5

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Demand and Consumer Choice

Learning Objectives

By the end of the chapter, you will be able to:

- Discuss the importance of utility in explaining consumer choice.
- Derive an individual demand curve for a good based on the equation for maximizing total utility and the principle of diminishing marginal utility.
- Apply utility theory to explanations of consumer behavior.
- Identify and describe the concept of consumer surplus.
- Describe how advertising attempts to increase utility.

Introduction

Consider this. . . Where you work, where you shop, and most certainly in the student union there is a vending area. In that area there are most likely coin-operated machines that supply everything from soft drinks, to snacks, to newspapers. If you think about it, you will notice a significant difference between the machines that dispense soft drinks or snacks and those that dispense newspapers. After you have deposited the requisite amount of money, the food and drink machines provide a single can or package through a chute of some sort, while the newspaper machine allows you to open a door and take one paper from a stack. Why? Are readers more honest than eaters?

This chapter will help provide an answer to this puzzle. To do this we will look at what determines consumer choice. Since individual demand curves form the bedrock of microeconomic analysis, we need to consider the factors that underlie them.

The first approach economists took in examining consumer demand, the classical approach, involved the concept of measurable utility. We will use this approach to examine some problems and suggest some applications for demand analysis. The second approach to consumer demand, indifference curve analysis, is discussed in an appendix to this chapter.

5.1 Choice, Value, and Utility Theory

The idea that households and firms must make choices because of scarcity is the fundamental notion of economic analysis. We now want to expand on that analysis to consider why consumers behave in the way they do. Why does a person demand a certain good or service? An obvious answer is that the good or service is expected to satisfy some need or desire of the consumer.

Economists' view of consumer choice is based on five assumptions about the psychology of consumer behavior:

1. Consumers (or households) must make choices because they have limited income and are forced to choose which of their many wants to satisfy.
2. Consumers make rational choices when they make these consumption decisions. That is, they weigh costs and benefits and make the decision that gives them the most satisfaction.
3. Consumers make these choices with imperfect information. In other words, they don't know (with certainty) all the attributes of the goods they are choosing to consume.
4. As increasing amounts of a good are consumed, the additional satisfaction gained from an additional unit becomes smaller.
5. Many goods have qualities that make them satisfactory substitutes for other goods.

All of these statements may seem simple and obvious, but they will enable us to draw some powerful conclusions about the nature of demand.

Economics in Action: Crunch Into Utility Theory

Using the classic potato chip, this video bites straight into utility theory, to help us understand the total amount of satisfaction one gains from a product despite the diminishing marginal utility. Check out the following clip provided by MindBites at http://www.youtube.com/watch?v=PZJR9EemtjQ.

The History of Utility Theory: The Diamond-Water Paradox

In the early development of economic theory, economists often posed questions that they then debated. One of the popular debate topics was what determined value. Adam Smith wrote that value could mean either "value in use" or "value in exchange." He posed (in 1776) what became known as the diamond-water paradox:

> The things that 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 value in use. Nothing is more valuable 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. (Smith)

The **diamond-water paradox** was the problem that classical economists used when they argued that value in use could not determine price (value in exchange). Diamonds, although less useful than water, are more expensive than water. The dialogue about the diamond-water paradox went on for a long time. Many famous mathematicians, economists, and philosophers took part in the debate. The confusion over the diamond-water paradox arose in part over disagreement as to what the term *useful* meant. In the 1870s, William Stanley Jevons, Carl Menger, and Leon Walras, all writing separately, solved the paradox by developing a theory of value in which demand and utility came to the forefront. Their solution played a major role in developing the theory of consumer demand.

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The diamond-water paradox argues that value in use cannot determine price. Diamonds, for example, are arguably less useful than water but are more expensive than water.

Another part of the debate underlying the diamond-water paradox was an argument over whether value (or price) was determined by supply or demand. In a famous analogy, Alfred Marshall, the great British economist, said that you could no more say whether supply or demand determined value than you could say which

blade of a pair of scissors did the cutting. That is, value (or price) is determined by the interaction of supply and demand.

We'll consider the influence of demand on value first and leave supply for later chapters. Demand theorists use the notion of utility. If a consumer wants a good or service, then that good or service has utility for that person. **Utility** is the satisfaction a consumer receives from consuming a good or service. The same good may have a great deal of utility for one person and none or very little for some other person. Like beauty, utility is in the eye (or mind) of the beholder.

Total Utility and Marginal Utility

A good unit for the measurement of utility, like the pound or gallon or mile, does not exist. Since utility is unique to the individual, however, an arbitrary (and imaginary) unit called the **util** can be employed. As long as no attempt is made to compare the number of utils of different people, this is a satisfactory measuring device. Such comparisons between people are inappropriate because the number of utils is a subjective measure of a certain individual's satisfaction and as such is not subject to meaningful comparisons. (Some people prefer the beach to the mountains!)

A relationship that expresses a person's desire to consume differing amounts of a good is called a **utility function**. For example, suppose you try to construct your utility function for a certain brand of soft drink. First, choose a convenient time period, such as a day. Then, for one unit (one can) of Coke per day, assign an arbitrary number of utils, say 20. (You can choose any number at all: 1, or 1,000, or 47 1/2.) Ask yourself, if I get 20 utils from one can, how many would I get if I consumed two cans per day? Suppose, after much reflection, you say 38. Ask yourself the same question about three cans per day, four, five, six, and so on. You use these figures to construct a utility schedule, as shown in Table 5.1.

Table 5.1: Utility schedule for Coke

Cans of Coke per day	Total utility (utils)	Marginal utility (utils)
1	20	20
2	38	18
3	54	16
4	67	13
5	77	10
6	84	7
7	88	4
8	89	1
9	87	−2
10	82	−5

Marginal utility (*MU*) is the amount of utility that one more or one less unit consumed adds to or subtracts from total utility. It is the change in satisfaction provided by one more or one less unit of consumption. The formula for marginal utility is

$$\text{MU} = \frac{\text{change in total utility}}{\text{change in quantity consumed}}$$

In Table 5.1, the marginal utility is determined by calculating how much each additional can of Coke adds to total utility. For example, the first can of Coke adds 20 utils to total utility. The fourth can of Coke adds 13 utils to total utility. Marginal utility is found by subtracting the total utility of consuming three Cokes from the total utility of consuming that number plus one ($67 - 54 = 13$).

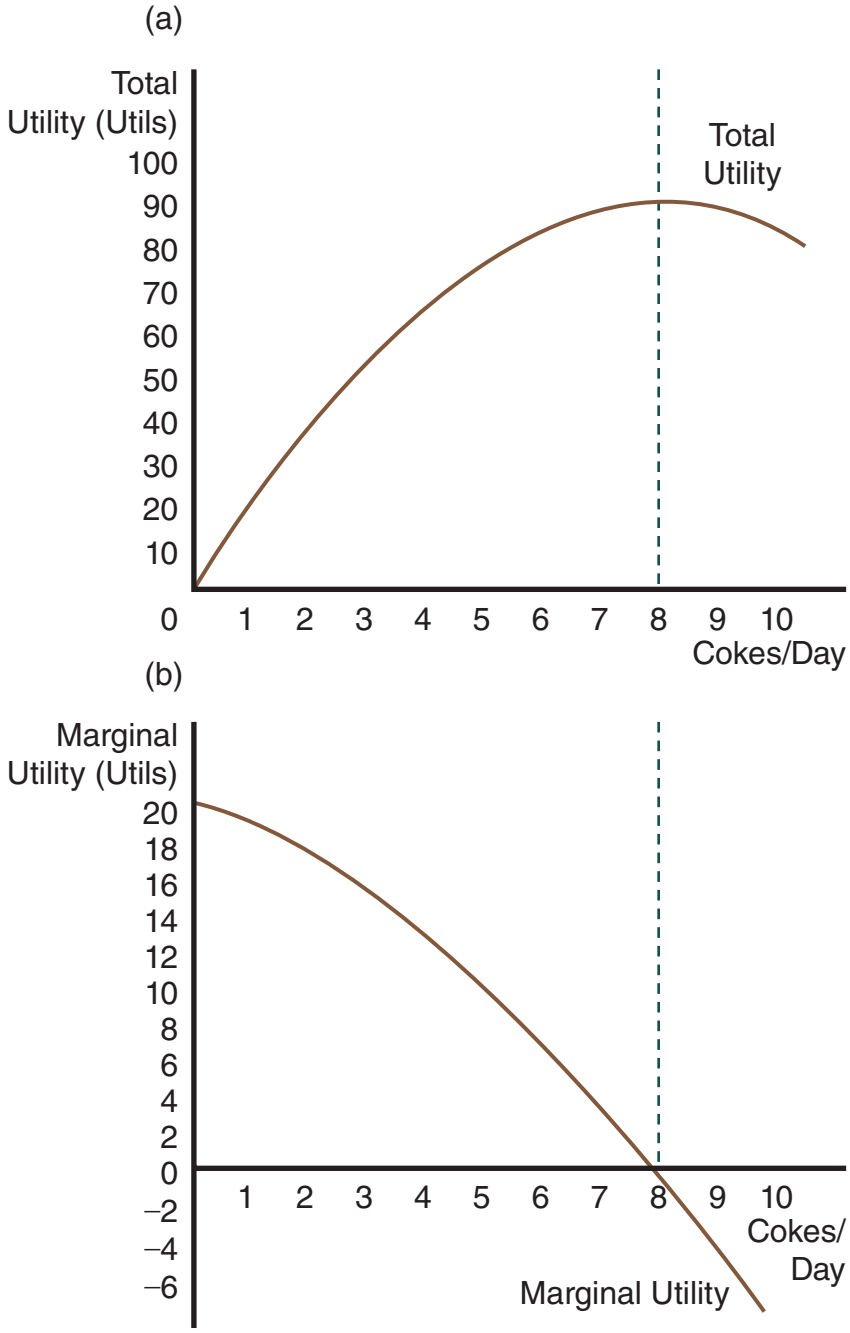
Principle of Diminishing Marginal Utility

The important feature of the schedule shown in Table 5.1 is that, although the total utility becomes larger the more you consume per day (up to a point), the increases to total utility from each additional unit consumed become smaller. The fact that additional, or marginal, utility declines as consumption increases is called diminishing marginal utility.

The **principle of diminishing marginal utility** states that the greater the level of consumption of a particular good in a given time period, the lower the marginal utility of an additional unit. As you consume more units of a good, the later units yield less of an addition to total utility than the preceding units did. For instance, the seventh Coke is expected to provide less additional pleasure than the sixth Coke. This principle is reflected in Table 5.1. Marginal utility falls from 7 utils for the sixth Coke to 4 utils for the seventh.

Figure 5.1(a) shows the total utility curve plotted from Table 5.1. Figure 5.1(b) shows the marginal utility curve that corresponds to the table. Note that when the total utility curve reaches its maximum, marginal utility is zero. Thereafter each additional unit contributes a negative marginal utility; thus, total utility will be decreased. In Table 5.1, total utility reaches a maximum at eight Cokes per day because the ninth Coke has a negative marginal utility.

Figure 5.1: Total and marginal utility



Total utility increases as consumption increases to a certain level—in this case 8 Cokes per day—and then it declines. When total utility is increasing, marginal utility is declining, illustrating the principle of diminishing marginal utility. At the point where total utility begins to decline, marginal utility becomes negative.

5.2 Utility and Consumer Behavior

The concepts of utility and price can be combined to show how consumers make choices in the marketplace. Consumers are confronted with a range of items and also a range of prices. A consumer may not necessarily choose based solely on which item has the greatest utility; price and the consumer's income are also important factors. In other words, consumers don't always buy their first choice. You may prefer a Porsche to a Chevrolet but decide to purchase the Chevrolet. The explanation for this behavior lies in the relationship between price and utility.

Suppose, for example, you are considering purchasing a six-pack of soft drinks. You are presented with the three possibilities shown in Table 5.2. Coke is your first choice because to you it yields the most utility. But the relevant question is not which soft drink has the most utility, but rather which has the most utility *per dollar*. Therefore, you choose to buy a six-pack of Pepsi. This choice implies that the extra satisfaction of Coke over Pepsi is not worth $0.75, but the extra satisfaction of Pepsi over RC Cola is worth $0.25. There are other things you can do with the extra $0.75. You are saying that $.75 spent on something other than Coke will yield more additional utils than the difference between the utility of Coke and the utility of Pepsi, but that $0.25 spent on other goods will not yield more utils than spending it on Pepsi instead of RC Cola.

Table 5.2: Hypothetical utility-per-dollar comparison

Choice	Marginal utility (utils)	Price (dollars)	Marginal utility per dollar (utils)
Coke	30.0	3.00	10
Pepsi	27.0	2.25	12
RC Cola	20.0	2.00	10

Thus, in deciding how to spend your money, you look at marginal utility per dollar rather than marginal utility alone. You do this because money is the common measure of what you have to give up. Dollars can be used to buy any available good. So for each dollar you spend, you want to choose the item with the highest utility per dollar. In doing so, you economize by getting the most satisfaction per dollar.

Maximizing Total Utility

The self-interest assumption maintains that individuals will act to maximize their total utility. To see how marginal utility and price influence how a consumer maximizes total utility, consider an example with only two goods, Coke and pizza. A unit of Coke costs $0.50 and a unit of pizza costs $1. The consumer's utility schedules for the two goods are presented in Table 5.3. The consumer has a given amount of income, called a budget constraint. A **budget constraint** is a given level of income that determines the maximum amount of goods that may be purchased by a consumer. Let's allow this consumer a budget constraint of $13, and see how that amount will be allocated between the two goods to achieve maximum utility.

Table 5.3: Utility for a consumer of two goods

Coke				Pizza			
Quantity per week (cans)	Marginal utility, *MU* (utils)	*MU*/*P* (*P* = $.50)	Total utility, *TU* (utils)	Quantity per week (pieces)	Marginal utility, *MU* (utils)	*MU*/*P* (*P* = $1.00)	Total utility, *TU* (utils)
1	15	30	15	1	32	32	32
2	14	28	29	2	31	31	63
3	13	26	42	3	28	28	91
4	12	24	54	4	24¾	24¾	115¾
5	11	22	65	5	20¼	20¼	136
6	10¾	21½	75¾	6	18	18	154
7	10¼	20½	86	7	17	17	171
8	10	20	96	8	16	16	187
9	9	18	105	9	14	14	201
10	8	16	113	10	12	12	213
11	7	14	120	11	11	11	224
12	6½	13	126½	12	9	9	233

The first dollar will be allocated to pizza because a dollar's worth of pizza (one piece) yields 32 utils of satisfaction compared with 29 utils for a dollar's worth of Coke (two cans). The next dollar will also be spent on pizza because it yields 31 utils, which is still greater than the first dollar's worth of Coke, the alternative purchase. In other words, the consumer buys two pieces of pizza before buying any Coke. The third dollar is spent on Coke because the 29 utils of satisfaction gained from purchasing two cans are greater than the 28 utils that are yielded by a third piece of pizza. The process continues until the entire income of $13 is spent. In maximizing total utility, the consumer will spend $5 on ten cans of Coke and $8 on eight pieces of pizza. This allocation produces 300 utils of satisfaction—the maximum total utility that can be purchased with $13 of income. You cannot find a different combination of Coke and pizza that will produce more satisfaction (try reducing Coke consumption by two cans and increasing pizza consumption by one piece, or vice versa).

The consumer's choices are based on a maximization rule that says that total utility is maximized when the last dollar spent on good *A* yields the same utility as the last dollar spent on good *B*. In algebraic form, total utility is maximized when

$$\frac{\text{Marginal utility of of good A}}{\text{Price of good A}} = \frac{\text{Marginal utility of of good B}}{\text{Price of good B}}$$

This can be written

$$\frac{MU_A}{P_A} = \frac{MU_B}{P_B}$$

The marginal utility of a can of Coke, when ten cans per week are consumed, is 8 utils, and the price of a can is \$0.50. Thus,

$$\frac{MU_{cola}}{P_{cola}} = \frac{8}{\$0.50} = 16 \text{ utils per dollar}$$

For pizza, at the optimum consumption rate, the marginal utility is 16, and the price is \$1. Thus,

$$\frac{MU_{pizza}}{P_{pizza}} = \frac{16}{\$1.00} = 16 \text{ utils per dollar}$$

Of course, individuals don't spend all their income on goods. Sometimes individuals hold money as they do any other commodity. Including money (symbolized by \$), the equation for maximization of utility is

$$\frac{MU_A}{P_A} = \frac{MU_B}{P_B} = \frac{MU_\$}{P_\$}$$

Utility maximization is the process by which a consumer adjusts consumption, given a budget constraint and a set of prices, in order to attain the highest total amount of satisfaction. The equation above is an expression for utility maximization. It includes all commodities, even money. This equation says that in order to maximize total utility, the marginal utilities per dollar of all goods consumed have to be equal and also have to equal the marginal utility of money. If this is not the case, a change in the consumption pattern can produce more satisfaction for a given budget constraint. This equation is just a formal way of saying that people allocate their income so as to yield the most satisfaction possible. When utility is being maximized, the additional satisfaction from any use of a dollar will equal the additional satisfaction from any other use of that dollar. When this is not the case, the consumer can reallocate personal income from one good to another and gain more satisfaction.

To see how a given consumption pattern can be adjusted to achieve maximum utility, look again at Table 5.3. Let's give Susan an income of \$9 and say that she uses it to buy \$3 worth of cola and \$6 worth of pizza. The expression

$$\frac{MU_{cola}}{P_{cola}} = \frac{MU_{pizza}}{P_{pizza}}$$

doesn't hold because

$$\frac{10\frac{3}{4}}{0.50} > \frac{18}{1}$$

Susan isn't maximizing her utility because the last dollar she spent on cola yielded more utils than the last dollar she spent on pizza. Susan should reallocate her consumption outlays.

By giving up a dollar's worth of pizza, she will lose 18 utils. But she will gain 20 1/4 utils by spending that dollar on more cola. Her total utility will thus rise by 2 (rounded off), and

$$\frac{10}{0.50} > \frac{20\frac{1}{4}}{1}$$

By purchasing eight cans of cola and five pieces of pizza, Susan is maximizing utility with a $9 budget constraint.

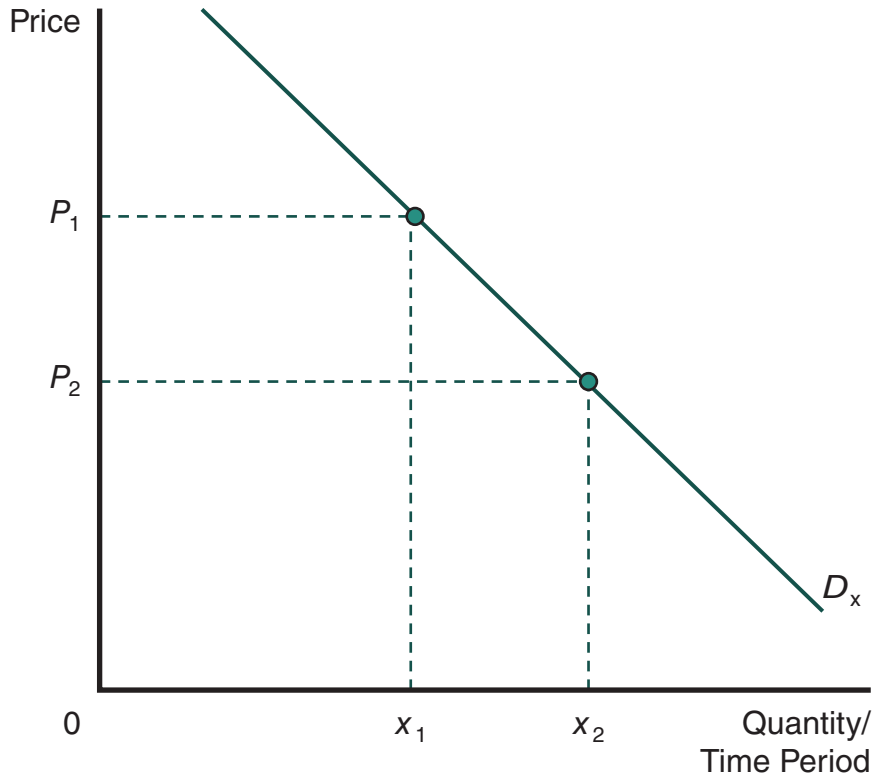
Marginal Utility and the Law of Demand

Utility theory makes it possible to derive a consumer's demand curve for a good (good x). Suppose there are only two goods, x and y. Remember, demand curves are drawn using the ceteris paribus assumption. That is, income, tastes, and the prices of all other goods (good y) are held constant. The consumer is initially in equilibrium, maximizing utility when

$$\frac{MU_x}{P_x} = \frac{MU_y}{P_y}$$

At this equilibrium, MU_{xl} corresponds to the consumption of x_1 units of good x in Figure 5.2. The price of x_1 units is represented by P_1 in Figure 5.2.

Figure 5.2: Demand curve for good *x*



When price falls from P_1 to P_2, the consumer's utility maximization is thrown out of equilibrium. Equilibrium will be restored if the consumer increases consumption to x_2.

Now suppose the price of good x falls to P_2. This change throws the expression out of equilibrium because the denominator on the left side is now smaller, making the left side of the expression larger.

To get back into equilibrium, the consumer has to lower the value of the left side of the expression and/or raise the value of the right side. How can this be done? If the individual consumes more of x, MU_x will decline because of the principle of diminishing marginal utility. As consumption moves to x_2 on Figure 5.2, the marginal utility of good x falls. Furthermore, consuming more of x will mean some reduction in the consumption of y. As consumption of y falls, MU_y rises.

Utility-maximizing behavior requires that when the price of good x falls (as from P_1 to P_2 in Figure 5.2), the consumer will increase consumption of x. Since this is necessary for utility maximization, it demonstrates that the demand curves of individuals must have a negative slope. That is, the lower the price of a good, the greater the quantity demanded.

Problems With Utility Theory

There are two major problems with a demand theory based on utility. The first problem is that some goods are not divisible. The second, more serious problem is that utility cannot be measured.

The theory works well enough to describe the consumption of certain kinds of goods, such as soft drinks or pizzas. When the good being consumed is an automobile or a home, however, it is difficult to talk about additional units because the purchase is "lumpy." It is very difficult to consume a part of a house or a part of a car, but it is common to consume part of a six-pack of cola.

This problem with utility theory is really not a major flaw. Consumers can still make adjustments with most lumpy purchases. Consider a house as an example. Suppose the consumer decides after the purchase that the house is too large and that other purchases would yield more marginal utility. Over time, expenditures on the house can be lowered by a lessening of routine maintenance so that more can be spent on the other goods that yield a higher marginal utility. Buying a smaller house, buying one at a less desirable location, and renting are also available alternatives.

A greater problem with utility theory is that it is impossible to measure utility. We have proceeded as if there were a way we could strap a meter to a consumer and exactly measure the utility expected from consuming one more unit, somewhat like measuring temperature or blood pressure. This is, of course, not possible. But before you reject utility theory as useless, remember that it is a theoretical tool. It really isn't that important for the theory of demand to be able to measure utility. The purpose of utility theory is to develop a better understanding of why and how quantity demanded will change when prices change.

Check Point: Utility Theory

- Assumptions of model
  - Individual has budget constraint
  - Individual gets utility from consumption
  - Marginal utility diminishes as consumption rises
- Maximization
  - Utility is maximized where the marginal utility per dollar spent on all goods (and the marginal utility of money) is equal
- Testable implications
  - Quantity demanded is inversely related to price, ceteris paribus
  - As the price of good rises, the demand for substitutes will increase, ceteris paribus
  - As income rises, the demand for normal goods will increase, ceteris paribus

Policy Focus: Progressive Income Taxation—Are Utility Functions Interdependent?

Many non-economists believe that money and income are subject to diminishing marginal utility. This idea is one of the main arguments (but certainly not the only one) for a progressive income tax. A progressive tax takes a larger percentage of dollars from those earning high incomes because for them a dollar's marginal utility is thought to be low. A smaller percentage of dollars is taken from those taxpayers earning lower incomes because for them a dollar's marginal utility is thought to be much higher. This argument assumes that it is possible to measure utility *and* to make interpersonal utility comparisons. Such comparisons are attempts to measure the utility of one individual relative to that of another. One way to avoid directly comparing utilities for different people is to assume that individuals all have the same utility schedule for given levels of income. With these two assumptions, proponents of the progressive income tax argue that society can maximize total utility by taking income away from high-income individuals who have lower marginal utilities of income and transferring it to low-income individuals who have higher marginal utilities of income.

Those who apply principles of individual utility maximization to a society as a whole are on very shaky ground, however. First, economists generally believe that interpersonal utility comparisons are not feasible. People are different. There is no way you can prove that an additional $100 of income gives less satisfaction to actress Angelina Jolie than to an unemployed auto worker. In fact, Ms. Jolie might get more satisfaction from being an expert consumer. It is impossible to prove that one individual gets more or less satisfaction from an increment to income than any other individual does.

A second and more fundamental problem with this analysis is that it assumes a diminishing marginal utility for income, or goods and services in general. This proposition cannot be proven. The principle of diminishing marginal utility, you will remember, states that the marginal utility of a *particular good* declines as consumption is increased. Increased income, however, represents an increase in the consumption of all goods. If wants are insatiable, there is no reason to believe that the principle of diminishing marginal utility holds for money or income. Even so, it is probably the case that most people think that income has diminishing marginal utility. What do you think?

There may be other arguments for progressive income taxes. Progressive income taxes may offset more regressive sales or property taxes to create an overall proportional tax system. In other cases, where income is very unequally distributed, the only substantial source of revenue ***(continued)***

Policy Focus: Progressive Income Taxation ***(continued)***

for the government to tap may be income taxes on the very wealthy. There may be subjective interpretations of what is equitable or fair that go way beyond the scope of economics. All economics has to say on the subject is that diminishing marginal utility is not a valid argument for progressive income taxation.

Income and Substitution Effects

The law of demand, which you studied in Chapter 3, states that as the price of a good or service declines, the quantity demanded increases, ceteris paribus. This law is true because of two effects that result from the price decline.

The first effect is called the **substitution effect**. When the price of a good (or service) falls, the good becomes less expensive relative to all other goods. As a result, consumers purchase more of it because it has become a better substitute for other goods as it has become cheaper. Steaks and ground beef provide a good example. As the price of steak falls, more people will switch from ground beef to steaks.

The second effect of a price decline is called the **income effect**. When the price of a good or service falls, ceteris paribus, the consumer's real income, or purchasing power, rises. That is, after buying the same amount as before (of the good for which price has fallen), the consumer has more income left over. With this higher real income, more of all normal goods will be consumed. Thus, the consumption of the good whose price declined also will increase (if it is a normal good). Income and substitution effects, along with diminishing marginal utility, explain why demand curves slope down from left to right.

5.3 Some Applications of Utility Theory

You have practiced and observed utility maximization in your own life even though you may not have thought of it in the formal language of economics. Suppose, for example, you are organizing the beer concession for a fund-raising event. There are two ways to run the concession: you can charge an admission fee to the event and then allow unlimited consumption, or you can charge a set price for each beer, say $2.50 per glass. Utility theory predicts different levels of consumption for these two alternatives and thus different requirements for planning the supply. In the first case, beer drinkers will consume beer until the marginal utility per glass is zero because the price per additional glass is zero. In the second case, beer drinkers will consume beer until the marginal utility per glass equals the marginal utility of $2.50. You can predict, then, that there will be more drunken, rowdy behavior if the party is financed by an admission charge.

If you don't agree with this analysis, reflect back on parties you have observed. Were the most rowdy ones the pay-as-you-go type or the admission type? With the growing awareness of alcohol abuse on campus, student organizations on some campuses have outlawed keg beer parties ("all you can drink") and required that they be replaced with

can-only beer parties (pay by the can). These campus rule-setters understand diminishing marginal utility whether they know it or not.

This example may seem insignificant because the consumption of beer isn't a very earth-shaking issue. Let's change the good from beer to medical services. If the government were to provide free national health care, what do you predict would happen to the consumption of these services? People would consume them until the marginal utility of the last unit is zero. This is exactly what tends to happen with a prepaid or tax-financed health care system.

Take, for example, the health care reform undertaken by the state of Massachusetts in 2006. Building on a long history of reform efforts, Massachusetts created near-universal health care for state residents. Fast forwarding six years later, what was the result? First, by 2010 the percentage of uninsured individuals in Massachusetts was just 6.3 percent, compared to the national average of 18.4 percent. (Henry J. Kaiser Family Foundation, 2012) Although the number of visits to hospitals and community health centers increased, as expected, these additional visits were primarily for adults receiving preventative care. According to a report by the Kaiser Family Foundation, "The number of unnecessary emergency room visits and hospital inpatient stays fell, suggesting improvements in health care delivery" (Henry J. Kaiser Family Foundation, 2012, 5). It is important to recognize that utility theory was able to predict an increase in the consumption of health care services, but not necessarily the type of services, which means that it only helps us to understand one aspect of such a policy change.

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Utility maximization is practiced and observed in everyday life. For example, utility theory can help predict what might happen if the government were to provide free national health care.

The Diamond-Water Paradox Explained

Adam Smith (and others) argued that utility (and thus demand) could not be a determinant of price because diamonds, while less useful than water, are more expensive than water. The paradox disappears if we distinguish between total utility and marginal utility. The total utility of water is high. However, since there is a great deal in existence and large quantities are consumed, its marginal utility is low. The total utility of diamonds, on the other hand, is relatively low. However, since diamonds are rare, their marginal utility is high. Price, then, is determined by marginal utility, not total utility. Economists say that marginal utility determines value in exchange (price) and that total utility determines value in use. Price, then, is related to scarcity through utility. If something has a low marginal utility at all quantities consumed, it will have a low price, regardless of how scarce it is. If something is relatively scarce and has a high marginal utility, it will be valuable and thus expensive.

Shopping for Bargains

Economists have used the concept of utility-maximizing behavior to analyze shopping behavior. The idea is that a buyer will search for bargains until the expected savings in value or utility equals the cost of continued searching.

Several predictions can be made from this theory. The first is that the larger the amount individuals expect to save, the longer they will continue to search. In other words, the bigger the item in terms of your budget, the more you will shop around. You will search longer for a good price on a car than for a good price on a loaf of bread. You might even buy bread at a convenience store, where you know the price is higher, to save some shopping time. The second prediction is that, in percentage terms, the variation in prices for bigger budget items should be smaller than the variation in prices for smaller budget items. The search process will drive high-price sellers of large items out of business or force them to reduce their prices. The third prediction is that where search costs are higher, price differences between sellers could be higher without driving the high-priced sellers out of business. Have you ever noticed that prices of gasoline are higher near freeways than in towns? Utility-maximizing theory can explain this phenomenon. Users of freeways are going somewhere, often in a hurry. Their search costs are high. They therefore do less shopping around and as a result pay higher prices.

The Internet plays an important role by drastically reducing search costs, which may also have an impact on prices and buying behavior. For example, according to a study by Chiou and Pate (2010), online auctions exhibit substantially less price dispersion than documented in physical stores and other online markets. They also find evidence of greater search by price-sensitive shoppers, which generally leads to lower prices for all goods on the Internet.

Economics in Action: Follow Your Cravings

The Khan Academy explains marginal utility through chocolate bars and fruits. As an individual craves more chocolate and fruit, she or he will consider the satisfaction of each product individually and against each other. When price gets involved, marginal utility helps the individual decide how to gain the most "bang for the buck." Find out for yourself at http://www.khanacademy.org/finance-economics/microeconomics/v/marginal-utility.

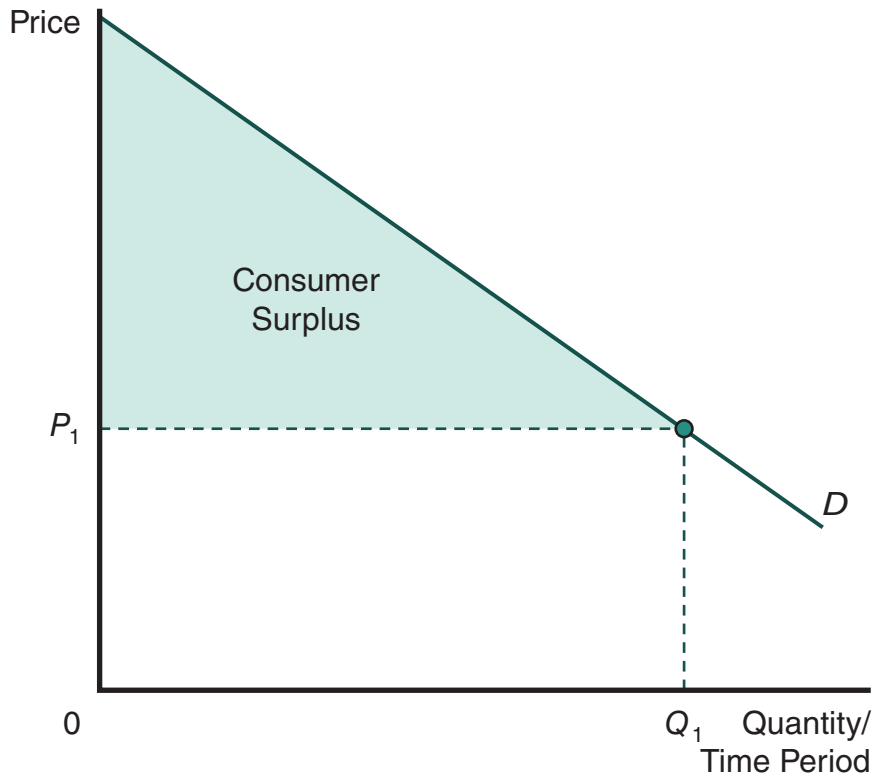
5.4 Consumer Surplus and Utility

Consumers often benefit in a market economy because they are able to purchase a good or service by sacrificing something that is worth less to them than the value of what they receive. **Consumer surplus** is the extra utility derived from a purchase that has a value to the consumer greater than the market price. Utility theory provides a measure of consumer surplus.

Consider the demand curve for a single consumer (or group of homogeneous consumers) in Figure 5.3. At price P_1 the individual will consume Q_1 units of the good. According to

the theory of utility-maximizing behavior, the marginal utility of the last unit purchased is equal to the price of the unit. This means that the marginal utility of each previous unit purchased was greater than price P_1. The consumer would have been willing to pay higher prices for those previous units, so at the market price of P_1 the consumer receives a bonus in terms of utility on all units but the last one. The total purchase is worth more to the consumer than the total amount (price times quantity) that is paid. This extra utility gained is called consumer surplus and is represented by the shaded area in Figure 5.3. Consumer surplus will be an important concept when we study monopoly. The next Global Outlook box describes an application of consumer surplus in international trade.

Figure 5.3: Consumer surplus



The consumer surplus is the shaded area above the price P_1 and below the demand curve.

5.5 Advertising, Marketing, and Demand

The theory developed in this chapter explains a great deal about demand and consumer equilibrium. It does not say anything about the role of advertising and marketing. Advertising and marketing are difficult topics for economists to deal with because economic analysis usually assumes that consumers are informed, rational utility maximizers who know their own tastes and preferences. Advertising and marketing are not, however, inconsistent with those basic assumptions.

Advertisers spend a great deal of time trying to alter consumers' tastes and perceptions. If enough tastes and perceptions can be changed that the average consumer's utility from the firm's product can be increased, more will be demanded. Changes in tastes do not mean that the consumer is not rational. Even without advertising, tastes would change over time with changes in age, education, and other factors. Some tastes even change regularly with the change of season.

Shi Wei/Getty Images

Advertisers spend a great deal of time trying to alter consumers' tastes and perceptions. Much advertising is directed toward making consumer demand more inelastic by convincing buyers that other products are not satisfactory.

Advertisers also spend some time generating information for consumers about prices. This behavior of advertisers fits with the description of consumers' search behavior. If the cost of getting information falls, the cost of the search falls and consumers will do more searching. As a consequence, they may alter their purchasing patterns and buy from sellers offering lower prices.

Much advertising is directed toward making consumer demand more in-elastic by convincing buyers that similar products are not satisfactory substitutes for the one being advertised. In other words, the advertiser attempts to widen the spread between the utility of its product and the utility of potential substitutes. From what you have learned in this chapter, you can see that if this strategy succeeds, an advertiser can charge a higher price for its product without losing many sales.

Global Outlook: Pity the Poor Japanese Consumer!

Japan places high tariffs on food products to protect an efficient and powerful political lobby in Japan. The Organization for Economic Co-operation and Development (OECD) calculates that over 45 percent of the value of Japan's farm production comes from trade barriers or domestic subsidies. In addition to tariffs, Japan has additional rules that make imports of other vegetables and fruits both difficult and expensive for exporters. (United States Department of Agriculture, Economic Research Service, 2012)

American beef ranchers, rice farmers, and citrus growers complain bitterly to the U.S. government about these tariffs. In fact, U.S. producers of goods that the Japanese export to the United States use these high tariffs in Japan as an argument that the United States should impose tariffs on Japanese goods to create a "level playing field." Let's examine the effect of Japanese tariffs on Japanese consumers.

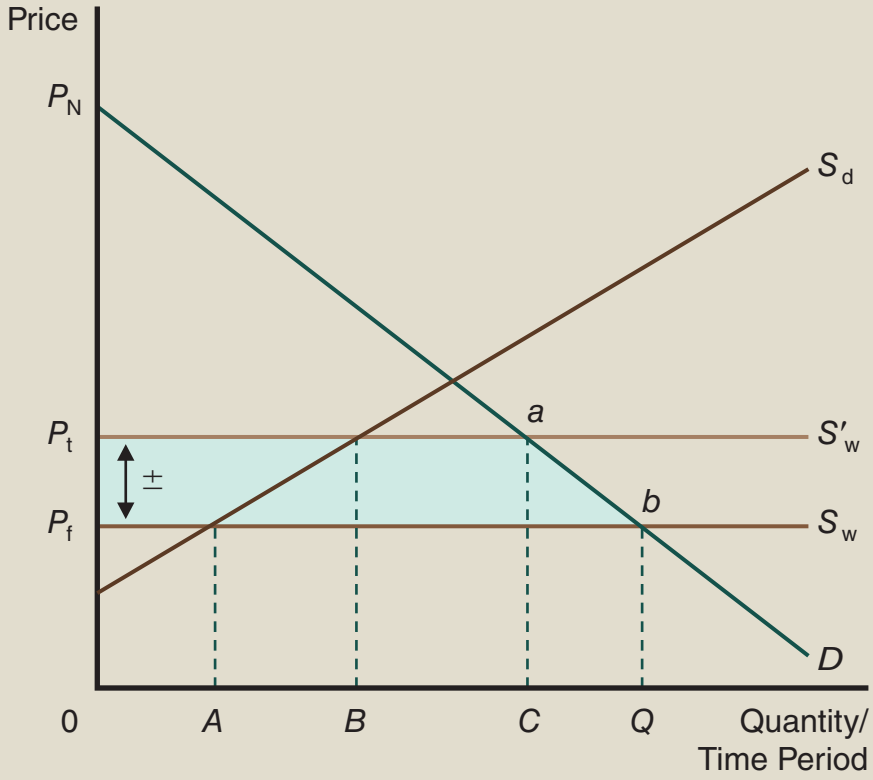
Tariffs have many effects. They reduce the efficiency of resource allocation. They redistribute income between countries and between producers and consumers within countries. They ***(continued)***

Global Outlook: Pity the Poor Japanese Consumer! *(continued)*

raise revenue for the countries that impose them. All of the economic effects of tariffs are important and will be discussed in the chapter on international trade. It is possible, however, to use the concept of consumer surplus developed in this chapter to see how tariffs affect the well-being of Japanese consumers.

In Figure 5.4, S_d is the domestic supply curve and S_w is the world supply curve. World supply is perfectly elastic at the world price P_f. Consumers are demanding quantity Q, of which quantity A is sold by domestic producers and quantity $Q - A$ is imported. The triangle formed by S_w, D, and the vertical axis represents consumer surplus. What happens if the government imposes a tariff equal to t? The price rises by the amount of the tariff to P_t, creating a new world supply curve, S'_w. Consumers now purchase quantity B from domestic producers and $C - B$ from foreign producers. Consumer surplus is now represented by the triangle formed by S'_w, D, and the vertical axis. There has been a reduction in consumer surplus equal to the difference between the two triangles, or the shaded area. What this example demonstrates is that a tariff permits domestic producers to sell more of a product at a higher price and that government revenues rise by the amount of the tariff times the imported quantity. However, consumers experience a decline in consumer surplus.

Figure 5.4: Tariffs and consumer surplus



Consumer surplus before the tariff is equal to triangle P_fP_Nb. The loss of consumer surplus is area P_fP_tab.

(continued)

Global Outlook: Pity the Poor Japanese Consumer! ***(continued)***

The citizens that suffer the most from Japanese tariffs on beef, rice, and citrus are Japan's own domestic consumers. The problem is that they are not an effective lobbying group, while Japanese farmers are. Given what we know about economics, what would we expect to see? In recent years, a small but growing number of Japanese consumers and businesses are doing what economics would predict: abandoning their loyalty to expensive, premium-grade homegrown rice and switching to cheaper alternatives from China, Australia, and the United States (Tabuchi, 2012). If this trend continues, the downward pressure on domestic prices may lead Japanese farmers to rethink their strategy.

Summary

Consider again. . . You should now be able to explain why the vending machine technology is different for newspapers than it is for food and drink. It surely has nothing to do with technology. It would be easy to have the paper delivered to you in the same way a pack of Skittles comes out of the machine. The explanation is in marginal utility analysis. Newspaper companies know that for most people the marginal utility of the second paper is zero—maybe even negative because you have to get rid of it. So most people will be honest. Have you ever taken a second paper when you only paid for one? If you did, perhaps the reason was that you anticipated that you would have to share the paper and as a result the second paper had positive utility. It is easy for newspapers to "trust" the honesty of people because the second unit of what they sell is "worthless."

Key Points

1. Total utility is the total amount of satisfaction expected from consuming an item. Marginal utility is the change in total utility from consuming one more or one less unit of a good.
2. Consumers, in deciding among items, choose those items with the highest marginal utility per dollar. An individual maximizes total utility by consuming all items so that their marginal utilities per dollar spent are equal. When the price of a good or service falls, the quantity demanded increases because of income effects and substitution effects.
3. Marginal utility determines value in exchange (price) and total utility determines value in use.
4. Consumer surplus is the extra utility derived from a purchase that has a value to the consumer that is greater than the price paid. In this sense consumer surplus is bonus utility to the consumer.
5. If advertising can change tastes and perceptions, the utility a consumer gets from the advertised product will increase.

Key Terms

budget constraint A given level of income that determines the maximum amount of goods that may be purchased by a consumer.

consumer surplus The extra utility derived from a purchase that has value to the consumer greater than the market price.

diamond-water paradox The fact that diamonds, although less useful than water, are more expensive than water. That is, things with the greatest value in exchange (price) often have little value in use.

income effect An increase in demand for a good (or service) when its price falls, ceteris paribus, because the household's real income rises and the consumer buys more of all normal goods.

marginal utility (*MU*) The amount of utility that one more or one less unit of consumption adds to or subtracts from total utility.

principle of diminishing marginal utility The fact that the additional utility declines as quantity consumed increases. Less satisfaction is obtained per additional unit as more units are consumed.

substitution effect An increase in the quantity demanded of a good (or services) because its price has fallen and it becomes a better substitute for all other goods.

util An arbitrary unit used to measure individual utility.

utility The satisfaction that a consumer receives from consuming a good or service.

utility function A relationship expressing a consumer's desire to consume differing amounts of a good.

utility maximization The process by which a consumer adjusts consumption, given a budget constraint and a set of prices, in order to attain the highest total amount of satisfaction.

Critical Thinking and Discussion Questions

1. How is the diamond-water paradox useful in explaining the difference between a useful good and a good that has utility?
2. What is diminishing marginal utility and why is it important?
3. How does the presence of a budget constraint limit the maximum utility possible?
4. What is consumer surplus and how is it related to utility?
5. The topics in this chapter discuss rational consumer behavior. Is it ever rational to be irrational?
6. How does the presence of outlet stores impact consumer surplus?
7. If the developers of the Microsoft Surface tablet use flashy advertising to increase sales, how are they trying to impact consumer utility?
8. The marginal utility of one good is 3 and the price is $4.00 and the marginal utility of another good is 6 and its price is $2.00. According to consumer choice based on the maximization rule is the consumer maximizing utility? Explain.
9. Observers of the wealthy often comment on the fact that they tend to waste a lot of things, like food, but are very careful in their use of time. Is this irrational behavior?
10. If your rent doubles in one year, what happens to your budget constraint? How would this change the quantity and types of goods you purchase?

11. What would you expect to happen to a normal consumer's total utility for steak if the Surgeon General confirmed a link between the consumption of beef and certain cancers?
12. When restaurants offer "all-you-can-eat" buffets, they typically have restrictions. What restrictions might they want to impose and how are these related to utility theory?
13. If the government wanted to propose a more progressive tax system, how could they try to use the concept of diminishing marginal utility in their argument?
14. Does advertising increase or decrease the utility you receive from consuming certain goods? Is this good or bad? Should certain types of advertising be regulated by the government?
15. How would a university policy to make food on campus more affordable for students impact the university's utility? Are there other positive outcomes?

Chapter 5 Appendix: Indifference Analysis: An Alternative Approach to Consumer Choice

The marginal utility theory discussed in this chapter has the drawback that it requires precise numerical values to be assigned to alternatives (cardinal utility). A later innovation in the economic theory of choice was based on ordinal utility. Ordinal utility requires only that the utility of the choices can be ranked. Instead of saving, "The next slice of pizza has 30 units of utility," or, "The next Coke has 25 units of utility," the consumer needs only to be able to say, "I prefer another slice of pizza to another Coke."

In the late 1800s, Italian economist Vilfredo Pareto and British economist F.Y. Edgeworth, working separately, developed an approach to analyzing consumer behavior based on ordinal utility—**indifference analysis**. It wasn't until 1939, when Nobel Prize-winning British economist Sir John Hicks published his classic book, *Value and Capital*, that this technique became popular with economic theorists and teachers. The theory swept the economics profession, and, for a while, marginal utility analysis fell into disrepute.

Pareto, Edgeworth, Hicks, and others were not trying to discredit utility theory; rather, they were proposing an alternative way of viewing consumer behavior. The major improvement of their theory is that it does not require the measurement of units of utility. All that is necessary is that consumers be able to rank bundles of goods in the order, from low to high, in which they prefer them.

5.1A Indifference or Preference

Indifference and preference seem better than marginal utility for describing the way consumers actually make decisions. Individuals make choices between bundles, or collections, of goods. For example, you might choose between four tickets to a football game and two tickets to a concert. In indifference analysis, the consumer is viewed as making choices between collections of goods and services. The only assumption is that the consumer is able to state preferences for different collections or to profess indifference between some of them. In other words, confronted with a choice between going to a movie and going to a football game, the consumer might rank the football game as the preferred choice. Or the consumer might say, "I don't have a preference. I'm indifferent to the two choices."

Suppose Mary is considering different combinations of cans of Coke and slices of pizza, as indicated in Table 5.1A. Combination *A* consists of 16 cans of Coke and 3 slices of pizza, and combination *B* consists of 12 cans and 4 slices. When these two combinations are offered to Mary, she states that neither combination *A* nor combination *B* is preferred over the other. They are equal in the amount of satisfaction she expects to derive. Therefore, she is indifferent between the two. Offering Mary the choice among combinations C, *D*, and *E* yields the same response—indifference. Mary has indicated that all five combinations of pizza and Coke yield the same amount of satisfaction. These five combinations comprise an **indifference set** for her.

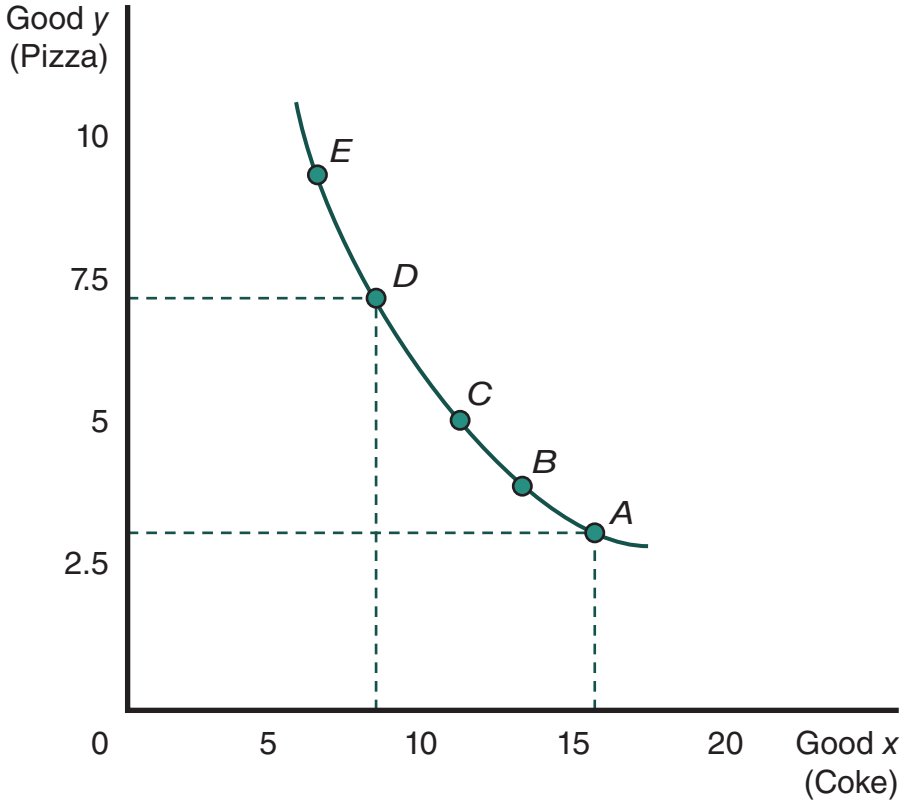
Table 5.1A: Mary's indifference set

Combination	Good *x* (cans of Coke)	Good *y* (slices of pizza)
A	16	3
B	12	4
C	0	5
D	8	7
E	6	9

An indifference set can be represented graphically by an indifference curve. An indifference curve corresponding to the indifference set in Table 5.1A is shown in Figure 5.1A. An **indifference curve** shows all combinations of two goods (or services) among which a consumer is indifferent.

Indifference curves are negatively sloped because for a consumer to be in-different, all points on the curve must represent equal amounts of utility. If more of one good is added to the combination, some of the other must be removed. Each combination represents a trade-off. In Mary's case, if combination *B* has more pizza than combination *A*, it must have less Coke, since the combinations yield the same level of satisfaction. If one combination had more pizza and more Coke than any other, or if it had more of one without having less of the other, it would be preferred. The consumer would no longer be indifferent. This is yet another way of saying that more is preferred to less.

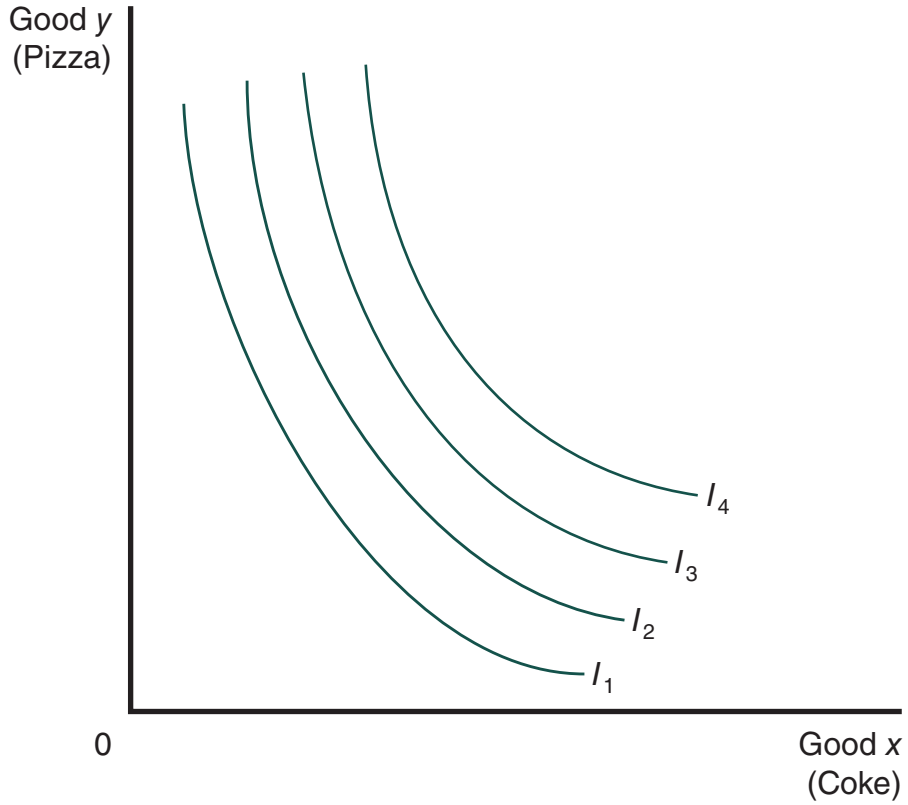
Figure 5.1A: Indifference curve



An indifference curve represents combinations of two goods among which the consumer is indifferent. All combinations on the same indifference curve give the same level of satisfaction.

The indifference set represented by a higher indifference curve is preferred to that represented by a lower indifference curve. As Mary moves from I_1 to I_2 to I_3 to I_4 in Figure 5.2A, she receives more satisfaction. Such a series of indifference curves is called an **indifference map**. Every individual consumer has such a map, and movement to a higher curve on the map represents a gain in utility.

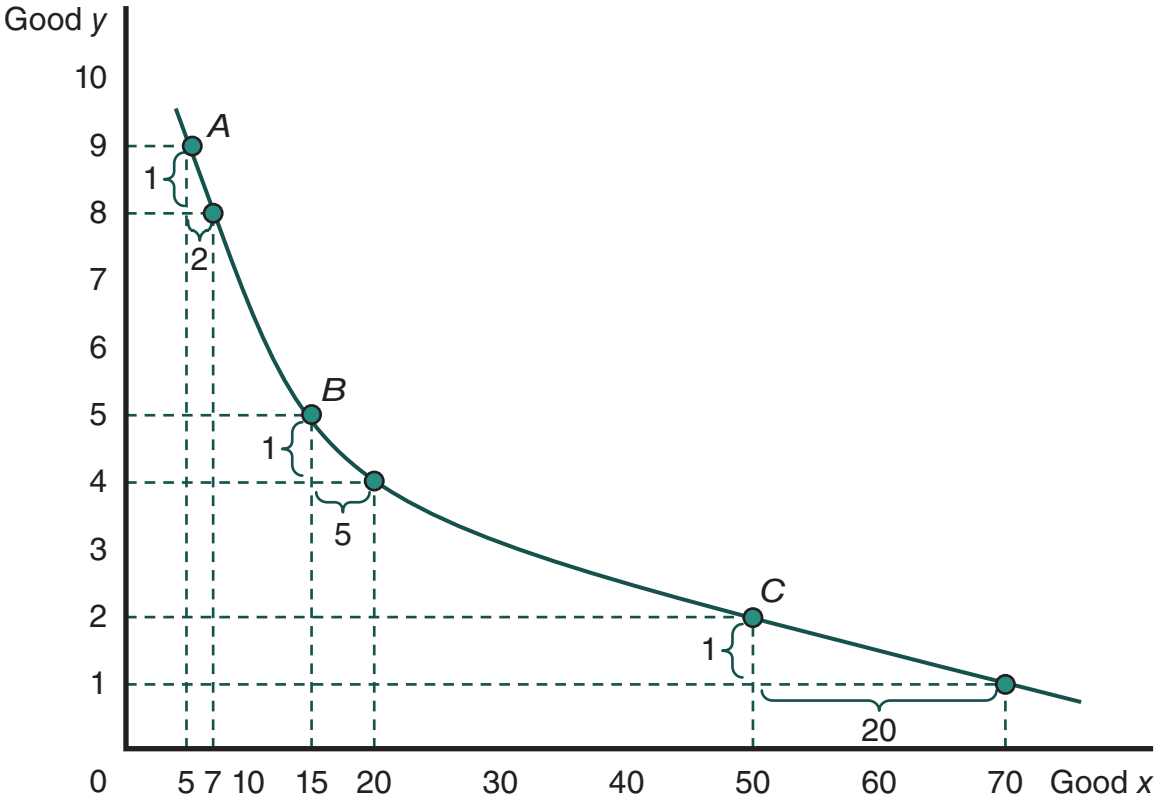
Figure 5.2A: Indifference map



An indifference map is a set of indifference curves, each corresponding to a different level of satisfaction. Higher curves on the map represent higher levels of satisfaction.

The shape of the typical indifference curve for two goods will be somewhat convex with respect to the origin. The convexity means that as a consumer gets more units of one good and fewer units of the other, it takes more and more units of the more abundant good to compensate for the loss of one unit of the good that is becoming more scarce. For example, at Point *A* in Figure 5.3A, the individual is consuming relatively large amounts of good *y* and small amounts of good *x*. In order to compensate for a reduction in consumption of 1 unit of *y*, the person would only require 2 units of *x* in order to be satisfied with such a trade. At Point *B*, however, since less of *y* and more of *x* are being consumed compared to Point *A*, it will take a larger quantity of *x* (5 units) to compensate for the loss of 1 unit of *y*. At Point *C*, the person is consuming a large amount of *x* and very little *y*. To give up 1 unit of *y*, 20 more units of *x* would be needed to have the same utility as before.

Figure 5.3A: Convexity feature of indifference curves



A typical indifference curve is convex to the origin. This convexity means that it takes increasingly larger amounts of the abundant good to compensate for losses of the good that is becoming more scarce.

Why do economists expect such preference relations to hold? First, most of us would agree that this is the way we would behave in such a trade-off situation. Second, the opposite conclusion seems highly unlikely. It would say that the less you had of a good, the less you would want of it relative to other goods, and the more you had of a good, the more valuable additional units of it would become. Indifference curves reflect the concept of diminishing marginal utility for two goods without assigning numerical values to utility.

5.2A Diminishing Marginal Rates of Substitution

The trade-off ratio along an indifference curve is called the **marginal rate of substitution (*MRS*)**. The marginal rate of substitution of x for y, MRS_{xy} shows the willingness of the consumer to substitute between goods x and y:

$$\text{MRS}_{xy} = \frac{\text{number of units of y given up}}{\text{number of units of x gained}}$$

In Figure 5.3A, the MRS_{xy} at Point *A* is 1/2. That is, 1 unit of *y* must be sacrificed to gain 2 units of *x*. At Point *B*, the MRS_{xy} is 1/5, and at Point *C* it is 1/20. The declining value of MRS_{xy} is a reflection of the **principle of diminishing marginal rates of substitution**. That is, as more of one good (*x*) is substituted for the other good (*y*), the value of good *x* in terms of good *y* declines.

5.3A Budget Constraints

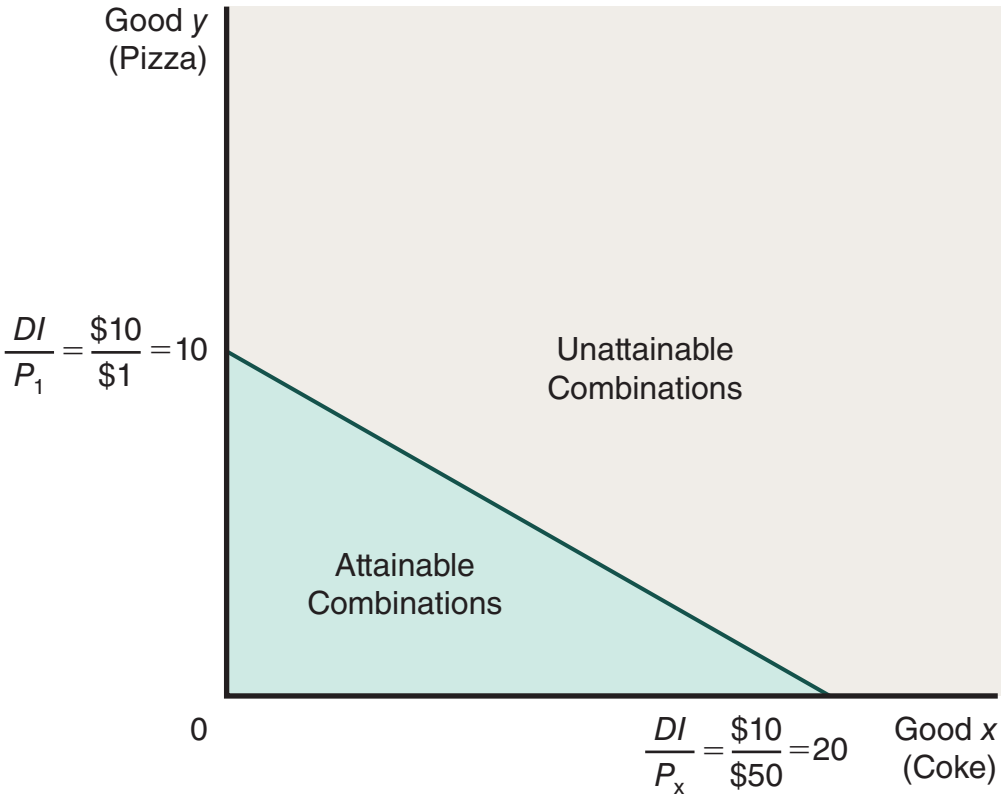
An indifference map makes it possible to compare points representing combinations of two goods to determine whether the consumer prefers one such combination or feels indifferent among several. All points on any single indifference curve are equivalent to each other in utility, even if utility cannot be measured numerically. Points on indifference curves located to the right and above other indifference curves are preferred combinations.

Which combinations are actually attainable for the consumer? The answer depends on the income available and on the prices of the goods. Keep in mind that the consumer faces prices that are determined in markets and cannot influence them. Income constrains the consumer from buying all that might be desired. The income is the budget constraint and, when drawn on the indifference map, is called the budget line.

We limit the analysis to two goods (you could think of one of them as "all other goods"). Again assume that Mary can consume either slices of pizza or cans of Coke. Suppose she has a disposable income (*DI*) of $10.00 and pizza (good *y*) and Coke (good *x*) sell for $1.00 and $0.50, respectively, per unit. The construction of the budget line is illustrated in Figure 5.4A. If she spends her entire income (*DI*) on pizza, she can buy 10 slices. This number is determined by dividing income by the price of the good:

$$\frac{DI}{P_y} = \frac{\$10.00}{\$1.00} = 10 \text{ slices of pizza}$$

Figure 5.4A: Budget line



A budget line graphically depicts the consumption combinations that are attainable with a given level of income. Any combination above the line is unattainable.

Thus, 10 is the *y*-intercept. The *x*-intercept is calculated in the same manner:

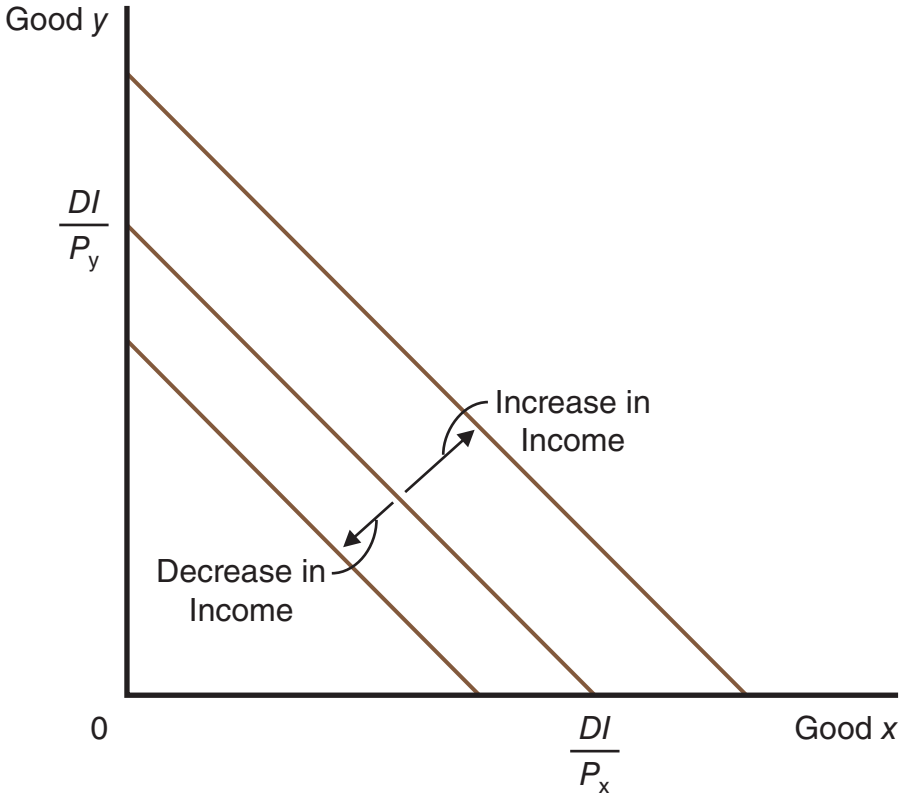
$$\frac{\text{DI}}{\text{P}_x} = \frac{\$10.00}{\$0.50} = 20 \text{ cans of Coke}$$

A straight line connecting the two points that represent buying all good *y* (pizza) or all good *x* (Coke) shows all possible combinations that Mary can purchase with a given income level of $10. For example, $10 will buy 5 slices of pizza and 10 Cokes or 6 slices of pizza and 8 Cokes. Any combination outside (above) the line is unattainable at that income level. It is outside her budget constraint. In other words, the budget line is the dividing line between those combinations that are attainable and those that are unattainable at a given level of prices and a given level of income.

5.4A Changes in Income and Changes in Price

The budget line is developed holding prices and income constant. How do changes in income and prices affect the budget line? An increase in income means that more of both goods can be purchased, if prices stay the same. A doubling of income means that twice as much of both goods can be purchased, if prices remain constant. An increase in income is represented by a parallel outward shift of the budget line. A decrease in income is represented by a parallel inward shift of the budget line. Such shifts are shown in Figure 5.5A.

Figure 5.5A: The effect of income changes on budget lines

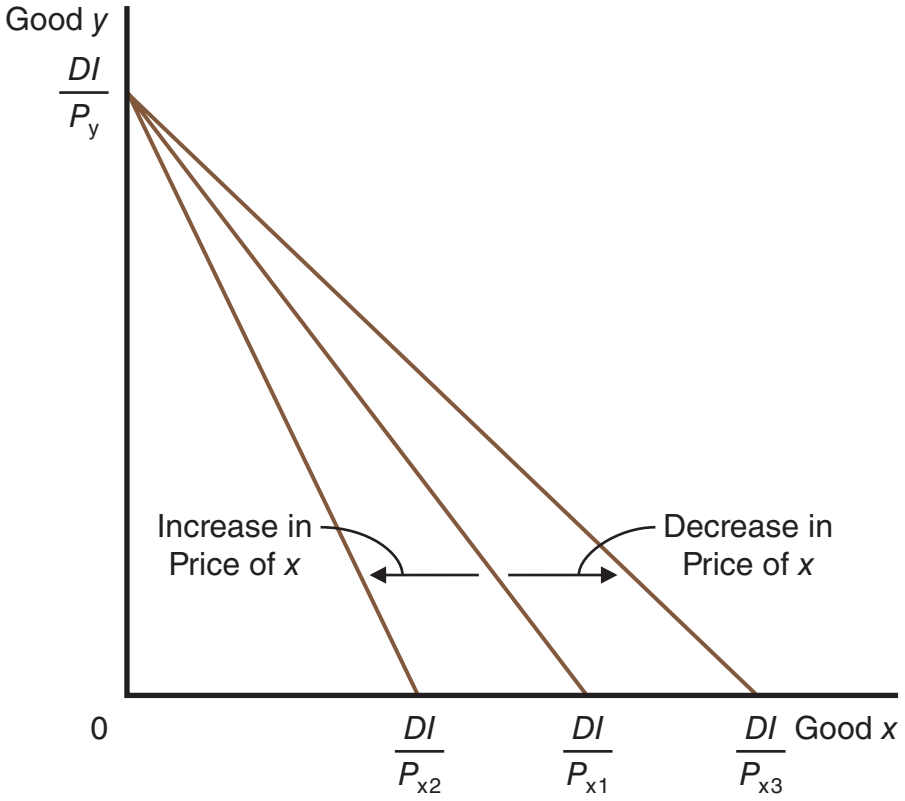


An increase in income is represented by an outward parallel shift of the budget line. A decrease in income is represented by an inward parallel shift of the budget line.

A change in the price of one good affects the maximum amount of that good that can be purchased, but does not affect the maximum amount of the other good that can be purchased. If the price of cola rises and Mary spends all her income on pizza, the price rise has no effect on the amount of pizza purchased. A price rise, then, will only affect the intercept of the budget line with the axis for the good that has experienced the price rise. Such a change is shown in Figure 5.6A. A price rise for good x from P_{x1} to P_{x2} causes the x-intercept of the budget line to move closer to the origin, reflecting the fact that

less of good x can now be purchased with constant income. A decrease in the price of good x from P_{x1} to P_{x3} means more of good x can be purchased. The x-intercept of the budget line moves away from the origin, reflecting increases in the potential consumption of good x.

Figure 5.6A: The effect of price changes on budget lines



An increase in the price of one good changes the slope of the budget line because if all disposable income is spent on that good, less of it can be purchased. As a result, the intercept of the budget line will shift closer to the origin. The opposite holds for a decrease in price.

Price changes cause the slope of the budget line to change. The slope of the budget line is $\Delta y/\Delta x$. Note that the slope is the negative of the ratio of the y-intercept to the x-intercept, or

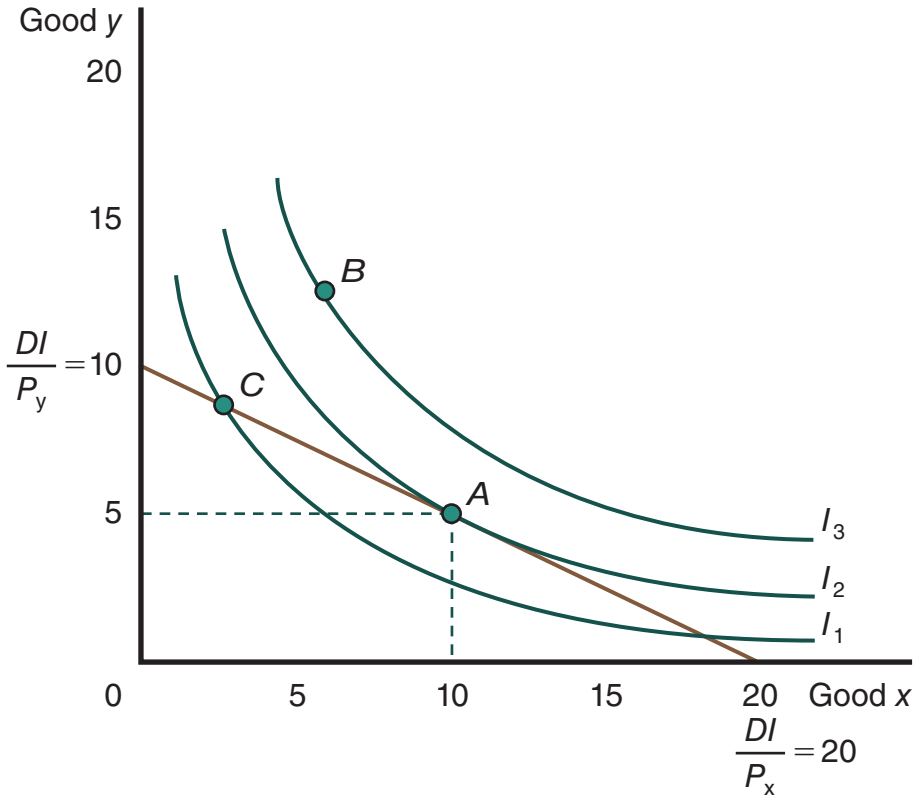
$$\frac{\frac{DI}{P_y}}{\frac{DI}{P_x}} = \frac{P_x}{P_y}$$

The slope of the budget line changes when the ratio of the prices of the two goods changes. A change in income, on the other hand, represents no change in relative prices. In that case, the slope of the budget line remains the same, but it shifts as described above.

5.5A Maximization of Consumer Satisfaction

Adding a budget line to an indifference map makes it possible to demonstrate maximization of consumer satisfaction. In Figure 5.7A, at Point *A*, the budget line is tangent to indifference curve I_2. Any point on I_3, such as Point *B*, is preferred to Point *A* because higher indifference curves represent higher levels of utility. However, Point *B* is not attainable because it is outside the budget line. Point *C* on I_1 is attainable, but a point on I_2 is also attainable, and any point on I_2 represents more satisfaction than any point on I_1. The consumer wants to reach the highest attainable indifference curve. The highest attainable curve will be one that is tangent to the budget line because no higher curve can be reached with the given income and prices. In this example, the consumer is maximizing utility, or is in equilibrium, at Point *A* on indifference curve I_2.

Figure 5.7A: Maximization of consumer satisfaction



An individual maximizes consumer satisfaction at the point where the budget line is tangent to the highest attainable indifference curve.

You should remember from geometry that two curves that are tangent have equal slopes at the point of tangency. At the point of tangency between the indifference curve and the

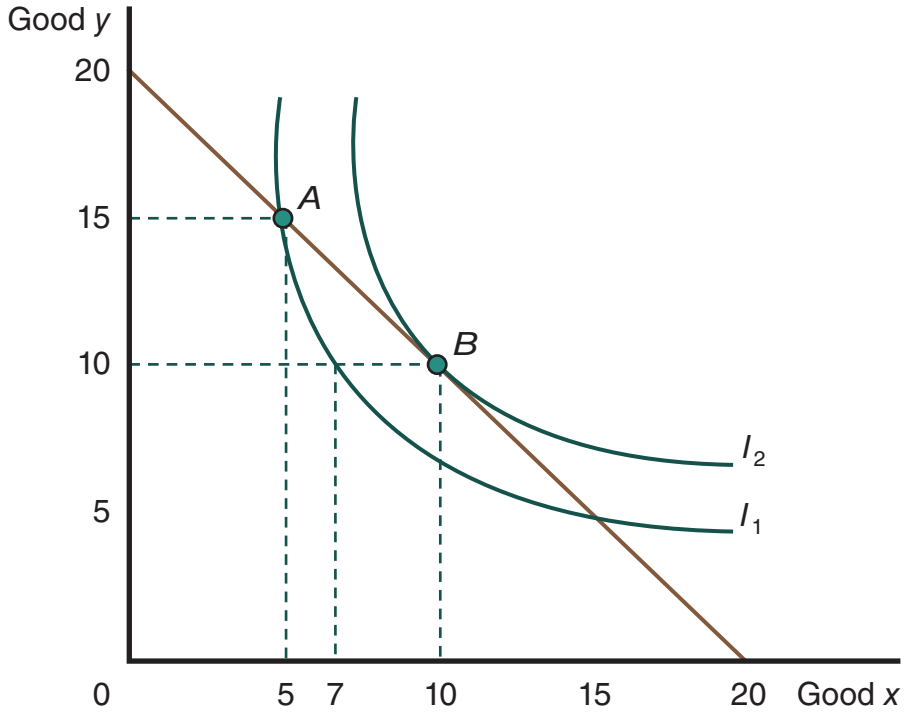
budget line, the marginal rate of substitution is equal to the ratio of the price of x to the price of y. That is,

$$MRS_{xy} = \frac{P_x}{P_y}$$

This expression means that the marginal rate of substitution expresses the willingness of the consumer to trade a certain amount of x for a certain amount of y, and the slope of the budget line reflects the market's willingness to trade a certain amount of x for a certain amount of y. The impersonal forces of the market impose the relative prices on the consumer, so the consumer adjusts consumption amounts in such a way that his or her trade-off is the same as the trade-off in the market.

Suppose you are consuming 15 units of y and 5 units of x (you are at Point A in Figure 5.8A). According to your indifference curve (I_1), you would be willing to give up 5 units of y if you received 2 additional units of x. The market, however, is willing to give you 5 units of x in exchange for 5 units of y (note Point B). You would probably consume less y and more x. In fact, you would be able to increase your utility by moving in the direction of the tangency of some higher indifference curve with the budget line.

Figure 5.8A: Tangency once again

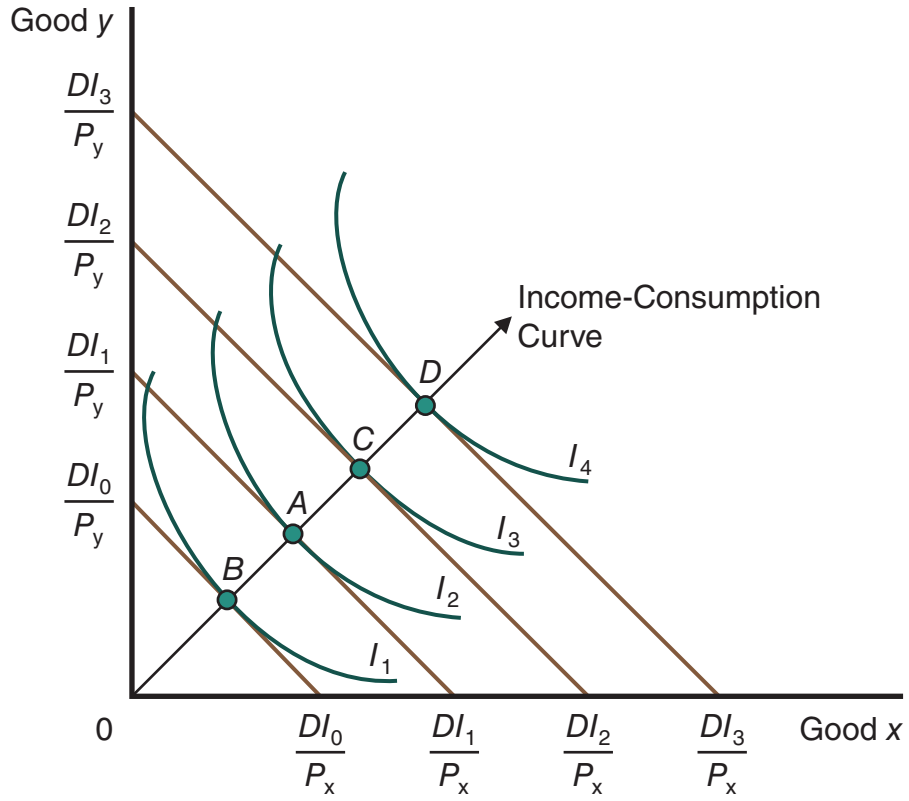


Lower indifference curves that are within the budget constraint represent lower levels of utility than the highest, but still attainable, indifference curve.

Consumer Reaction to Income Changes

The best feature of indifference curve analysis is that it allows us to analyze the reaction of consumers to price and income changes. Using the indifference map and the budget line, we can trace the adjustment process that takes place when a household experiences a change in income. In Figure 5.9A, for example, if the household's income is represented by the budget line DI_1 and x and y sell for P_x and P_y, respectively, the optimal utility is at Point A. A decrease in income is represented by budget line DI_0, and two increases in income are represented by budget lines DI_2 and DI_3. The respective optimal positions representing tangencies of these budget lines with an indifference curve are Points B, C, and D. Connecting Points A, B, C, and D generates an **income-consumption curve**. This curve shows how consumption of the two goods changes as income changes. Recall the discussion of the income elasticity of demand in the preceding chapter. The income elasticities of both good x and good y in Figure 5.9A are positive because consumption of both goods increases as income increases. (Remember that a positive income elasticity indicates that a good is a normal good. An inferior good has a negative income elasticity since, in that case, as income increases, consumption of the good decreases.)

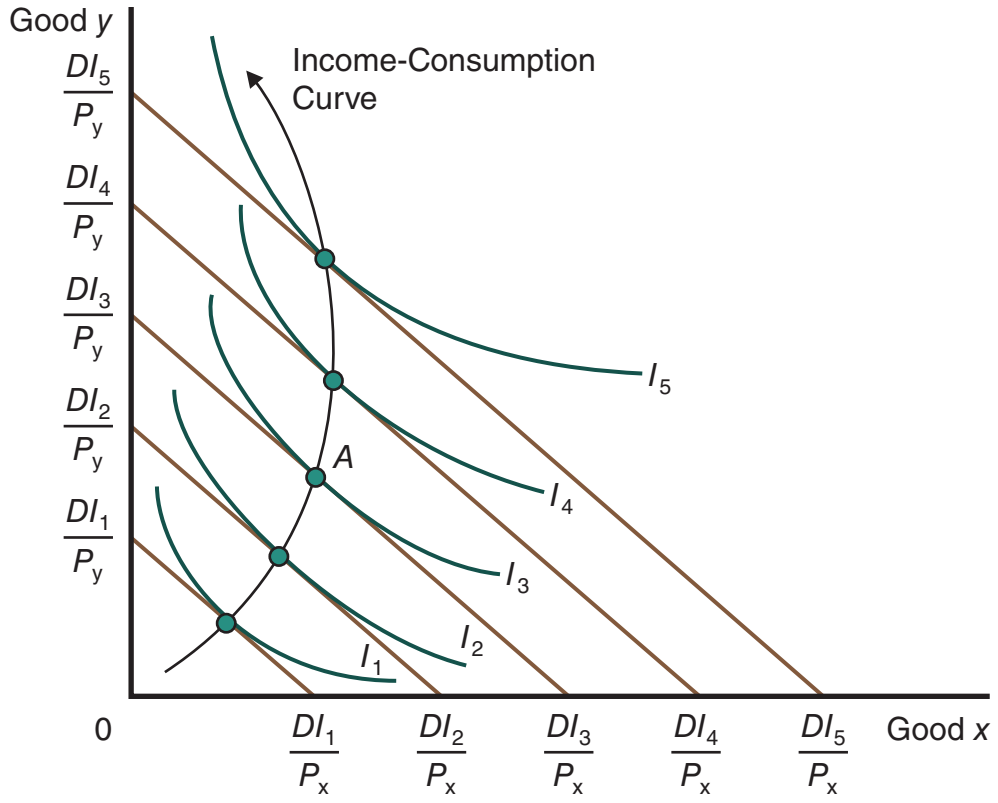
Figure 5.9A: Income changes and the income-consumption curve



An income-consumption curve traces the response of consumption combinations to changes in income.

Figure 5.10A shows a case where one commodity, good x, is a normal good for a household until its income reaches DI_3 When income increases above DI_3, the household buys less of x. So x is a normal good up to Point A and then becomes an inferior good as the income-consumption curve bends backward. There is nothing derogatory about the term inferior. A daily newspaper might be considered an inferior good for some buyers. As income falls, a person may buy the paper more often because it is a less expensive form of entertainment and also because it offers job listings. Remember, also, that a normal good to some people may be an inferior good to others.

Figure 5.10A: Income-consumption curve for an inferior good

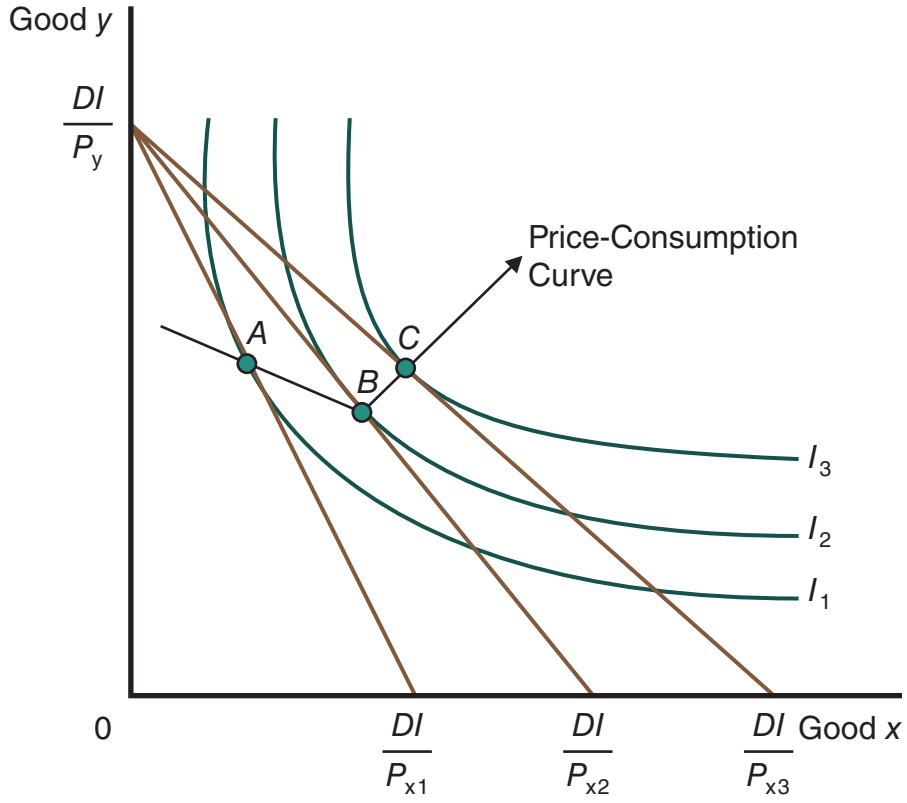


The income-consumption curve for an inferior good bends backwards, indicating that less of the good is consumed as income increases beyond a certain level.

Consumer Reaction to Price Changes

Let's look at how the optimal consumption combination will be affected by price changes. Initially, the consumer is at the point of maximum utility (Point A in Figure 5.11A). As the price of x falls from P_{x1} to P_{x2}, the budget line rotates out to intersect the x-axis at DI/P_{x2}, and the consumer now has a new optimum at Point B on indifference curve I_2. Another decrease in price to P_{x3} allows the consumer to reach a still higher indifference curve, I_3, and a new optimum at Point C. Connecting the Points A, B, and C produces a **price-consumption curve**. This curve shows how consumption changes when relative prices change.

Figure 5.11A: Price-consumption curve



A price-consumption curve depicts how consumption changes when relative prices change.

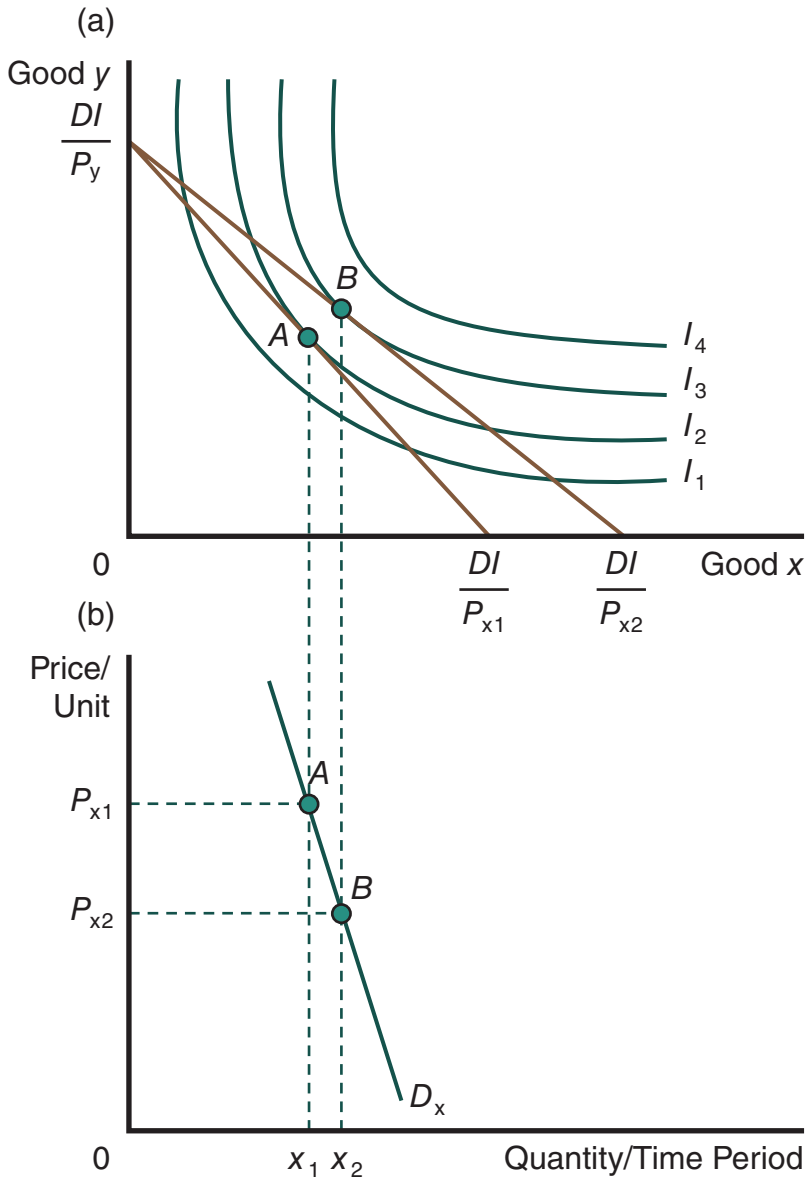
The theory behind this change in consumption patterns relies on the income and substitution effects again. When the price of a good falls, there are two forces at work to cause the consumer to increase purchases of that good. First, when the price of a good falls, the market trade-off between this good and other goods (or the substitution rate) changes. This part of the response to a price change is the substitution effect. Second, the consumer has a larger real income, meaning that with the same nominal income, more of both (or all) goods can be purchased (and will be purchased as long as the good is not an inferior good). This part of the response to a price change is the income effect.

5.6A Indifference Analysis and the Law of Demand

Indifference analysis can be used to derive a consumer's demand curve and demonstrate the law of demand. This demonstration is a ceteris paribus experiment in which the price of one good is changed. Part (a) of Figure 5.12A shows an indifference map and a budget line for goods x and y. The consumer is at an optimum at Point A. At Point A, the individual consumes x_1 units of good x at a price of P_{x1}. Price and quantity demanded of good x are plotted in part (b). Now suppose the price of x falls to P_{x2}. As before, this

decline in price causes the budget line to rotate outward. A new optimum is reached at Point *B*, where the new budget line is tangent to indifference curve I_3. The change in price has caused the quantity demanded to increase from x_1 to x_2, as shown in part (b). The line connecting two price-quantity points in part (b) is a demand curve for good *x*, and it has the usual negative slope.

Figure 5.12A: Deriving a demand curve



When the price of good *x* decreases, the consumer can reach a higher indifference curve. This increased consumption of good *x* at a lower price means that the demand curve must have a negative slope.

Key Terms

income-consumption curve A curve that uses parallel budget lines to show changes in consumer equilibrium when income changes.

indifference analysis An approach to analyzing consumer behavior based on ranking the utility of choices relative to one another.

indifference curve A plot of all combinations of goods that the consumer is indifferent among.

indifference map A set of indifference curves. Higher curves on the map represent higher levels of utility.

indifference set Any number of combinations of goods among which the individual consumer is indifferent (has no preference).

marginal rate of substitution (*MRS*) The trade-off ratio along an indifference curve.

price-consumption curve A curve that shows changes in consumer equilibrium when the price of one good on an indifference curve changes.

principle of diminishing marginal rates of substitution The fact that as more of one good is consumed, more and more of the other must be given up to maintain indifference between the two.