Household Behavior and Consumer Choice

6

CHAPTER OUTLINE

Every day people in a market economy make decisions. Some of those decisions involve the products they plan to buy: Should you buy a Coke for lunch, a bottle of tea, or just drink water? Should you purchase a laptop computer or stick with your old desktop? Some decisions are about the labor market: Should you continue your schooling or go to work instead? If you do start working, how much should you work? Should you work more when you get a raise or just take it easy? Many decisions involve a time element. If you decide to buy a laptop, you may have to use your savings or borrow money. That will leave you with fewer choices about what you can buy in the future. On the other hand, the laptop itself is an investment.

To many people, the decisions listed in the previous paragraph seem very different from one another. As you will see in this chapter, however, from an economics perspective, these decisions have a great deal in common. In this chapter, we will develop a set of principles that can be used to understand decisions in the product market and the labor market—decisions for today and for the future.

As you read this chapter, you might want to think about some of the following questions, questions that you will be able to answer by chapter's end. Baseball, even when it was more popular than it is today, was never played year-round. Indeed, no professional sport has a year-round season. Is this break necessary to give the athletes a rest, or is there something about household choice that helps explain this pattern? When the price of gasoline rises, people drive less, but one study suggests that they also switch from brand name products to generics or store brands.[1] Why might this be? Studying household choice will help you understand many decisions that underpin our market economy.

A constant theme that will run through the analysis is the idea of *constrained choice*. That is, the decisions that we make we make under constraints that exist in the marketplace. Household consumption choices are constrained by income, wealth, and existing prices. Household decisions about labor supply and job choice are clearly constrained by the availability of jobs. This was on everyone's minds when the number of unemployed reached 15 million and the unemployment rate hovered at about 10 percent during the 2009–2010 period. In addition, the choices we make in the workforce are constrained by the existing structure of market wages.

Household Choice in Output Markets

Every household must make three basic decisions:

1. How much of each product, or output, to demand
2. How much labor to supply
3. How much to spend today and how much to save for the future

[1] Dora Gicheva, Justine Hastings, and Sofia Villas-Boas, "Revisiting the Income Effect: Gasoline Prices and Grocery Purchases," NBER Working Paper No. 13614, October 2007.

As we begin our look at demand in output markets, you must keep in mind that the choices underlying the demand curve are only part of the larger household choice problem. Closely related decisions about how much to work and how much to save are equally important and must be made simultaneously with output–demand decisions.

The Determinants of Household Demand

As we saw in Chapter 3, several factors influence the quantity of a given good or service demanded by a single household:

- The price of the product
- The income available to the household
- The household's amount of accumulated wealth
- The prices of other products available to the household
- The household's tastes and preferences
- The household's expectations about future income, wealth, and prices

Recall that demand schedules and demand curves express the relationship between quantity demanded and price, *ceteris paribus*. A change in price leads to a movement along a demand curve. Changes in income, in other prices, or in preferences shift demand curves to the left or right. We refer to these shifts as "changes in demand." However, the interrelationship among these variables is more complex than the simple exposition in Chapter 3 might lead you to believe.

The Budget Constraint

Before we examine the household choice process, we need to discuss what choices are open and not open to households. If you look carefully at the list of items that influence household demand, you will see that the first four actually define the set of options available. Information on household income and wealth, together with information on product prices, makes it possible to distinguish those combinations of goods and services that are affordable from those that are not.[2]

budget constraint The limits imposed on household choices by income, wealth, and product prices.

Income, wealth, and prices thus define what we call household **budget constraint**. The budget constraint facing any household results primarily from limits imposed externally by one or more markets. In competitive markets, for example, households cannot control prices; they must buy goods and services at market-determined prices. A household has some control over its income: Its members can choose whether to work, and they can sometimes decide how many hours to work and how many jobs to hold. However, constraints exist in the labor market too. The amount that household members are paid is limited by current market wage rates. Whether they can get a job is determined by the availability of jobs.

Although income does depend, at least in part, on the choices that households make, we will treat it as a given for now. Later in this chapter, we will relax this assumption and explore labor supply choices in more detail.

The income, wealth, and price constraints that surround choice are best illustrated with an example. Consider Barbara, a recent graduate of a midwestern university who takes a job as an account manager at a public relations firm. Let us assume that she receives a salary of $1,000 per month (after taxes) and that she has no wealth and no credit. Barbara's monthly expenditures are limited to her flow of income. Table 6.1 summarizes some of the choices open to her.

TABLE 6.1 Possible Budget Choices of a Person Earning $1,000 per Month after Taxes

Option	Monthly Rent	Food	Other Expenses	Total	Available?
A	$ 400	$250	$350	$1,000	Yes
B	600	200	200	1,000	Yes
C	700	150	150	1,000	Yes
D	1,000	100	100	1,200	No

[2] Remember that we drew the distinction between income and wealth in Chapter 3. *Income* is the sum of household earnings within a given period; it is a flow variable. In contrast, *wealth* is a stock variable; it is what a household owns minus what it owes at a given point in time.

A careful search of the housing market reveals four vacant apartments. The least expensive is a one-room studio with a small kitchenette that rents for $400 per month, including utilities (option A). If she lived there, Barbara could afford to spend $250 per month on food and still have $350 left over for other things.

About four blocks away is a one-bedroom apartment with wall-to-wall carpeting and a larger kitchen. It has more space, but the rent is $600, including utilities. If Barbara took this apartment, she might cut her food expenditures by $50 per month and have only $200 per month left for everything else.

In the same building as the one-bedroom apartment is an identical unit on the top floor of the building with a balcony facing west toward the sunset. The balcony and view add $100 to the monthly rent. To live there, Barbara would be left with only $300 to split between food and other expenses.

Just because she was curious, Barbara looked at a town house in the suburbs that was renting for $1,000 per month. Obviously, unless she could get along without eating or doing anything else that cost money, she could not afford it. The combination of the town house and any amount of food is outside her budget constraint.

Notice that we have used the information that we have on income and prices to identify different combinations of housing, food, and other items that are available to a single-person household with an income of $1,000 per month. We have said nothing about the process of choosing. Instead, we have carved out what is called a **choice set** or **opportunity set**, the set of options that is defined and limited by Barbara's budget constraint.

choice set *or* opportunity set The set of options that is defined and limited by a budget constraint.

Preferences, Tastes, Trade-Offs, and Opportunity Cost So far, we have identified only the combinations of goods and services that are and are not available to Barbara. Within the constraints imposed by limited incomes and fixed prices, however, households are free to choose what they will and will not buy. Their ultimate choices are governed by their individual preferences and tastes.

It will help you to think of the household choice process as a process of allocating income over a large number of available goods and services. Final demand of a household for any single product is just one of many outcomes that result from the decision-making process. Think, for example, of a demand curve that shows a household's reaction to a drop in the price of air travel. During certain periods when people travel less frequently, special fares flood the market and many people decide to take trips that they otherwise would not have taken. However, if you live in Florida and decide to spend $400 to visit your mother in Nashville, you cannot spend that $400 on new clothes, dinners at restaurants, or a new set of tires.

A change in the price of a single good changes the constraints within which households choose, and this may change the entire allocation of income. Demand for some goods and services may rise while demand for others falls. A complicated set of trade-offs lies behind the shape and position of a household demand curve for a single good. Whenever a household makes a choice, it is weighing the good or service that it chooses against all the other things that the same money could buy.

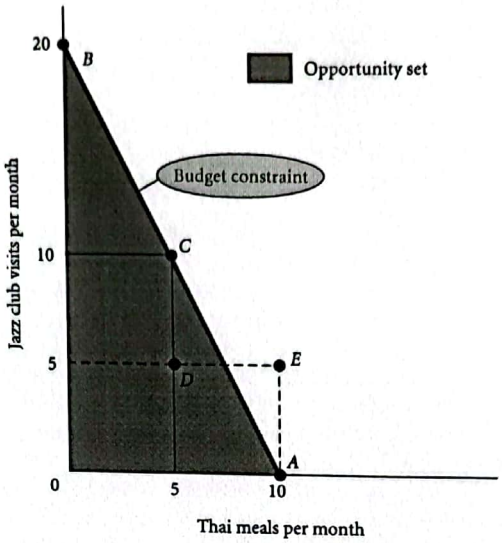
Consider again our young account manager and her options listed in Table 6.1. If she hates to cook, likes to eat at restaurants, and goes out three nights a week, she will probably trade off some housing for dinners out and money to spend on clothes and other things. She will probably rent the studio for $400. She may, however, love to spend long evenings at home reading, listening to classical music, and sipping tea while watching the sunset. In that case, she will probably trade off some restaurant meals, evenings out, and travel expenses for the added comfort of the larger apartment with the balcony and the view. As long as a household faces a limited budget—and all households ultimately do—the real cost of any good or service is the value of the other goods and services that could have been purchased with the same amount of money. The real cost of a good or service is its opportunity cost, and opportunity cost is determined by relative prices.

The Budget Constraint More Formally Ann and Tom are struggling graduate students in economics at the University of Virginia. Their tuition is paid by graduate fellowships. They live as resident advisers in a first-year dormitory, in return for which they receive an apartment and meals. Their fellowships also give them $200 each month to cover all their other expenses. To simplify things, let us assume that Ann and Tom spend their money on only two things: meals at a local Thai restaurant and nights at a local jazz club, The Hungry Ear. Thai meals go for a fixed price of $20 per couple. Two tickets to the jazz club, including espresso, are $10.

As Figure 6.1 shows, we can graphically depict the choices that are available to our dynamic duo. The axes measure the *quantities* of the two goods that Ann and Tom buy. The horizontal axis

▸ FIGURE 6.1 Budget Constraint and Opportunity Set for Ann and Tom

A budget constraint separates those combinations of goods and services that are available, given limited income, from those that are not. The available combinations make up the opportunity set.



measures the number of Thai meals consumed per month, and the vertical axis measures the number of trips to The Hungry Ear. (Note that price is not on the vertical axis here.) Every point in the space between the axes represents some combination of Thai meals and nights at the jazz club. The question is this: Which of these points can Ann and Tom purchase with a fixed budget of $200 per month? That is, which points are in the opportunity set and which are not?

One possibility is that the students in the dorm are driving Ann and Tom crazy. The two grad students want to avoid the dining hall at all costs. Thus, they might decide to spend all their money on Thai food and none of it on jazz. This decision would be represented by a point *on* the horizontal axis because all the points on that axis are points at which Ann and Tom make no jazz club visits. How many meals can Ann and Tom afford? The answer is simple: When income is $200 and the price of Thai meals is $20, they can afford $200 ÷ $20 = 10 meals. This point is labeled *A* on the budget constraint in Figure 6.1.

Another possibility is that general exams are coming up and Ann and Tom decide to relax at The Hungry Ear to relieve stress. Suppose they choose to spend all their money on jazz and none of it on Thai food. This decision would be represented by a point *on* the vertical axis because all the points on this axis are points at which Ann and Tom eat no Thai meals. How many jazz club visits can they afford? Again, the answer is simple: With an income of $200 and with the price of jazz/espresso at $10, they can go to The Hungry Ear $200 ÷ $10 = 20 times. This is the point labeled *B* in Figure 6.1. The line connecting points *A* and *B* is Ann and Tom's budget constraint.

What about all the points between *A* and *B* on the budget constraint? Starting from point *B*, suppose Ann and Tom give up trips to the jazz club to buy more Thai meals. Each additional Thai meal "costs" two trips to The Hungry Ear. The opportunity cost of a Thai meal is two jazz club trips.

Point *C* on the budget constraint represents a compromise. Here Ann and Tom go to the club 10 times and eat at the Thai restaurant 5 times. To verify that point *C* is on the budget constraint, price it out: 10 jazz club trips cost a total of $10 × 10 = $100, and 5 Thai meals cost a total of $20 × 5 = $100. The total is $100 + $100 = $200.

The budget constraint divides all the points between the axes into two groups: those that can be purchased for $200 or less (the opportunity set) and those that are unavailable. Point *D* on the diagram costs less than $200; point *E* costs more than $200. (Verify that this is true.) The opportunity set is the shaded area in Figure 6.1.

Clearly, both prices and incomes affect the size of a household's opportunity set. If a price or a set of prices falls but income stays the same, the opportunity set gets bigger and the household is better off. If we define **real income** as the set of opportunities to purchase real goods and services, "real income" will have gone up in this case even if the household's money income has not. A consumer's opportunity set expands as the result of a price decrease. On the other hand, when money income increases and prices go up even more, we say that the household's "real income" has fallen.

real income The set of opportunities to purchase real goods and services available to a household as determined by prices and money income.

The concept of real income is very important in macroeconomics, which is concerned with measuring real output and the price level.

The Equation of the Budget Constraint

Yet another way to look at the budget constraint is to write the consumer's problem as an equation. In the previous example, the constraint is that total expenditure on Thai meals plus total expenditure on jazz club visits must be less than or equal to Ann and Tom's income. Total expenditure on Thai meals is equal to the *price* of Thai meals times the number, or *quantity*, of meals consumed. Total expenditure on jazz club visits is equal to the *price* of a visit times the number, or *quantity*, of visits. That is,

$$\$20 \times \text{Thai meals} + \$10 \times \text{jazz visits} \leq \$200$$

If we let X represent the number of Thai meals and we let Y represent the number of jazz club visits and we assume that Ann and Tom spend their entire income on either X or Y, this can be written as follows:

$$20X + 10Y = \$200$$

This is the equation of the budget constraint—the line connecting points A and B in Figure 6.1. Notice that when Ann and Tom spend nothing at the jazz club, $Y = 0$. When you plug $Y = 0$ into the equation of the budget constraint, $20X = 200$ and $X = 10$. Since X is the number of Thai meals, Ann and Tom eat Thai food 10 times. Similarly, when $X = 0$, you can solve for Y, which equals 20. When Ann and Tom eat no Thai food, they can go to the jazz club 20 times.

In general, the budget constraint can be written

$$P_X X + P_Y Y = I,$$

where P_X = the price of X, X = the quantity of X consumed, P_Y = the price of Y, Y = the quantity of Y consumed, and I = household income.[3]

Budget Constraints Change When Prices Rise or Fall Now suppose the Thai restaurant is offering two-for-one certificates good during the month of November. In effect, this means that the price of Thai meals drops to \$10 for Ann and Tom. How would the budget constraint in Figure 6.1 change?

First, point B would not change. If Ann and Tom spend all their money on jazz, the price of Thai meals is irrelevant. Ann and Tom can still afford only 20 trips to the jazz club. What has changed is point A, which moves to point A' in Figure 6.2. At the new lower price of \$10, if Ann and Tom spent all their money on Thai meals, they could buy twice as many, \$200 ÷ \$10 = 20. The budget constraint *swivels*, as shown in Figure 6.2.

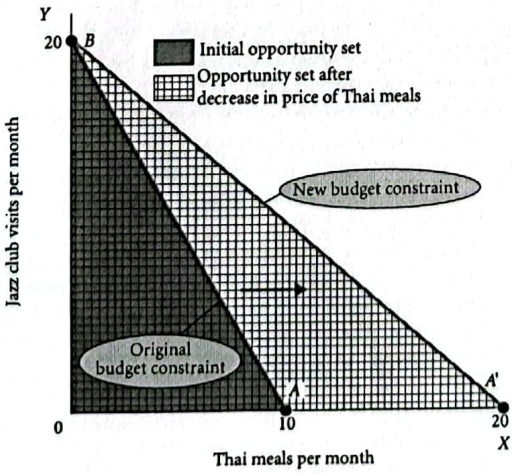


FIGURE 6.2 The Effect of a Decrease in Price on Ann and Tom's Budget Constraint
When the price of a good decreases, the budget constraint swivels to the right, increasing the opportunities available and expanding choice.

[3] You can calculate the slope of the budget constraint as $-P_X/P_Y$, the ratio of the price of X to the price of Y. This gives the trade-off that consumers face. In the example, $-P_X/P_Y = -2$, meaning to get another Thai meal, Ann and Tom must give up two trips to the jazz club.

The new, flatter budget constraint reflects the new trade-off between Thai meals and Hungry Ear visits. Now after the price of Thai meals drops to $10, the opportunity cost of a Thai meal is only one jazz club visit. The opportunity set has expanded because at the lower price, more combinations of Thai meals and jazz are available.

Figure 6.2 thus illustrates a very important point. When the price of a single good changes, more than just the quantity demanded of that good may be affected. The household now faces an entirely different problem with regard to choice—the opportunity set has expanded. At the same income of $200, the new lower price means that Ann and Tom might choose more Thai meals, more jazz club visits, or more of both. They are clearly better off. The budget constraint is defined by income, wealth, and prices. Within those limits, households are free to choose, and the household's ultimate choice depends on its own likes and dislikes.

Notice that when the price of meals falls to $10, the equation of the budget constraint changes to $10X + 10Y = 200$, which is the equation of the line connecting points A' and B in Figure 6.2.

The range of goods and services available in a modern society is as vast as consumer tastes are variable, and this makes any generalization about the household choice process risky. Nonetheless, the theory of household behavior that follows is an attempt to derive some logical propositions about the way households make choices.

The Basis of Choice: Utility

Somehow, from the millions of things that are available, each of us manages to sort out a set of goods and services to buy. When we make our choices, we make specific judgments about the relative worth of things that are very different.

utility The satisfaction a product yields.

During the nineteenth century, the weighing of values was formalized into a concept called utility. Whether one item is preferable to another depends on how much **utility**, or satisfaction, it yields relative to its alternatives. How do we decide on the relative worth of a new puppy or a stereo? a trip to the mountains or a weekend in New York City? working or not working? As we make our choices, we are effectively weighing the utilities we would receive from all the possible available goods.

Certain problems are implicit in the concept of utility. First, it is impossible to measure utility. Second, it is impossible to compare the utilities of different people—that is, we cannot say whether person A or person B has a higher level of utility. Despite these problems, however, the idea of utility helps us better understand the process of choice.

Diminishing Marginal Utility

In making their choices, most people spread their incomes over many different kinds of goods. One reason people prefer variety is that consuming more and more of any one good reduces the marginal, or extra, satisfaction they get from further consumption of the same good. Formally, **marginal utility (*MU*)** is the additional satisfaction gained by the consumption or use of *one more* unit of a good or service.

marginal utility (*MU*) The additional satisfaction gained by the consumption or use of *one more* unit of a good or service.

It is important to distinguish marginal utility from total utility. **Total utility** is the total amount of satisfaction obtained from consumption of a good or service. Marginal utility comes only from the *last unit* consumed; total utility comes from *all* units consumed.

total utility The total amount of satisfaction obtained from consumption of a good or service.

Suppose you live next to a store that sells homemade ice cream that you are crazy about. Even though you get a great deal of pleasure from eating ice cream, you do not spend your entire income on it. The first cone of the day tastes heavenly. The second is merely delicious. The third is still very good, but it is clear that the glow is fading. Why? The answer is because the more of any one good we consume in a given period, the less satisfaction, or utility, we get from each additional, or marginal, unit. In 1890, Alfred Marshall called this "familiar and fundamental tendency of human nature" the **law of diminishing marginal utility.**

law of diminishing marginal utility The more of any one good consumed in a given period, the less satisfaction (utility) generated by consuming each additional (marginal) unit of the same good.

Consider this simple example. Frank loves country music, and a country band is playing seven nights a week at a club near his house. Table 6.2 shows how the utility he derives from the band might change as he goes to the club more frequently. The first visit generates 12 "utils," or units of utility. When Frank goes back another night, he enjoys it, but not quite as much as the first night. The second night by itself yields 10 additional utils. *Marginal utility* is 10, while the *total utility* derived from two nights at the club is 22. Three nights per week at the club provide 28 total utils; the marginal utility of the third night is 6 because total utility rose from 22 to 28. Figure 6.3 graphs total and marginal utility using the data in Table 6.2. Total utility increases up

TABLE 6.2 Total Utility and Marginal Utility of Trips to the Club Per Week

Trips to Club	Total Utility	Marginal Utility
1	12	12
2	22	10
3	28	6
4	32	4
5	34	2
6	34	0

through Frank's fifth trip to the club but levels off on the sixth night. Marginal utility, which has declined from the beginning, is now at zero.

Diminishing marginal utility helps explain the reason most sports have limited seasons. Even rabid fans have had enough baseball by late October. Given this fact, it would be hard to sell out ball games for a year-round season. While diminishing marginal utility is a simple and intuitive idea, it has great power in helping us understand the economic world.

Allocating Income to Maximize Utility

How many times in one week would Frank go to the club to hear his favorite band? The answer depends on three things: Frank's income, the price of admission to the club, and the alternatives available. If the price of admission was zero and no alternatives existed, he would probably go to

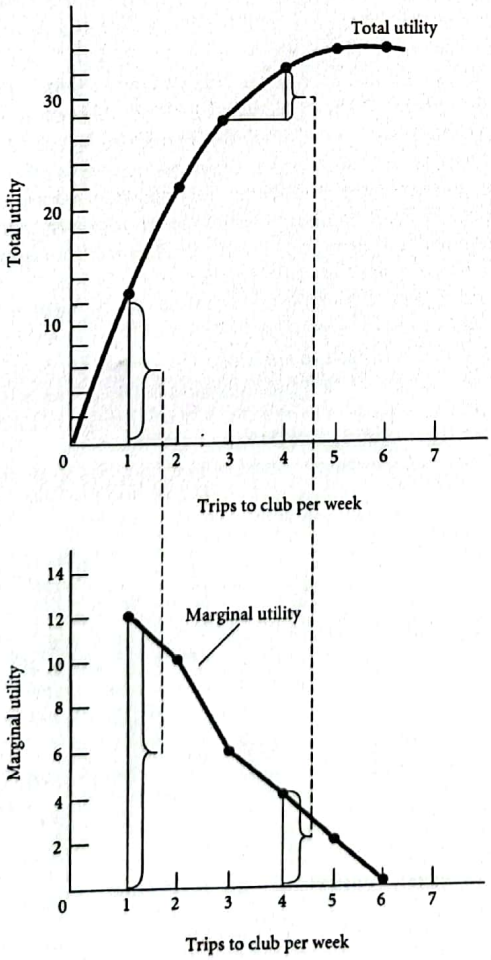


FIGURE 6.3 Graphs of Frank's Total and Marginal Utility
Marginal utility is the additional utility gained by consuming one additional unit of a commodity—in this case, trips to the club. When marginal utility is zero, total utility stops rising.

the club five nights a week. (Remember, the sixth night does not increase his utility, so why should he bother to go?) However, Frank is also a basketball fan. His city has many good high school and college teams, and he can go to games six nights a week if he so chooses.

Let us say for now that admission to both the country music club and the basketball games is free—that is, there is no price/income constraint. There is a time constraint, however, because there are only seven nights in a week. Table 6.3 lists Frank's total and marginal utilities from attending basketball games and going to country music clubs. From column 3 of the table, we can conclude that on the first night, Frank will go to a basketball game. The game is worth far more to him (21 utils) than a trip to the club (12 utils).

On the second night, Frank's decision is not so easy. Because he has been to one basketball game this week, the second game is worth less (12 utils as compared to 21 for the first basketball game). In fact, because it is worth the same as a first trip to the club, he is indifferent as to whether he goes to the game or the club. So he splits the next two nights: One night he sees ball game number two (12 utils); the other night he spends at the club (12 utils). At this point, Frank has been to two ball games and has spent one night at the club. Where will Frank go on evening four? He will go to the club again because the marginal utility from a second trip to the club (10 utils) is greater than the marginal utility from attending a third basketball game (9 utils).

Frank is splitting his time between the two activities to maximize total utility. At each successive step, he chooses the activity that yields the most marginal utility. Continuing with this logic, you can see that spending three nights at the club and four nights watching basketball produces total utility of 76 utils each week (28 plus 48). No other combination of games and club trips can produce as much utility.

So far, the only cost of a night of listening to country music is a forgone basketball game and the only cost of a basketball game is a forgone night of country music. Now let us suppose that it costs $3 to get into the club and $6 to go to a basketball game. Suppose further that after paying rent and taking care of other expenses, Frank has only $21 left to spend on entertainment. Typically, consumers allocate limited incomes, or budgets, over a large set of goods and services. Here we have a limited income ($21) being allocated between only two goods, but the principle is the same. Income ($21) and prices ($3 and $6) define Frank's budget constraint. Within that constraint, Frank chooses to maximize utility.

Because the two activities now cost different amounts, we need to find the *marginal utility per dollar* spent on each activity. If Frank is to spend his money on the combination of activities lying within his budget constraint that gives him the most total utility, each night he must choose the activity that gives him the *most utility per dollar spent.* As you can see from column 5 in Table 6.3, Frank gets 4 utils per dollar on the first night he goes to the club (12 utils ÷ $3 = 4 utils per dollar). On night two, he goes to a game and gets 3.5 utils per dollar (21 utils ÷ $6 = 3.5 utils per dollar). On night three, it is back to the club. Then what happens? When all is said and done—work this out for yourself—Frank ends up going to two games and spending three nights at the club. No other combination of activities that $21 will buy yields more utility.

TABLE 6.3 Allocation of Fixed Expenditure per Week Between Two Alternatives

(1) Trips to Club per Week	(2) Total Utility	(3) Marginal Utility (*MU*)	(4) Price (*P*)	(5) Marginal Utility per Dollar (*MU/P*)
1	12	12	$3.00	4.0
2	22	10	3.00	3.3
3	28	6	3.00	2.0
4	32	4	3.00	1.3
5	34	2	3.00	0.7
6	34	0	3.00	0

(1) Basketball Games per Week	(2) Total Utility	(3) Marginal Utility (*MU*)	(4) Price (*P*)	(5) Marginal Utility per Dollar (*MU/P*)
1	21	21	$6.00	3.5
2	33	12	6.00	2.0
3	42	9	6.00	1.5
4	48	6	6.00	1.0
5	51	3	6.00	0.5
6	51	0	6.00	0

The Utility-Maximizing Rule

In general, utility-maximizing consumers spread out their expenditures until the following condition holds:

$$\text{utility-maximizing rule: } \frac{MU_X}{P_X} = \frac{MU_Y}{P_Y} \text{ for all goods,}$$

where MU_X is the marginal utility derived from the last unit of X consumed, MU_Y is the marginal utility derived from the last unit of Y consumed, P_X is the price per unit of X, and P_Y is the price per unit of Y.

To see why this **utility-maximizing rule** is true, think for a moment about what would happen if it were *not* true. For example, suppose MU_X/P_X was greater than MU_Y/P_Y; that is, suppose a consumer purchased a bundle of goods so that the marginal utility from the last dollar spent on X was greater than the marginal utility from the last dollar spent on Y. This would mean that the consumer could increase his or her utility by spending a dollar less on Y and a dollar more on X. As the consumer shifts to buying more X and less Y, he or she runs into diminishing marginal utility. Buying more units of X *decreases* the marginal utility derived from consuming additional units of X. As a result, the marginal utility of another dollar spent on X falls. Now *less* is being spent on Y, and that means its marginal utility *increases*. This process continues until $MU_X/P_X = MU_Y/P_Y$. When this condition holds, there is no way for the consumer to increase his or her utility by changing the bundle of goods purchased.

utility-maximizing rule Equating the ratio of the marginal utility of a good to its price for all goods.

You can see how the utility-maximizing rule works in Frank's choice between country music and basketball. At each stage, Frank chooses the activity that gives him the most utility per dollar. If he goes to a game, the utility he will derive from the next game—marginal utility—falls. If he goes to the club, the utility he will derive from his next visit falls, and so on.

The principles we have been describing help us understand an old puzzle dating from the time of Plato and familiar to economists beginning with Adam Smith. Adam Smith wrote about it in 1776:

> The things which have the greatest value in use have frequently little or no value in exchange; and on the contrary, those which have the greatest value in exchange have frequently little or no value in use. Nothing is more useful than water: but it will purchase scarce anything; scarce anything can be had in exchange for it. A diamond, on the contrary, has scarce any value in use; but a very great quantity of other goods may frequently be had in exchange for it.[4]

Although diamonds have arguably more than "scarce any value in use" today (for example, they are used to cut glass), Smith's **diamond/water paradox** is still instructive, at least where water is concerned.

diamond/water paradox A paradox stating that (1) the things with the greatest value in use frequently have little or no value in exchange and (2) the things with the greatest value in exchange frequently have little or no value in use.

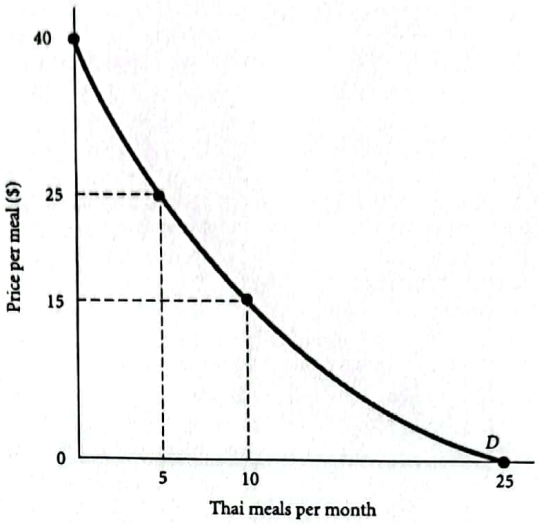
The low price of water owes much to the fact that it is in plentiful supply. Even at a price of zero, we do not consume an infinite amount of water. We consume up to the point where *marginal* utility drops to zero. The *marginal* value of water is zero. Each of us enjoys an enormous consumer surplus when we consume nearly free water. At a price of zero, consumer surplus is the entire area under the demand curve. We tend to take water for granted, but imagine what would happen to its price if there were not enough for everyone. It would command a high price indeed.

Diminishing Marginal Utility and Downward-Sloping Demand

The concept of diminishing marginal utility offers one reason people spread their incomes over a variety of goods and services instead of spending all income on one or two items. It also leads us to conclude that demand curves slope downward.

To see why this is so, let us return to our friends Ann and Tom, the struggling graduate students. Recall that they chose between meals at a Thai restaurant and trips to a jazz club. Now think about their demand curve for Thai meals, shown in Figure 6.4. When the price of a meal is $40, they decide not to buy any Thai meals. What they are really deciding is that the utility gained

[4] Adam Smith, *The Wealth of Nations*, Modern Library Edition (New York: Random House, 1937), p. 28 (1st ed. 1776). The cheapness of water is referred to by Plato in *Euthydemus*, 304 B.C.



▶ FIGURE 6.4 Diminishing Marginal Utility and Downward-Sloping Demand

At a price of $40, the utility gained from even the first Thai meal is not worth the price. However, a lower price of $25 lures Ann and Tom into the Thai restaurant 5 times a month. (The utility from the sixth meal is not worth $25.) If the price is $15, Ann and Tom will eat Thai meals 10 times a month—until the marginal utility of a Thai meal drops below the utility they could gain from spending $15 on other goods. At 25 meals a month, they cannot tolerate the thought of another Thai meal even if it is free.

from even that first scrumptious meal each month is not worth the utility that would come from the other things that $40 can buy.

Now consider a price of $25. At this price, Ann and Tom buy five Thai meals. The first, second, third, fourth, and fifth meals each generate enough utility to justify the price. Tom and Ann "reveal" this by buying five meals. After the fifth meal, the utility gained from the next meal is not worth $25.

Ultimately, every demand curve hits the quantity (horizontal) axis as a result of diminishing marginal utility—in other words, demand curves slope downward. How many times will Ann and Tom go to the Thai restaurant if meals are free? Twenty-five times is the answer; and after 25 times a month, they are so sick of Thai food that they will not eat any more even if it is free. That is, marginal utility—the utility gained from the last meal—has dropped to zero. If you think this is unrealistic, ask yourself how much water you drank today.

Income and Substitution Effects

Although the idea of utility is a helpful way of thinking about the choice process, there is an explanation for downward-sloping demand curves that does not rely on the concept of utility or the assumption of diminishing marginal utility. This explanation centers on income and substitution effects.

Keeping in mind that consumers face constrained choices, consider the probable response of a household to a decline in the price of some heavily used product, *ceteris paribus*. How might a household currently consuming many goods be likely to respond to a fall in the price of one of those goods if the household's income, its preferences, and all other prices remained unchanged? The household would face a new budget constraint, and its final choice of all goods and services might change. A decline in the price of gasoline, for example, may affect not only how much gasoline you purchase but also what kind of car you buy, when and how much you travel, where you go, and (not so directly) how many movies you see this month and how many projects around the house you get done.

The Income Effect

Price changes affect households in two ways. First, if we assume that households confine their choices to products that improve their well-being, then a decline in the price of any product, *ceteris paribus*, will make the household unequivocally better off. In other words, if a household continues to buy the same amount of every good and service after the price decrease, it will have income

left over. That extra income may be spent on the product whose price has declined, hereafter called good *X*, or on other products. The change in consumption of *X* due to this improvement in well-being is called the *income effect of a price change.*

Suppose you live in Florida and four times a year you fly to Nashville to visit your mother. Suppose further that last year a round-trip ticket to Nashville cost $400. Thus, you spend a total of $1,600 per year on trips to visit Mom. This year, however, increased competition among the airlines has led one airline to offer round-trip tickets to Nashville for $200. Assuming the price remains $200 all year, you can now fly home the same number of times and you will have spent $800 less for airline tickets than you did last year. Now that you are better off, you have additional opportunities. You can fly home a fifth time this year, leaving $600 ($800 − $200) to spend on other things, or you can fly home the same number of times (four) and spend the extra $800 on other things. When the price of something we buy falls, we are *better off.* When the price of something we buy rises, we are *worse off.*

Look back at Figure 6.2 on p. 125. When the price of Thai meals fell, the opportunity set facing Tom and Ann expanded—they were able to afford more Thai meals, more jazz club trips, or more of both. They were unequivocally better off because of the price decline. In a sense, their "real" income was higher.

Now recall from Chapter 3 the definition of a *normal good.* When income rises, demand for normal goods increases. Most goods are normal goods. Because of the price decline, Tom and Ann can afford to buy more. If Thai food is a normal good, a decline in the price of Thai food should lead to an increase in the quantity demanded of Thai food.

The Substitution Effect

The fact that a price decline leaves households better off is only part of the story. When the price of a product falls, that product also becomes *relatively* cheaper. That is, it becomes more attractive relative to potential substitutes. A fall in the price of product *X* might cause a household to shift its purchasing pattern away from substitutes toward *X*. This shift is called the *substitution effect of a price change.*

Earlier we made the point that the "real" cost or price of a good is what one must sacrifice to consume it. This opportunity cost is determined by relative prices. To see why this is so, consider again the choice that you face when a round-trip ticket to Nashville costs $400. Each trip that you take requires a sacrifice of $400 worth of other goods and services. When the price drops to $200, the opportunity cost of a ticket has dropped by $200. In other words, after the price decline, you have to sacrifice only $200 (instead of $400) worth of other goods and services to visit Mom.

To clarify the distinction between the income and substitution, imagine how you would be affected if two things happened to you at the same time. First, the price of round-trip air travel between Florida and Nashville drops from $400 to $200. Second, your income is reduced by $800. You are now faced with new relative prices, but—assuming you flew home four times last year—you are no better off now than you were before the price of a ticket declined. The decrease in the price of air travel has offset your decrease in income.

You are still likely to take more trips home. Why? The opportunity cost of a trip home is now lower, *ceteris paribus,* assuming no change in the prices of other goods and services. A trip to Nashville now requires a sacrifice of only $200 worth of other goods and services, not the $400 worth that it did before. Thus, you will substitute away from other goods toward trips to see your mother.

Everything works in the opposite direction when a price rises, *ceteris paribus.* A price increase makes households worse off. If income and other prices do not change, spending the same amount of money buys less and households will be forced to buy less. This is the income effect. In addition, when the price of a product rises, that item becomes more expensive relative to potential substitutes and the household is likely to substitute other goods for it. This is the substitution effect.

What do the income and substitution effects tell us about the demand curve? Both the income and the substitution effects imply a negative relationship between price and quantity demanded—in other words, downward-sloping demand. When the price of something falls, *ceteris paribus,* we are better off and we are likely to buy more of that good and other goods (income effect). Because lower price also means "less expensive relative to substitutes," we are likely to buy more of the good (substitution effect). When the price of something rises, we are