or marginal benefit) is greater than 1/2; it is approximately 1. As a result, the consumer is able to substitute 1 unit of food for 1 unit of clothing without loss of satisfaction. Because food is cheaper than clothing, it is in her interest to buy more food and less clothing. If our consumer purchases 1 less unit of clothing, for example, the \$2 saved can be allocated to two units of food, even though only one unit is needed to maintain her level of satisfaction.

The reallocation of the budget continues in this manner (moving along the budget line), until we reach point A, where the price ratio of 1/2 just equals the MRS of 1/2. This point implies that our consumer is willing to trade one unit of clothing for two units of food. Only when the condition MRS = $1/2 = P_F/P_C$ holds is she maximizing her satisfaction.

The result that the MRS equals the price ratio is deceptively powerful. Imagine two consumers who have just purchased various quantities of food and

demands of *other* people. These effects play a crucial role in the demands for many high-tech products, such as computer hardware and software, and telecommunications systems.

6. Finally, we will briefly describe some of the methods that economists use to obtain empirical information about demand.

4.1 Individual Demand

This section shows how the demand curve of an individual consumer follows from the consumption choices that a person makes when faced with a budget constraint. To illustrate these concepts graphically, we will limit the available goods to food and clothing, and we will rely on the utility-maximization approach described in Section 3.3 (page 110).

Price Changes

In §3.3, we explain how a consumer chooses the market basket on the highest indifference curve that touches the consumer's budget line.

We begin by examining ways in which the consumption of food and clothing changes when the price of food changes. Figure 4.1 shows the consumption choices that a person will make when allocating a fixed amount of income between the two goods.

Initially, the price of food is \$1, the price of clothing \$2, and the consumer's income \$20. The utility-maximizing consumption choice is at point B in Figure 4.1 (a). Here, the consumer buys 12 units of food and 4 units of clothing, thus achieving the level of utility associated with indifference curve U_2.

Now look at Figure 4.1 (b), which shows the relationship between the price of food and the quantity demanded. The horizontal axis measures the quantity of food consumed, as in Figure 4.1 (a), but the vertical axis now measures the price of food. Point G in Figure 4.1 (b) corresponds to point B in Figure 4.1 (a). At G, the price of food is \$1, and the consumer purchases 12 units of food.

In §3.2, we explain how the budget line shifts in response to a price change.

Suppose the price of food increases to \$2. As we saw in Chapter 3, the budget line in Figure 4.1 (a) rotates inward about the vertical intercept, becoming twice as steep as before. The higher relative price of food has increased the magnitude of the slope of the budget line. The consumer now achieves maximum utility at A, which is found on a lower indifference curve, U_1. Because the price of food has risen, the consumer's purchasing power—and thus attainable utility—has fallen. At A, the consumer chooses 4 units of food and 6 units of clothing. In Figure 4.1 (b), this modified consumption choice is at E, which shows that at a price of \$2, 4 units of food are demanded.

• **price-consumption curve** Curve tracing the utility-maximizing combinations of two goods as the price of one changes.

Finally, what will happen if the price of food *decreases* to 50 cents? Because the budget line now rotates outward, the consumer can achieve the higher level of utility associated with indifference curve U_3 in Figure 4.1 (a) by selecting D, with 20 units of food and 5 units of clothing. Point H in Figure 4.1 (b) shows the price of 50 cents and the quantity demanded of 20 units of food.

The Individual Demand Curve

We can go on to include all possible changes in the price of food. In Figure 4.1 (a), the **price-consumption curve** traces the utility-maximizing combinations of food and clothing associated with every possible price of food. Note that as the price of food falls, attainable utility increases and the consumer buys more food. This pattern of increasing consumption of a good in response to a decrease in

price almost always holds. But what happens to the consumption of clothing as the price of food falls? As Figure 4.1 (a) shows, the consumption of clothing may either increase or decrease. The consumption of both food *and* clothing can increase because the decrease in the price of food has increased the consumer's ability to purchase both goods.

An **individual demand curve** relates the quantity of a good that a single consumer will buy to the price of that good. In Figure 4.1 (b), the individual demand curve relates the quantity of food that the consumer will buy to the price of food. This demand curve has two important properties:

• **individual demand curve** Curve relating the quantity of a good that a single consumer will buy to its price.

1. ***The level of utility that can be attained changes as we move along the curve.*** The lower the price of the product, the higher the level of utility. Note from Figure 4.1 (a) that a higher indifference curve is reached as the price falls. Again, this result simply reflects the fact that as the price of a product falls, the consumer's purchasing power increases.

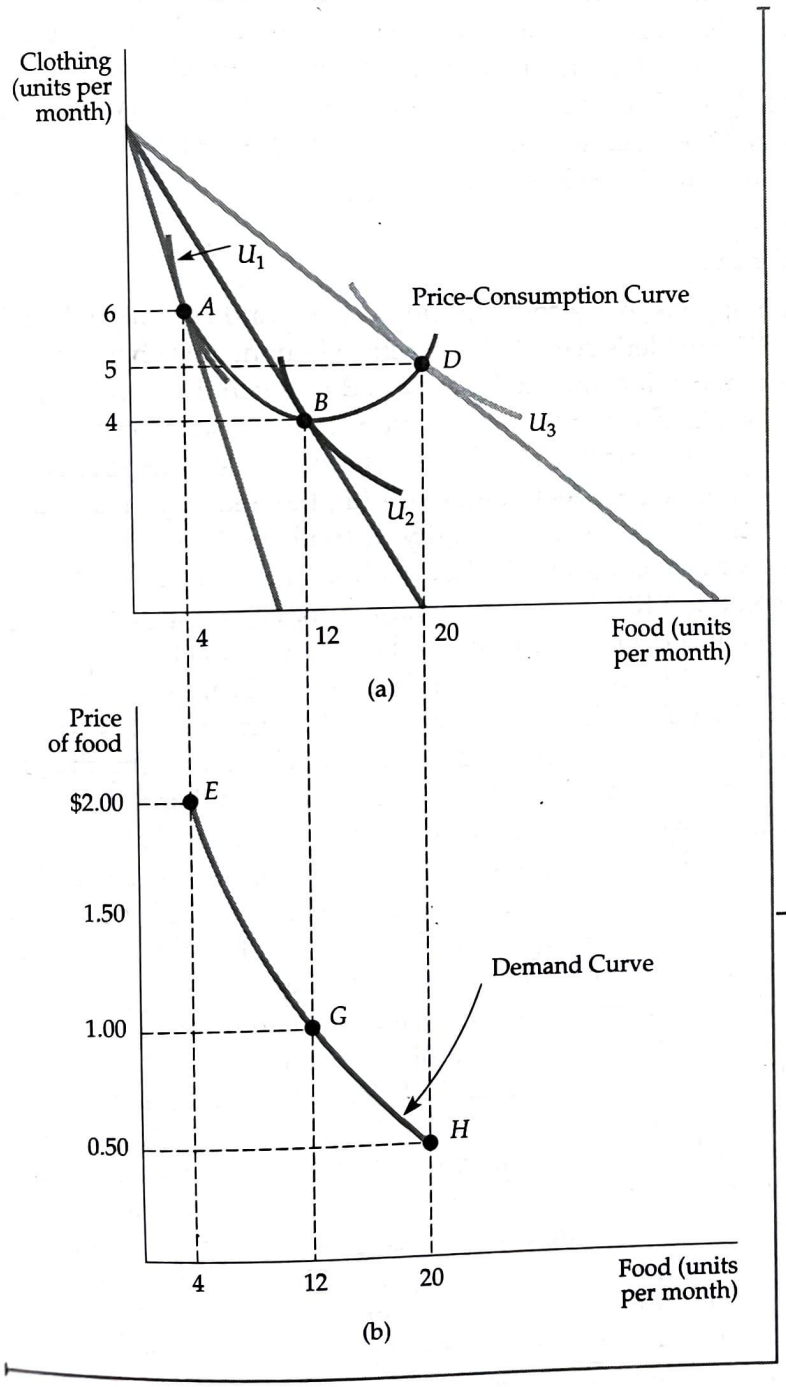

FIGURE 4.1
EFFECT OF PRICE CHANGES

A reduction in the price of food, with income and the price of clothing fixed, causes this consumer to choose a different market basket. In **(a)**, the baskets that maximize utility for various prices of food (point *A*, $2; *B*, $1; *D*, $0.50) trace out the price-consumption curve. Part **(b)** gives the demand curve, which relates the price of food to the quantity demanded. (Points *E*, *G*, and *H* correspond to points *A*, *B*, and *D*, respectively).

In §3.1, we introduce the marginal rate of substitution (MRS) as a measure of the maximum amount of one good that the consumer is willing to give up in order to obtain one unit of another good.

2. ***At every point on the demand curve, the consumer is maximizing utility by satisfying the condition that the marginal rate of substitution (MRS) of food for clothing equals the ratio of the prices of food and clothing.*** As the price of food falls, the price ratio and the MRS also fall. In Figure 4.1 (b), the price ratio falls from 1 ($2/$2) at E (because the curve U_1 is tangent to a budget line with a slope of -1 at A) to 1/2 ($1/$2) at G, to 1/4 ($0.50/$2) at H. Because the consumer is maximizing utility, the MRS of food for clothing decreases as we move down the demand curve. This phenomenon makes intuitive sense because it tells us that the relative value of food falls as the consumer buys more of it.

The fact that the MRS varies along the individual's demand curve tells us something about how consumers value the consumption of a good or service. Suppose we were to ask a consumer how much she would be willing to pay for an additional unit of food when she is currently consuming 4 units. Point E on the demand curve in Figure 4.1 (b) provides the answer: $2. Why? As we pointed out above, because the MRS of food for clothing is 1 at E, one additional unit of food is worth one additional unit of clothing. But a unit of clothing costs $2, which is, therefore, the value (or marginal benefit) obtained by consuming an additional unit of food. Thus, as we move down the demand curve in Figure 4.1 (b), the MRS falls. Likewise, the value that the consumer places on an additional unit of food falls from $2 to $1 to $0.50.

Income Changes

We have seen what happens to the consumption of food and clothing when the price of food changes. Now let's see what happens when income changes.

The effects of a change in income can be analyzed in much the same way as a price change. Figure 4.2 (a) shows the consumption choices that a consumer will make when allocating a fixed income to food and clothing when the price of food is $1 and the price of clothing $2. As in Figure 4.1 (a), the quantity of clothing is measured on the vertical axis and the quantity of food on the horizontal axis. Income changes appear as changes in the budget line in Figure 4.2 (a). Initially, the consumer's income is $10. The utility-maximizing consumption choice is then at A, at which point she buys 4 units of food and 3 units of clothing.

This choice of 4 units of food is also shown in Figure 4.2 (b) as E on demand curve D_1. Demand curve D_1 is the curve that would be traced out if we held income fixed at $10 *but varied the price of food.* Because we are holding the price of food constant, we will observe only a single point E on this demand curve.

What happens if the consumer's income is increased to $20? Her budget line then shifts outward parallel to the original budget line, allowing her to attain the utility level associated with indifference curve U_2. Her optimal consumption choice is now at B, where she buys 10 units of food and 5 units of clothing. In Figure 4.2 (b) her consumption of food is shown as G on demand curve D_2. D_2 is the demand curve that would be traced out if we held income fixed at $20 but varied the price of food. Finally, note that if her income increases to $30, she chooses D, with a market basket containing 16 units of food (and 7 units of clothing), represented by H in Figure 4.2 (b).

ncome-consumption
rve Curve tracing the utility-
aximizing combinations of two
oods as a consumer's income
anges.

We could go on to include all possible changes in income. In Figure 4.2 (a), the **income-consumption curve** traces out the utility-maximizing combinations of food and clothing associated with every income level. The income-consumption curve in Figure 4.2 slopes upward because the consumption of both food and clothing increases as income increases. Previously, we saw that a change in the price of a good corresponds to *a movement along a demand curve.* Here, the situation is different. Because each demand curve is

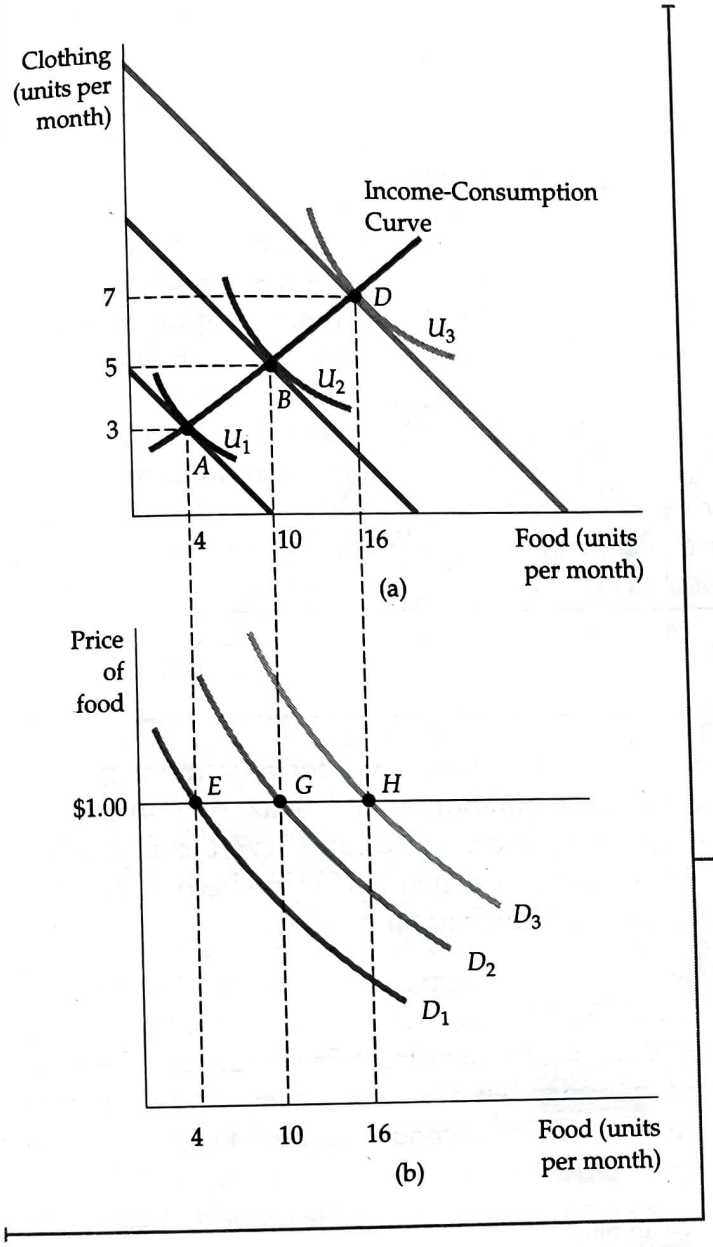

FIGURE 4.2
EFFECT OF INCOME CHANGES

An increase in income, with the prices of all goods fixed, causes consumers to alter their choice of market baskets. In part **(a)**, the baskets that maximize consumer satisfaction for various incomes (point *A*, $10; *B*, $20; *D*, $30) trace out the income-consumption curve. The shift to the right of the demand curve in response to the increases in income is shown in part **(b)**. (Points *E*, *G*, and *H* correspond to points *A*, *B*, and *D*, respectively.)

measured for a particular level of income, any change in income must lead to *a shift in the demand curve itself.* Thus *A* on the income-consumption curve in Figure 4.2 (a) corresponds to *E* on demand curve D_1 in Figure 4.2 (b); *B* corresponds to *G* on a different demand curve D_2. The upward-sloping income-consumption curve implies that an increase in income causes a shift to the right in the demand curve—in this case from D_1 to D_2 to D_3.

Normal versus Inferior Goods

When the income-consumption curve has a positive slope, the quantity demanded increases with income. As a result, the income elasticity of demand is positive. The greater the shifts to the right of the demand curve, the larger the income elasticity. In this case, the goods are described as *normal*: Consumers want to buy more of them as their incomes increase.

In some cases, the quantity demanded *falls* as income increases; the income elasticity of demand is negative. We then describe the good as *inferior.* The term *inferior* simply means that consumption falls when income rises. Hamburger, for example, is inferior for some people: As their income increases, they buy less hamburger and more steak.

In §2.4, we explain that the income elasticity of demand is the percentage change in the quantity demanded resulting from a 1-percent increase in income.

If the price of a movie ticket rises, we would expect individuals to rent more videos, because movie tickets and videos are substitutes. Similarly, two goods are *complements* if an increase in the price of one good leads to a decrease in the quantity demanded of the other. If the price of gasoline goes up, causing gasoline consumption to fall, we would expect the consumption of motor oil to fall as well, because gasoline and motor oil are used together. Two goods are *independent* if a change in the price of one good has no effect on the quantity demanded of the other.

One way to see whether two goods are complements or substitutes is to examine the price-consumption curve. Look again at Figure 4.1 (page 137). Note that in the downward-sloping portion of the price-consumption curve, food and clothing are substitutes: The lower price of food leads to a lower consumption of clothing (perhaps because as food expenditures increase, less income is available to spend on clothing). Similarly, food and clothing are complements in the upward-sloping portion of the curve: The lower price of food leads to higher clothing consumption (perhaps because the consumer eats more meals at restaurants and must be suitably dressed).

The fact that goods can be complements or substitutes suggests that when studying the effects of price changes in one market, it may be important to look at the consequences in related markets. (Interrelationships among markets are discussed in more detail in Chapter 16.) Determining whether two goods are complements, substitutes, or independent goods is ultimately an empirical question. To answer the question, we need to look at the ways in which the demand for the first good shifts (if at all) in response to a change in the price of the second. This question is more difficult than it sounds because lots of things are likely to be changing at the same time that the price of the first good changes. In fact, Section 4.6 of this chapter is devoted to examining ways to distinguish empirically among the many possible explanations for a change in the demand for the second good. First, however, it will be useful to undertake a basic theoretical exercise. In the next section, we delve into the ways in which a change in the price of a good can affect consumer demand.

4.2 Income and Substitution Effects

A fall in the price of a good has two effects:

1. ***Consumers will tend to buy more of the good that has become cheaper and less of those goods that are now relatively more expensive.*** This response to a change in the relative prices of goods is called the *substitution effect.*
2. ***Because one of the goods is now cheaper, consumers enjoy an increase in real purchasing power.*** They are better off because they can buy the same amount of the good for less money, and thus have money left over for additional purchases. The change in demand resulting from this change in real purchasing power is called the *income effect.*

Normally, these two effects occur simultaneously, but it will be useful to distinguish between them for purposes of analysis. The specifics are illustrated in Figure 4.6, where the initial budget line is RS and there are two goods, food and clothing. Here, the consumer maximizes utility by choosing the market basket at A, thereby obtaining the level of utility associated with the indifference curve U_1.

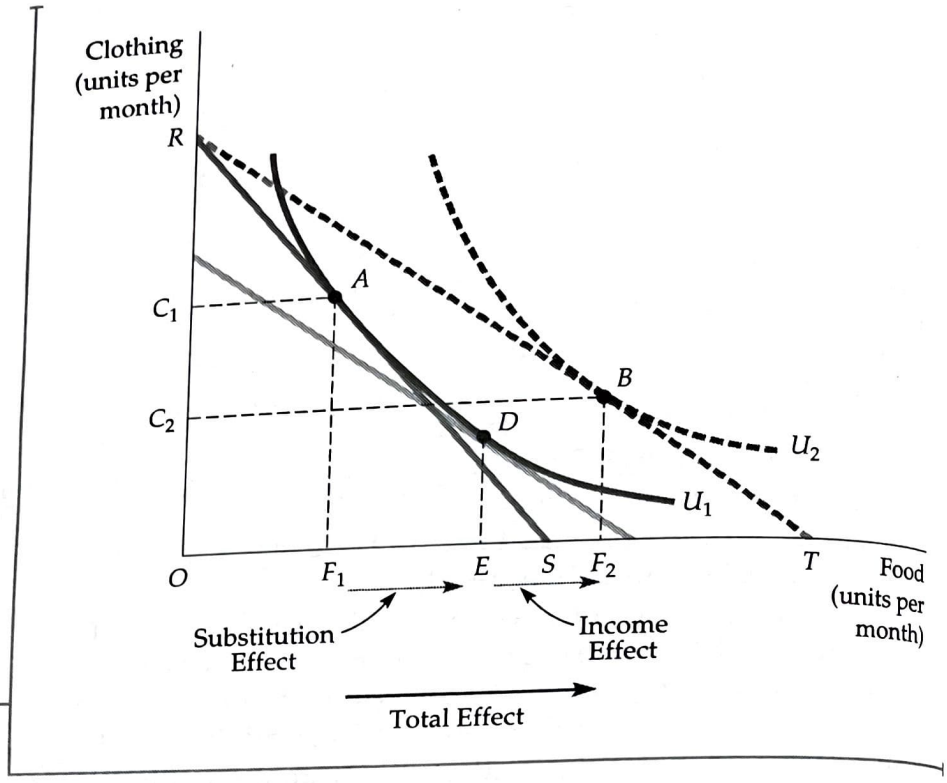

FIGURE 4.6
INCOME AND SUBSTITUTION EFFECTS: NORMAL GOOD

A decrease in the price of food has both an income effect and a substitution effect. The consumer is initially at *A*, on budget line *RS*. When the price of food falls, consumption increases by F_1F_2 as the consumer moves to *B*. The substitution effect F_1E (associated with a move from *A* to *D*) changes the relative prices of food and clothing but keeps real income (satisfaction) constant. The income effect EF_2 (associated with a move from *D* to *B*) keeps relative prices constant but increases purchasing power. Food is a normal good because the income effect EF_2 is positive.

Now let's see what happens if the price of food falls, causing the budget line to rotate outward to line *RT*. The consumer now chooses the market basket at *B* on indifference curve U_2. Because market basket *B* was chosen even though market basket *A* was feasible, we know (from our discussion of revealed preference in Section 3.4) that *B* is preferred to *A*. Thus, the reduction in the price of food allows the consumer to increase her level of satisfaction—her purchasing power has increased. The total change in the consumption of food caused by the lower price is given by F_1F_2. Initially, the consumer purchased OF_1 units of food, but after the price change, food consumption has increased to OF_2. Line segment F_1F_2, therefore, represents the increase in desired food purchases.

In §3.4, we show how information about consumer preferences is revealed by consumption choices made.

Substitution Effect

• **substitution effect**
Change in consumption of a good associated with a change in its price, with the level of utility held constant.

The drop in price has both a substitution effect and an income effect. The **substitution effect** is *the change in food consumption associated with a change in the price of food, with the level of utility held constant*. The substitution effect captures the change in food consumption that occurs as a result of the price change that makes food relatively cheaper than clothing. This substitution is marked by a movement along an indifference curve. In Figure 4.6, the substitution effect can be obtained by drawing a budget line which is parallel to the new budget line *RT* (reflecting the lower relative price of food), but which is just tangent to the original indifference curve U_1 (holding the level of satisfaction constant). The new, lower imaginary budget line reflects the fact that nominal income was reduced in order to accomplish our conceptual goal of isolating the substitution effect. Given that budget line, the consumer chooses market basket *D* and consumes *OE* units of food. The line segment F_1E thus represents the substitution effect.

Figure 4.6 makes it clear that when the price of food declines, the substitution effect always leads to an increase in the quantity of food demanded. The explanation lies in the fourth assumption about consumer preferences discussed in

Section 3.1—namely, that indifference curves are convex. Thus, with the convex indifference curves shown in the figure, the point that maximizes satisfaction on the new imaginary budget line parallel to RT must lie below and to the right of the original point of tangency.

Income Effect

Now let's consider the **income effect:** *the change in food consumption brought about by the increase in purchasing power, with relative prices held constant.* In Figure 4.6, we can see the income effect by moving from the imaginary budget line that passes through point D to the parallel budget line, RT, which passes through B. The consumer chooses market basket B on indifference curve U_2 (because the lower price of food has increased her level of utility). The increase in food consumption from OE to OF_2 is the measure of the income effect, which is positive, because food is a *normal good* (consumers will buy more of it as their incomes increase). Because it reflects a movement from one indifference curve to another, the income effect measures the change in the consumer's purchasing power.

• **income effect** Change in consumption of a good resulting from an increase in purchasing power, with relative prices held constant.

We have seen in Figure 4.6 that the total effect of a change in price is given theoretically by the sum of the substitution effect and the income effect:

$$\text{Total Effect}\,(F_1F_2) = \text{Substitution Effect}\,(F_1E) + \text{Income Effect}\,(EF_2)$$

Recall that the direction of the substitution effect is always the same: A decline in price leads to an increase in consumption of the good. However, the income effect can move demand in either direction, depending on whether the good is normal or inferior.

A good is **inferior** when the income effect is negative: As income rises, consumption falls. Figure 4.7 shows income and substitution effects for an inferior good. The negative income effect is measured by line segment EF_2. Even with

• **inferior good** A good that has a negative income effect.

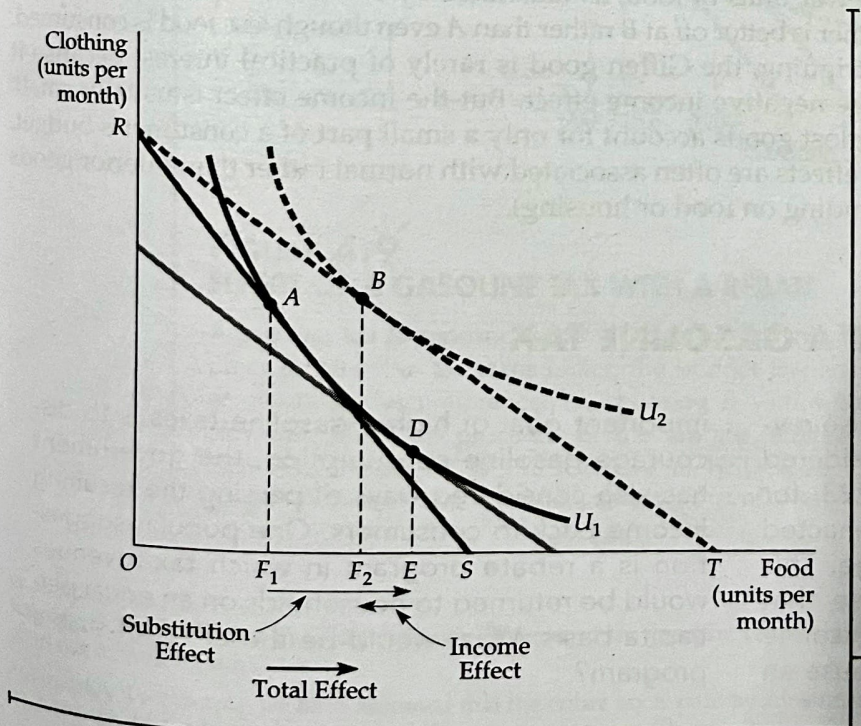

FIGURE 4.7
INCOME AND SUBSTITUTION EFFECTS: INFERIOR GOOD

The consumer is initially at A on budget line RS. With a decrease in the price of food, the consumer moves to B. The resulting change in food purchased can be broken down into a substitution effect, F_1E (associated with a move from A to D), and an income effect, EF_2 (associated with a move from D to B). In this case, food is an inferior good because the income effect is negative. However, because the substitution effect exceeds the income effect, the decrease in the price of food leads to an increase in the quantity of food demanded.

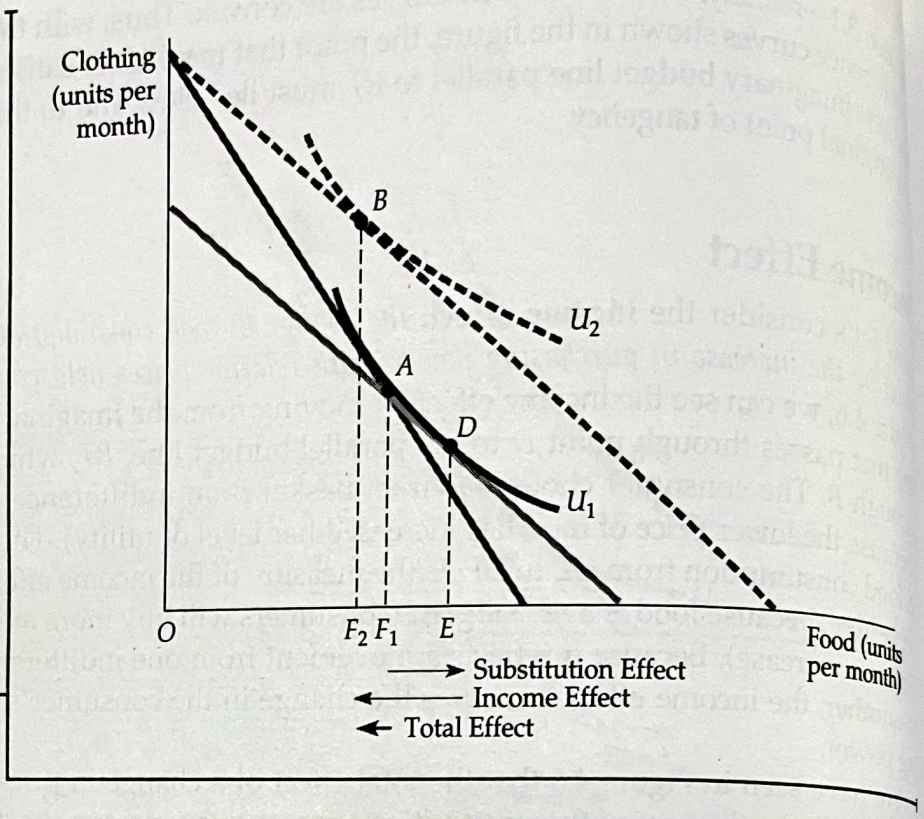

FIGURE 4.8
UPWARD-SLOPING DEMAND CURVE: THE GIFFEN GOOD

When food is an inferior good, and when the income effect is large enough to dominate the substitution effect, the demand curve will be upward-sloping. The consumer is initially at point *A*, but, after the price of food falls, moves to *B* and consumes less food. Because the income effect EF_2 is larger than the substitution effect F_1E, the decrease in the price of food leads to a lower quantity of food demanded.

inferior goods, the income effect is rarely large enough to outweigh the substitution effect. As a result, when the price of an inferior good falls, its consumption almost always increases.

A Special Case: The Giffen Good

• **Giffen good** Good whose demand curve slopes upward because the (negative) income effect is larger than the substitution effect.

Theoretically, the income effect may be large enough to cause the demand curve for a good to slope upward. We call such a good a **Giffen good,** and Figure 4.8 shows its income and substitution effects. Initially, the consumer is at *A*, consuming relatively little clothing and much food. Now the price of food declines. The decline in the price of food frees enough income so that the consumer desires to buy more clothing and fewer units of food, as illustrated by *B*. Revealed preference tells us that the consumer is better off at *B* rather than *A* even though less food is consumed.

Though intriguing, the Giffen good is rarely of practical interest because it requires a large negative income effect. But the income effect is usually small: Individually, most goods account for only a small part of a consumer's budget. Large income effects are often associated with normal rather than inferior goods (e.g., total spending on food or housing).

EXAMPLE 4.2 THE EFFECTS OF A GASOLINE TAX

In part to conserve energy and in part to raise revenues, the U.S. government has often considered increasing the federal gasoline tax. In 1993, for example, a modest 4.3 cent increase was enacted as part of a larger budget-reform package. This increase was much less than the increase that would have been necessary to put U.S. gasoline prices on a par with those in Europe. Because an important goal of higher gasoline taxes is to discourage gasoline consumption, the government has also considered ways of passing the resulting income back to consumers. One popular suggestion is a rebate program in which tax revenues would be returned to households on an equal per-capita basis. What would be the effect of such a program?