

Section I

Fundamental Economic Concepts

It is not from the benevolence of the butcher, the brewer or the baker, that we expect our dinner, but from their regard to their own interest. We address ourselves, not to their humanity but to their self-love, and never talk to them of our own necessities but of their advantages.

—Adam Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations*

Economics is about everyday life, about the choices each of us makes, and how these choices affect our neighbors, our community, our nation, and our world. Looking at these choices from the perspective of economics helps to illuminate hidden wonders in the everyday world around us. For example, the next time you stop at the supermarket to pick up a loaf of bread on your way home, pause for a minute to reflect on your surroundings. If your supermarket is like most, there will be rows of fresh produce, aisles of baked goods, shelves full of laundry detergent, cases of frozen foods and dairy products, and many other items. In fact, the average supermarket carries more than 33,000 different items.¹

That each of these items is on the shelf is the result of a complicated chain of decisions by an almost uncountable number of different people. For example, for a loaf of bread to reach the store, a farmer had to decide to grow the wheat, a milling company had to purchase the wheat and grind it into flour, a bakery had to purchase the flour along with other ingredients and then combine them to produce the loaf, and finally this perishable product had to be delivered in a timely fashion to the store. Each product has a similar story.

When you go to the store, you expect to be able to find the bread and all the other products your supermarket carries; but what insures that all of them will be there, as they almost always are? No one ordered the farmer

to grow wheat, or the baker to bake bread; they didn't take these actions so that you could stop to pick up a loaf of bread on the way home; they did what they did because it was in their own best interest. Yet somehow, almost magically, all of these individual choices were coordinated so that when you arrive at the store there is an entire aisle of different types of bread available for you to choose from.

Now step back and consider the fact that the store you are in is only one of thousands of supermarkets across the country, and that the supermarket is only one of the many millions of businesses that make up our economy. Many people take all of this for granted, but as the example of less developed countries around the world makes clear, there is nothing automatic or inevitable about how well our economy functions. Economics can help us to understand both why our economy functions smoothly most of the time, and why it occasionally breaks down.

BASIC ASSUMPTIONS OF ECONOMICS

Economics is the study of how individuals make choices about how to allocate scarce resources in order to satisfy virtually unlimited human wants and about how individuals interact with one another. While economists study a vast range of different behaviors, their work is unified by their reliance on a few seemingly simple, yet remarkably powerful assumptions.

Scarcity

Scarcity is an inescapable fact of human existence. There are only twenty-four hours in the day to devote to work, study, play, sleep, and other essential activities. No matter how wealthy a society is, the amount of work, energy, knowledge, and **capital** available to produce the goods and services people wish to consume is limited. On the other hand, our

desires are insatiable. Just as families must choose how much income to spend on food, clothing, vacation travel, and **savings** for retirement, societies face choices about how much of their resources to devote to healthcare, national defense, and education.

Trade-offs

Scarcity implies that every choice we make requires us to give up something to get something else. If you decide to spend an hour watching television, then that is one less hour you have available to study. Similarly, if you choose to spend \$10 to go to a movie, then you have \$10 less to spend on video games or to save for college expenses.

Opportunity Cost

The cost of what you choose is what you have to give up to get it. Economists call what you give up the “**opportunity cost**” of your choice. It is important to note that the opportunity cost is not necessarily the same as the monetary price you pay. For example, suppose a friend offers you a free ticket to a baseball game. You may not have to pay for the ticket, but the opportunity cost of attending the game is the value of what you would have been doing during that time if you had not gone to the game. For example, if you had been planning to work mowing lawns, the opportunity cost of this choice is the income from mowing that you would forego by attending the game.

Opportunity cost is a seemingly simple concept but applying it can sometimes be rather tricky. Consider the cost of attending college. It might seem obvious that the cost of attending college is the sum of the price of tuition, books, room and board. But this answer excludes an important cost of attending college. For most people, the biggest cost of attending college is the value of their time. By choosing to attend class and do homework, you are giving up time that could otherwise be spent working for pay. At the same time, the explicit monetary costs of attending college may overstate the true expense. Even if you did not attend college, you would still need to eat and have someplace to live. Thus, the costs of room and board are not really part of the cost of college.

Rationality

Economics assumes that people make choices by comparing the benefits of each action with the

opportunity costs of that action and then select the action that produces the greatest benefit. It is important to note that the benefits can be interpreted broadly. Many people care a great deal about social issues—such as reducing pollution or helping those less fortunate than themselves. Such concerns are entirely consistent with rational decision-making or **rationality**.

Most of the time, people perform this cost-benefit calculation intuitively and approximately. In the same way that a basketball player does not stop to calculate the physics behind a perfect three-point shot, rational people acquire a feel for what the costs and benefits of their actions will be. Just as some of us are better at hitting three-point shots than others, we are not born with the ability to infallibly calculate costs and benefits. One of the rewards of studying economics is that it helps us to become better decision-makers.

Gains from Trade

Individuals differ in their abilities, interests, and resources. As a result, we all are better at and get more pleasure from some activities than others. By specializing in the things we like and do the best, and then trading with other people who have different abilities, both we and they can then be better off. As long as the exchange is voluntary, then the benefits must outweigh the costs for both of the people involved.

MODELS AND ECONOMIC THEORY

Economic analysis relies on careful observation, description, and measurement of economic activity. But it also relies on theory. To understand how the economic phenomena we observe fit together, it is necessary to build theoretical models that capture the essential features of these interactions while stripping away the unnecessary details. Models come in a wide variety of forms and can be expressed in many different ways.

In economics, models most often consist of diagrams or mathematical formulas. At first glance, many of these models may appear hopelessly simplistic. But the test of a model is in how well it captures the aspects of reality that we are seeking to understand. The simplicity and lack of realism of many of these models is what allows us to identify so clearly what assumptions and characteristics are important.

POSITIVE AND NORMATIVE ECONOMICS

The insights that economics offers about individual and social decisions can be used in two ways. **Positive economics** uses the tools of economic analysis to describe and explain economic phenomena and to make predictions about what will happen under particular circumstances. It focuses on identifying cause-and-effect relationships and measuring their size. For example, positive economics tells us how much we might expect the **consumption** of gasoline to decrease when the price of gasoline increases. In this sense, positive economics is essentially value free. It does not require that the economic analyst express any opinion about the relative merits of different choices.

Normative economics is the term used to describe the use of economic analysis to guide decisions about what *should* be as opposed to what *is* the case. Normative economic statements combine economic analysis with value judgments about the relative merits of different possible economic outcomes. The tools of economic analysis, such as cost-benefit comparisons, can help to structure a discussion of different possible outcomes. But, choices between these outcomes usually require us to refer to criteria beyond the scope of economic theory to justify our particular choices.

To better illustrate this, let's consider the debate about whether to increase the minimum wage. Positive economics can help identify the way in which such an increase would affect different groups as well as provide estimates of their size. In addition to recognizing that a hike in the minimum wage would increase the incomes of those workers who hold minimum-wage jobs, it is important to also note that higher wages may result in some minimum-wage workers losing their jobs. Moreover, others who are seeking employment in jobs covered by the law may be unable to find employment. Finally, employers who have to pay higher wages may see their profits diminish, and they may pass some of the costs on to consumers, who will see the prices of goods and services that depend on minimum-wage workers increase. As this list suggests, an increase in the minimum wage will benefit some people and hurt others. To decide whether the benefits outweigh the costs requires a value judgment about the relative ranking of these effects on the different groups affected by the legislation.

EFFICIENCY AS A GOAL

An important criterion that economists often apply in evaluating a society's use of scarce resources is the efficiency of the resulting allocation. Given any particular outcome, economists would say that it was efficient if there is no way to improve at least one person's well-being without reducing the well-being of someone else. This criterion is called **Pareto efficiency**, after the Italian economist Vilfredo Pareto (1848–1923), who was the first to make use of this concept.

Notice that Pareto efficiency can characterize a wide range of different economic outcomes. Consider, for example, an economy with ten people that produces \$100 worth of goods and services. If each citizen receives \$9 of benefits and \$10 of production is wasted, then this outcome is not Pareto efficient. Redistributing the \$10 would make at least some of the citizens better off without making any of them worse off. On the other hand, a situation in which each citizen receives \$10 is Pareto efficient; there is no way to increase the well-being of any citizen without reducing the benefits of another.

However, an outcome in which one citizen receives \$91 of income and each of the other nine citizens receives \$1 is also efficient by the Pareto criterion. The only way to make anyone better off is through redistribution. Pareto efficiency does not provide a basis for choosing between these alternative efficient distributions of benefits. Which distribution is best is, from the perspective of economic analysis, a normative judgment that rests on criteria outside the realm of positive economics. While economic theory does not provide a basis for such choices, economists often offer such value judgments along with their positive analysis.

Despite this limitation, efficiency is an important first step in maximizing overall well-being. When we make decisions about how to allocate resources, it is important that we do so in a way that does not waste any of them.

MICROECONOMICS AND MACROECONOMICS

The tools of economic analysis can be used to study a wide array of phenomena, ranging from how individuals and businesses make decisions, to how they interact in markets, on up to the factors that determine the overall level of production, employment, and the price level of national economies.

The field of economics is traditionally divided into two broad subfields: microeconomics and macroeconomics. Microeconomics concentrates on individual behavior and the operation of particular markets. Macroeconomics concentrates on the overall performance of the national economy.

Clearly microeconomics and macroeconomics are closely linked. They share common assumptions about the basic features of human behavior. But, because they focus on economic activity on different scales, different aspects of this behavior are important. And, their modes of analysis are sufficiently different, so it is useful to consider them separately.

SECTION I SUMMARY

- ◆ Economics is the study of how individuals make choices about how to allocate and distribute scarce resources and how they interact with one another.
- ◆ Scarcity is inescapable because resources are limited and human desires are insatiable.
- ◆ Every choice we make involves trade-offs. The opportunity cost of what we choose is what we must give up by making that choice.
- ◆ Economics assumes that people make choices rationally by comparing the benefits and opportunity costs of each action and selecting the action that yields the greatest net benefit.
- ◆ Trade makes everyone involved better off.
- ◆ Economic models help us to understand economic phenomena by capturing essential details and eliminating unnecessary details.
- ◆ Positive economics uses the tools of economic analysis to describe economic phenomena and make predictions about what will happen under particular circumstances.
- ◆ Normative economics uses the tools of economic analysis to evaluate the relative merits of different situations.
- ◆ Pareto efficiency is an important criterion in economics. It describes a situation in which the only way that anyone can be made better off is by reducing the well-being of one or more other people.
- ◆ The two main branches of economics are microeconomics and macroeconomics.

Section II

Microeconomics

As the example of the supermarket discussed earlier illustrates, our modern economy achieves a high degree of coordination. The mechanism that produces this coordination is the interaction of supply and demand within markets. Within markets, the actions of buyers and sellers determine the price at which each product or service sells and the quantity that changes hands. Individual buyers and sellers respond to market prices in predictable ways.

The interaction of supply and demand in markets is the central topic of microeconomics. Our starting point is to develop an understanding of the behavior of perfectly competitive markets. We will begin by defining what we mean by a market, and then we will describe in more detail how supply and demand are determined by the self-interested choices of individual market participants. Although the assumptions of perfect competition may seem unrealistic at first, the resulting model is an essential building block for economic analysis. It is approximately true in many situations and provides an important benchmark against which to compare many other more complicated models.

After developing the model of perfect competition, we will illustrate its usefulness in analyzing a range of important topics, including the effects of taxation and other types of government policies, as well as the costs and benefits of trade. Having explored these applications, we will then begin to introduce additional features necessary to capture a wider range of economic phenomena. In this segment of the resource guide, we will examine a number of different ways in which markets may “fail” to be economically efficient.

We will conclude our discussion of microeconomics with a closer look at the role of government and other forms of collective choice.

PERFECTLY COMPETITIVE MARKETS

Markets

A market is comprised of all of the buyers and sellers of a particular good or service. Some markets, such as the New York Stock Exchange or the Chicago Mercantile Exchange, are highly organized. Buyers and sellers in such markets come together at a single location, and an auctioneer helps to set a price at which exchanges take place.²

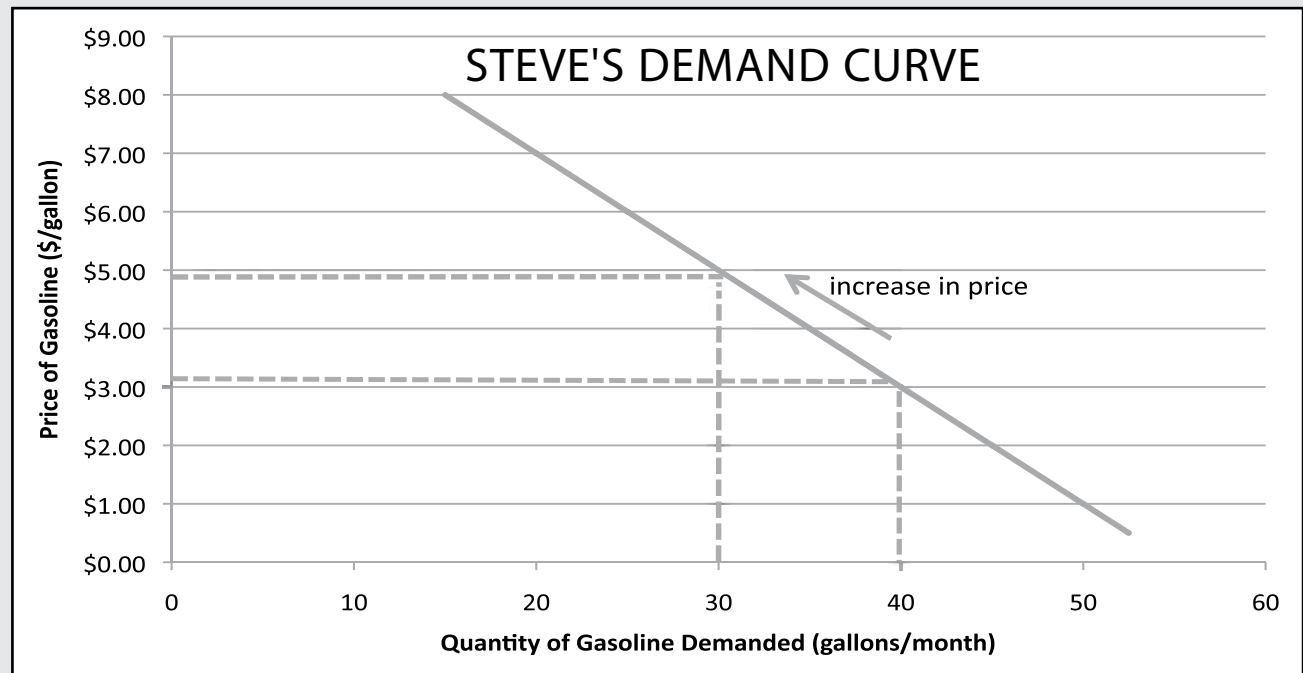
More often, markets are less formal. Nevertheless, we can think of the interaction between buyers and sellers as constituting a market. For example, consider the market for gasoline in your community. The sellers in this market are all the local gas stations in town, while the buyers consist of all the vehicle owners in the community or passing through it. Each of the sellers in this market posts the prices at which he or she will sell a gallon of gasoline, and buyers will select where to fill their tanks based on price and convenience. The buyers of gasoline are likely to be well informed about prices because gas prices are continually posted at all of the different stations.

The market for gasoline is highly competitive. There are many buyers and sellers even in a relatively small community, and none of these market participants trades more than a small fraction of the gasoline that changes hands. As a result, no one buyer or seller influences the price of gasoline, or the quantity sold. Rather, the price and quantity sold are determined by the combined actions of all the buyers and sellers in the market. The owner of each gas station knows that there are other stations selling a very similar product, so if the owner raises his or her price above the going price, then customers will go elsewhere. On the other hand, the owner has no reason to lower the price significantly below the going price because this will

FIGURE 1

STEVE'S DEMAND SCHEDULE

PRICE	QUANTITY OF GASOLINE DEMANDED
\$0.50	52.5
\$1.00	50
\$2.00	45
\$3.00	40
\$4.00	35
\$5.00	30
\$6.00	25
\$7.00	20
\$8.00	15
\$9.00	10



Steve's Demand Schedule and Demand Curve for Gasoline

simply reduce his or her income. In much the same way, because each buyer purchases only a small amount of gasoline compared to the total market, no one buyer can influence the price.

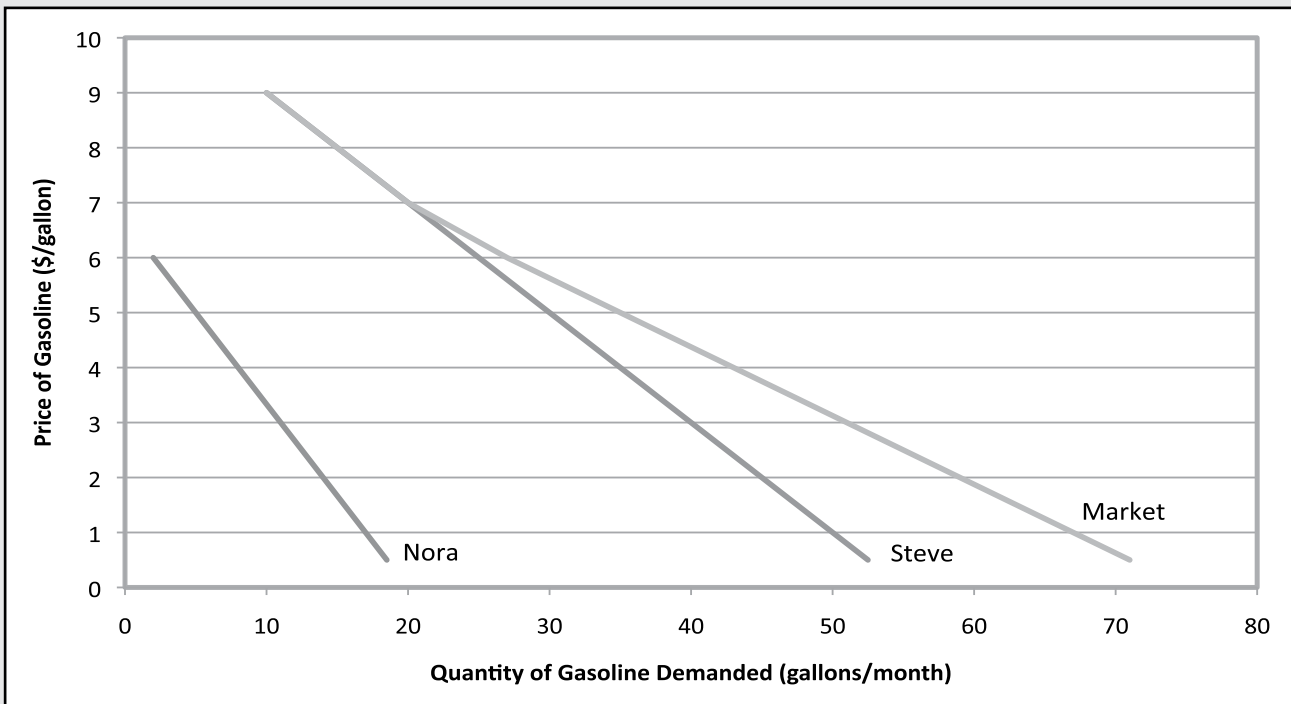
We say that a market is *perfectly competitive* if the good or service being bought and sold is highly standardized, the number of buyers and sellers is large, and all of the participants are well informed about

the market price. In such a market, buyers and sellers know that they can buy or sell as much as they wish without influencing the market price.

While only a few markets precisely conform to the assumptions of perfect competition, many real world markets are characterized by a high degree of competition and can usefully be described in terms of the perfect competition assumption. The market for

FIGURE 2

PRICE	STEVE		NORA		MARKET
0.5	52.5	+	18.5	=	71
1	50		17		67
2	45		14		59
3	40		11		51
4	35		8		43
5	30		5		35
6	25		2		27
7	20		0		20
8	15		0		15
9	10		0		10



Derivation of Market Demand for Gasoline

gasoline is a good example of a nearly competitive market. Unless you live in a very small town, you have probably noticed that the price of gasoline is not precisely the same at different stations. But, the differences in prices are never very large. As a result, many of the lessons we learn from analyzing perfectly competitive markets can be applied to less than perfectly competitive markets. Our analysis of perfect competition will also provide a useful benchmark against which to compare the outcomes of other types of markets.

Demand

The quantity demanded of any good is the amount of that good buyers are willing and able to purchase. This quantity depends on a wide range of factors. One of the most important is the good's price. If the price of the good is higher, buyers will demand less of the good; if the price is lower, then they will demand more. This negative relationship between a good's price and the quantity demanded is called the **law of demand**.

The law of demand is a result of the cost-benefit analysis that rational decision-makers use when deciding how to allocate their resources. As the price of a good increases, the opportunity cost of consuming that good also increases since consumers must cut back on their consumption of other goods to afford the higher price. If, for example, the price of gasoline rises, people will likely find ways to reduce the amount that they drive. They might do this by planning their trips more carefully or choosing to take the bus or ride a bicycle rather than drive.

The table in Figure 1 illustrates how Steve's purchases of gasoline each month depend on the price per gallon. At \$1 per gallon, Steve buys 50 gallons; when the price rises to \$2 a gallon, he cuts back to 45 gallons. If the price rises further, to \$3 a gallon, he cuts back to 40 gallons. This table is called a **demand schedule**.

The graph in Figure 1 shows another way of representing Steve's demand schedule. The downward-sloping line in this graph is called Steve's **demand curve**. Notice that we plot the points of Steve's demand schedule with the quantity demanded on the horizontal axis and the price on the vertical axis. To read this graph, find a price on the vertical axis (say \$3 per gallon) and then draw a line horizontally until it intersects the demand curve. Now draw a line vertically downward from that point until it intersects the horizontal axis. The point at which this line intersects the horizontal axis (40 gallons) is the quantity Steve demands when the price is \$3 per gallon.

When the market price changes, we find Steve's quantity demanded by moving up or down along the demand curve until we reach the height corresponding to the new market price. For example if the price were to rise from \$3 to \$5 a gallon, Steve's quantity demanded would decline from 40 gallons a month to 30 gallons a month. This movement is illustrated in Figure 1 by the arrow pointing up and to the left along the demand curve.

Steve is, of course, just one buyer. To find the market demand schedule, we must add up the quantity that every consumer will purchase at each possible price. Figure 2 illustrates how this process works with two individuals. In addition to Steve, the market now includes Nora. The table in Figure 2 shows that the market quantity demanded is the sum of the quantities that Steve and Nora wish to consume at that price.

The graph shows that we add the two demand curves *horizontally* to obtain the market demand.

Shifts in the Demand Curve

The market demand curve depicts the relationship between the quantity demanded and its price, assuming that all other factors that might influence the quantity demanded remain unchanged. But many other things can influence the quantity demanded. If one of these factors changes, it causes the entire demand curve to shift.

For example, if your community creates a new system of bicycle lanes that make it easier to bike from place to place, the quantity of gasoline demanded will decline at every price. As Figure 3 shows, such a change causes the market demand curve to shift to the *left*, indicating that at each price a lower quantity is demanded. Let's consider some of the most important factors affecting the quantity demanded.

Income

Suppose Steve's employer reduces his weekly hours of work, and thus his income. Because Steve has less **money** to spend on all the things he wishes to buy, he will likely reduce his consumption of gasoline. For most goods, demand is *positively* related to income: when income rises, the quantity demanded rises, but when income falls, the quantity demanded falls. Goods for which this is true are called **normal goods**.

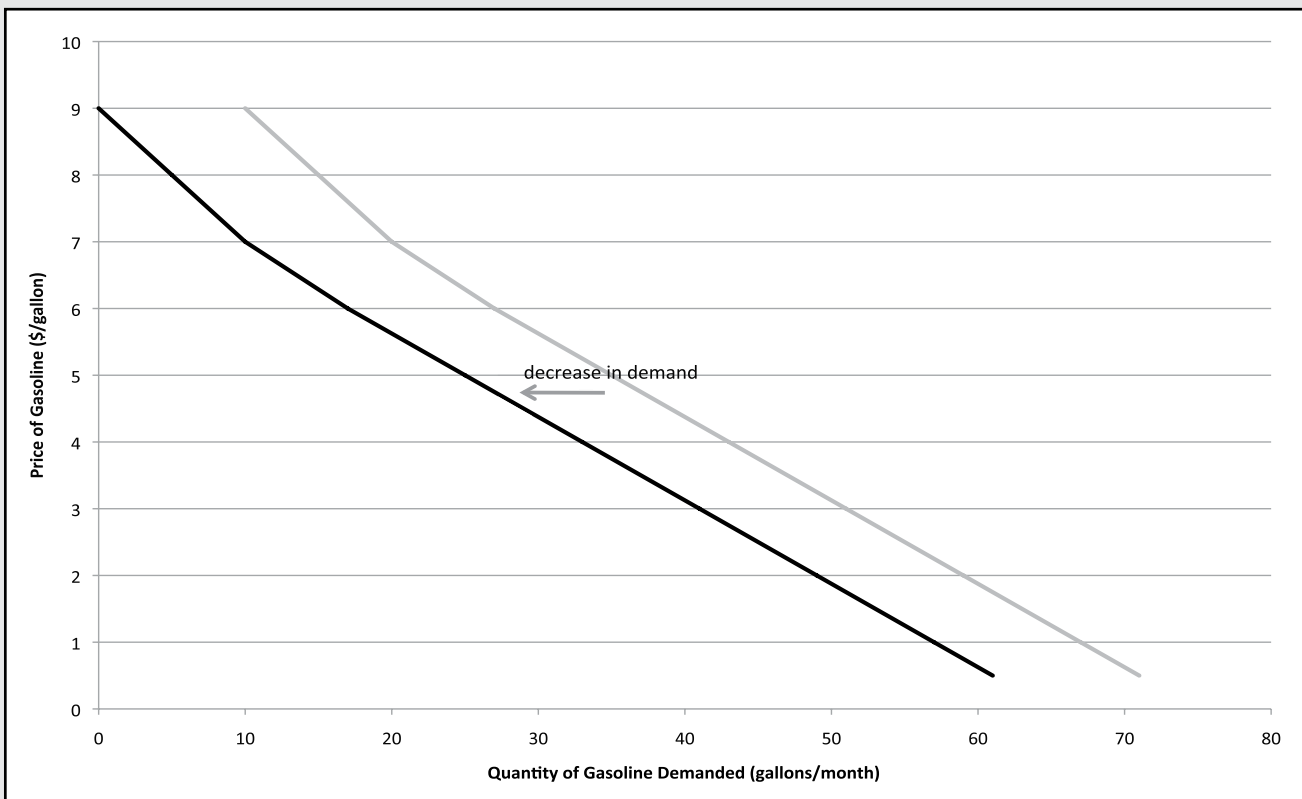
Not all goods are normal goods, however. Goods for which the quantity demanded falls as income rises are called **inferior goods**. Bus rides might be an example of an inferior good. As their income increases, consumers will be more likely to buy a car and drive instead of taking the bus.

The Prices of Related Goods

Suppose that the price of airline tickets falls. The law of demand says that consumers will purchase more airline travel. Because airline travel is to some extent a substitute for travel by car, people will likely reduce the number of miles they drive and hence the quantity of gasoline they demand at any price. When a decline in the price of one good causes a reduction in the quantity demanded of another, we say that these goods are **substitutes**.

Suppose, on the other hand, that the price of automobile insurance falls. Lower insurance costs

FIGURE 3



Effects of a Bike Lane on Demand for Gasoline

make it easier for more people to afford to own automobiles; car ownership will increase and so will the number of miles driven. When a lower price for one good causes demand for another good to increase, we call those two goods **complements**.

Tastes

Remember that the quantity demanded reflects a comparison of the benefits of consumption with the opportunity costs of purchasing the good. If the perceived benefits of consumption change, then so will the quantity demanded. For example, suppose that concerns about the environmental impacts of driving cause people to be more concerned about pollution. The likely impact will be a reduction in the demand for gasoline.

Expectations

Changes that you expect to occur in the future may also affect the quantity demanded. For example, if Steve is afraid that he may lose his job next month,

then he might cut back on his driving now in anticipation of this future change in his income.

Number of Buyers

Market demand is derived by adding up the demands of individual consumers. If there are more consumers, then demand will increase. If your community is growing because people and businesses are moving there, then the market demand for gasoline will be increasing with this growing population.

Supply

The quantity supplied of any good is the amount that sellers of that good are willing and able to produce. Many factors influence the quantity supplied, but the most important is the price that suppliers receive. The higher the price is, the greater the quantity that suppliers will want to produce. This *positive* relation between price and quantity supplied is called the **law of supply**.

The positive relationship between price and quantity

supplied reflects the cost-benefit analysis of rational suppliers. Gasoline station owners compare the benefits of each gallon sold to the opportunity cost of their time, effort, and expense to supply that gallon of gasoline. As the price rises, it will be rational to devote more resources to supplying gasoline. So long as the price they receive exceeds their opportunity cost, they will be willing to supply gasoline. At higher prices, they will be willing to work longer hours, hire additional help, and expand the size of their stations to boost sales. At lower prices, they will cut back on the time they spend supplying gasoline, reduce the number of their employees, or shift their efforts toward selling other products.

Figure 4 illustrates the relationship between price and quantity supplied for Shelly. Again, we plot the price of gasoline on the vertical axis and the quantity supplied on the horizontal axis. Shelly's **supply curve** is upward sloping, reflecting the positive relationship between price and quantity supplied.

The market supply curve is obtained by adding the quantities supplied at each price by all of the suppliers in the market. This is illustrated in Figure 5 for the case where there are two suppliers. Again, we obtain the market supply curve by adding the individual supply curves horizontally.

Shifts in the Supply Curve

The market supply curve shows the quantity supplied at each price, assuming that all other things remain unchanged. There are, however, many other factors that will influence the quantity supplied. A change in any of these factors will cause the supply curve to shift. Let's consider some of the most important factors that might cause the supply curve to shift.

Input Prices

Inputs are any of the things that suppliers have to purchase to supply a product. For example, the price that gasoline stations must pay their suppliers for gasoline is a major cost of doing business. If this price falls, the quantity of gasoline supplied will increase, causing the supply curve to shift to the right. But, there are other inputs that are important as well. These include labor costs, the real estate costs for the land on which the gasoline station is located, and utilities such as electricity. If any of these input costs increases, it will decrease the quantity supplied at every price,

causing the entire supply curve to shift to the left.

Technology

Changes in **technology** can affect how businesses operate and hence the quantity supplied. In the case of gasoline, the shift from full-service to self-service reduces labor costs and increases the quantity supplied. Similarly, pumps with credit card readers further reduce labor costs and increase the quantity supplied.

Expectations

If suppliers expect prices to rise in the future, then they may reduce the quantity they will supply today and store current inventory in expectation of the higher future prices.

Number of Sellers

As more sellers enter the market, the quantity supplied will increase. On the other hand, if a seller decides to leave the market, then the quantity supplied will be reduced.

Equilibrium

What will the price of gasoline be? How many gallons will be sold? To answer these questions we need to put the information about the market demand and market supply together. There is, as we will see, only one combination of price and quantity at which the market is at **equilibrium**, and it is at this point that the market will settle.

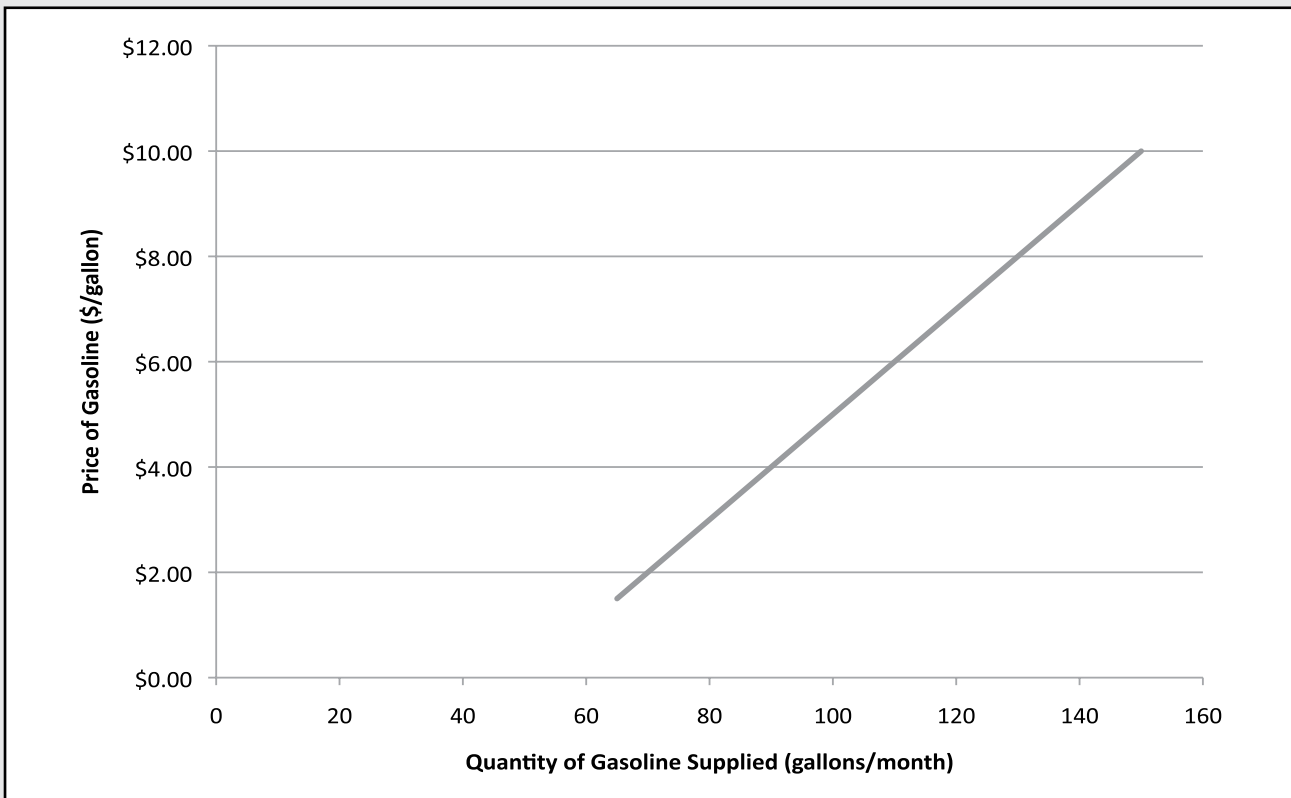
Equilibrium is a widely used concept in both the physical and social sciences. It is defined as a point at which all the forces at work in a system are balanced by other forces, resulting in a stable and unchanging situation. In economics, a market is in equilibrium when no participant in the market has any reason to alter his or her behavior.

The market equilibrium occurs at the combination of price and quantity where the market supply and demand curves intersect. Because the supply curve is upward sloping and the demand curve is downward sloping, there is only one possible point of intersection. Figure 6 illustrates the market equilibrium for gasoline. In this hypothetical example, the equilibrium price is \$2.50, and the equilibrium quantity is 10,000 gallons of gasoline per month.

At this point, we can say that the buyers and sellers in this market are all satisfied, in the sense that buyers are

FIGURE 4

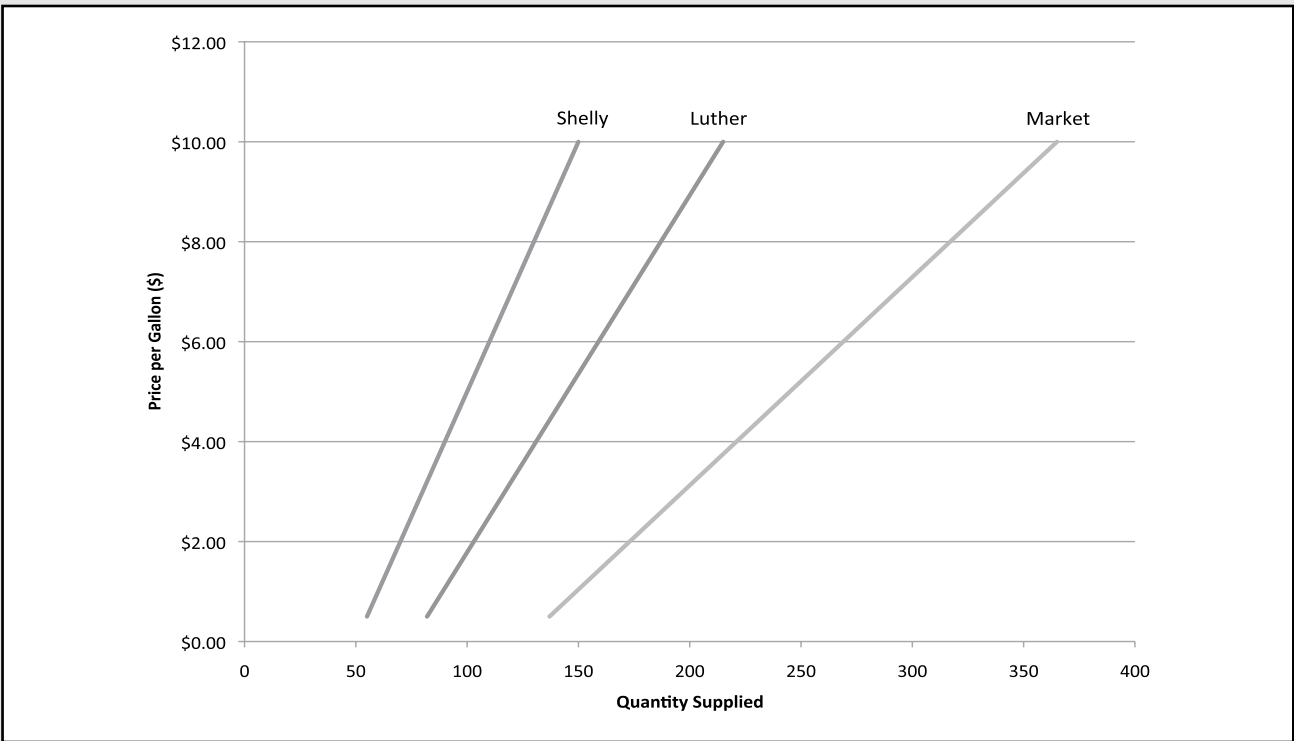
PRICE OF A GALLON OF GASOLINE	QUANTITY OF GASOLINE SUPPLIED
\$1.50	65
\$2.00	70
\$2.50	75
\$3.00	80
\$3.50	85
\$4.00	90
\$4.50	95
\$5.00	100
\$5.50	105
\$6.00	110
\$6.50	115
\$7.00	120
\$7.50	125
\$8.00	130
\$8.50	135
\$9.00	140
\$9.50	145
\$10.00	150



Shelly's Supply Schedule and Supply Curve

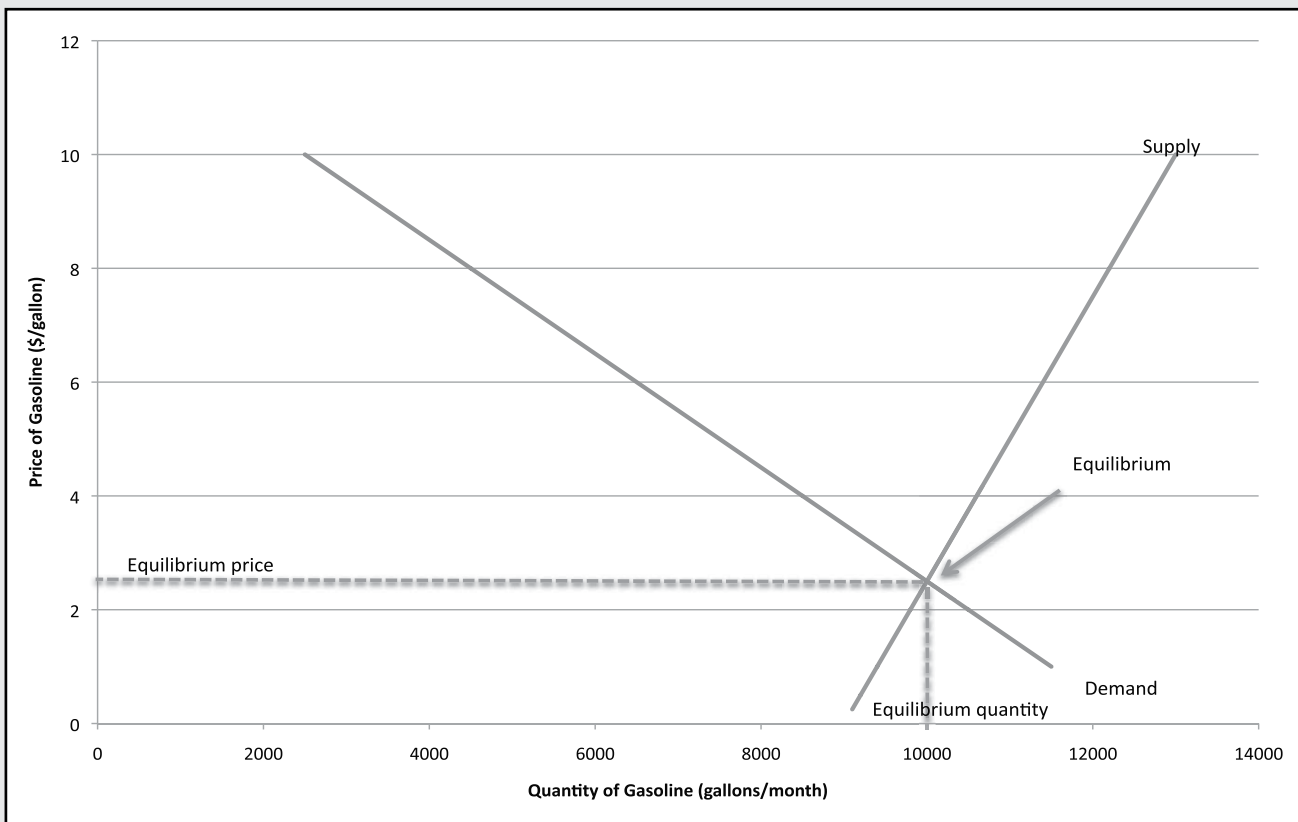
FIGURE 5

PRICE OF A GALLON OF GASOLINE	SHELLY'S QUANTITY SUPPLIED	LUTHER'S QUANTITY SUPPLIED	MARKET QUANTITY SUPPLIED
\$0.50	55	+ 82	= 137
\$1.00	60	89	149
\$1.50	65	96	161
\$2.00	70	103	173
\$2.50	75	110	185
\$3.00	80	117	197
\$3.50	85	124	209
\$4.00	90	131	221
\$4.50	95	138	233
\$5.00	100	145	245
\$5.50	105	152	257
\$6.00	110	159	269
\$6.50	115	166	281
\$7.00	120	173	293
\$7.50	125	180	305
\$8.00	130	187	317
\$8.50	135	194	329
\$9.00	140	201	341
\$9.50	145	208	353
\$10.00	150	215	365



Derivation of the Market Supply Curve

FIGURE 6



Market Equilibrium

able to purchase as much gasoline as they would like at a price of \$2.50 a gallon, and suppliers can sell as much gasoline as they would like at this price. There are, no doubt, buyers who complain that the price of gasoline is too high and would like the price to be lower, and similarly suppliers who complain that the price is too low and would like it to be higher.

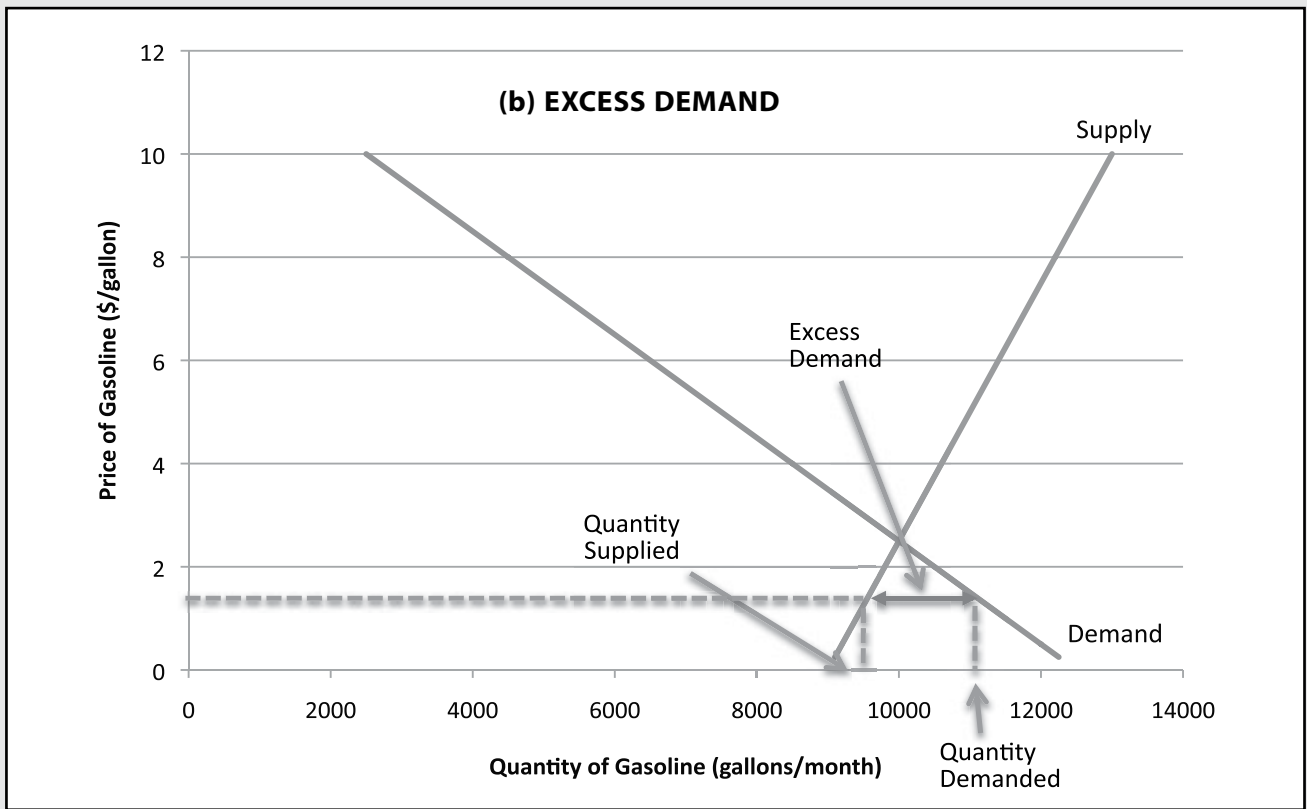
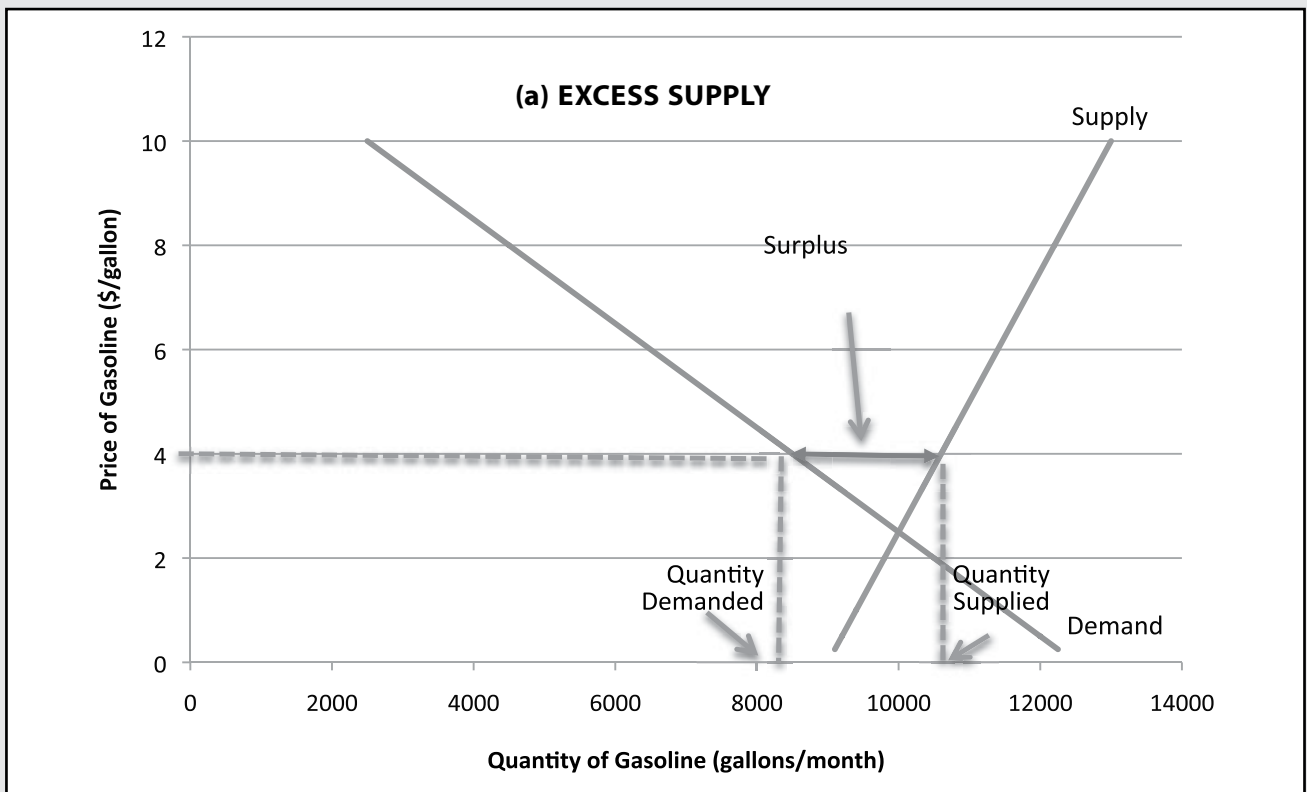
An important feature of market equilibrium is that the market has an automatic tendency to gravitate toward this combination of price and quantity. Figure 7 illustrates this point. We start (Figure 7a) by supposing that the price is higher than \$2.50. At a price of \$4 a gallon, for example, suppliers would like to sell 10,600 gallons, but buyers only wish to purchase 8,500 gallons a month. In other words, there is an *excess supply*. No one can force people to buy more gasoline than they want. Suppliers will find that they have too much gasoline on hand, their storage tanks are filling up, and they cannot unload their inventory.

Under these circumstances, suppliers have an incentive to lower their price a little bit. If one station posts a price of \$3.90 a gallon, it will attract buyers from other stations, and its surplus will be reduced. But once the other stations see that they are losing customers, they will be forced to lower their prices as well. The pressure to cut prices and attract business will not go away until the price has reached the equilibrium level of \$2.50 a gallon.

Now suppose that the price is below the equilibrium price. Figure 7b illustrates this situation. At a price of \$1.50 there is an *excess demand* for gasoline. Buyers wish to purchase 11,000 gallons of gasoline, but suppliers are willing to sell only 9,600 gallons. Now there are shortages: some drivers cannot find any gasoline, and others have to wait in long lines to purchase gasoline.

Buyers might be tempted to offer to pay a little bit extra to be sure to get what they need, and sellers will see they

FIGURE 7



Markets out of Equilibrium

can raise prices without sacrificing sales. The pressure to raise prices will continue until the price has reached the equilibrium level. Only at this point will buyers and sellers have no desire to change their behavior.

The Characteristics of Competitive Market Equilibrium

Competitive markets tend to gravitate toward the equilibrium quantity and price. This is a very important feature of markets and has several desirable consequences. First, competitive markets are an extremely effective method of allocating resources. When the market for a good is in equilibrium, the price conveys important information for potential suppliers about the value consumers place on that good. At the same time, the price informs potential demanders about the opportunity cost of supplying the good. This two-way communication is how markets insure that scarce goods and services are produced at the lowest cost and allocated to the buyers who value them the most highly.

The competitive market equilibrium insures that the available supply goes to those buyers who value the good most highly, and that it is provided by those suppliers who have the lowest costs of supplying the good. This fact leads to the second characteristic of the competitive market equilibrium: it maximizes the benefits buyers and sellers receive from exchange.

Let's begin by considering the benefits buyers receive from participating in the market. The important insight is the height of the market demand curve at each point reveals the marginal buyer's willingness to pay. The marginal buyer is the buyer who, at that price, is just indifferent between buying the good in question or not buying it.

To illustrate this, let's consider the highly simplified example presented in Figure 8. The table lists the amount each of four fans would be willing to pay to purchase a ticket to a Bruce Springsteen concert. The table shows that Barb values attending the concert at \$100, and at any price less than that she will purchase a ticket. The other potential buyers place a lower value on attending the concert.

If the concert promoter sets the price of tickets at \$60, then Steve will not purchase a ticket, since the most he is willing to pay is \$50. The other three consumers will all purchase tickets, but the benefit they receive from being able to purchase the ticket for \$60 varies. Barb

would have paid \$100, so attending the concert produces a benefit valued at \$40 for her. Since Bob was willing to pay \$80, his benefit is \$20, and Sharon's benefit is just \$10. Adding these amounts together, we see that the three purchasers receive a combined benefit of \$70. We call this amount the **consumer surplus** since it is the surplus value that consumers receive.

The demand curve in Figure 8 slopes downward, indicating that as the price falls, more of the fans will be willing to purchase tickets. At any point along this demand curve, its height shows the marginal purchaser's willingness to pay. Because the height of the demand curve measures buyers' willingness to pay, the difference between the height of the demand curve and a horizontal line drawn at the market price measures the consumer surplus for the marginal buyer at each quantity demanded. More generally, we can use the total area below the demand curve and above the market price as a measure of total consumer surplus. This area, then, provides a monetary measure of how much benefit all of the buyers in a particular market receive from participating in that market.

In the same way the height of the demand curve represents buyers' willingness to pay, the height of the supply curve at each quantity supplied measures the willingness to supply of the marginal seller—that is, the seller who would leave the market if the price were any lower. Put somewhat differently, the height of the supply curve measures the opportunity cost to the marginal seller. If the market price exceeds this opportunity cost, the difference is a monetary measure of what is called the **producer surplus**. And we can measure the combined surplus of all suppliers using the area above the supply curve and below the market price as is illustrated in Figure 9.

Combining consumer surplus and producer surplus provides a measure of the total benefits that market participants receive from their transactions. We call this benefit the **total surplus**. One goal of a benevolent social planner should be to maximize this combined surplus, since this is the outcome that produces the greatest overall good. An outcome that maximizes total surplus satisfies the economist's criterion of Pareto efficiency, since at this point there is no way to make anyone better off without reducing the welfare of someone else.

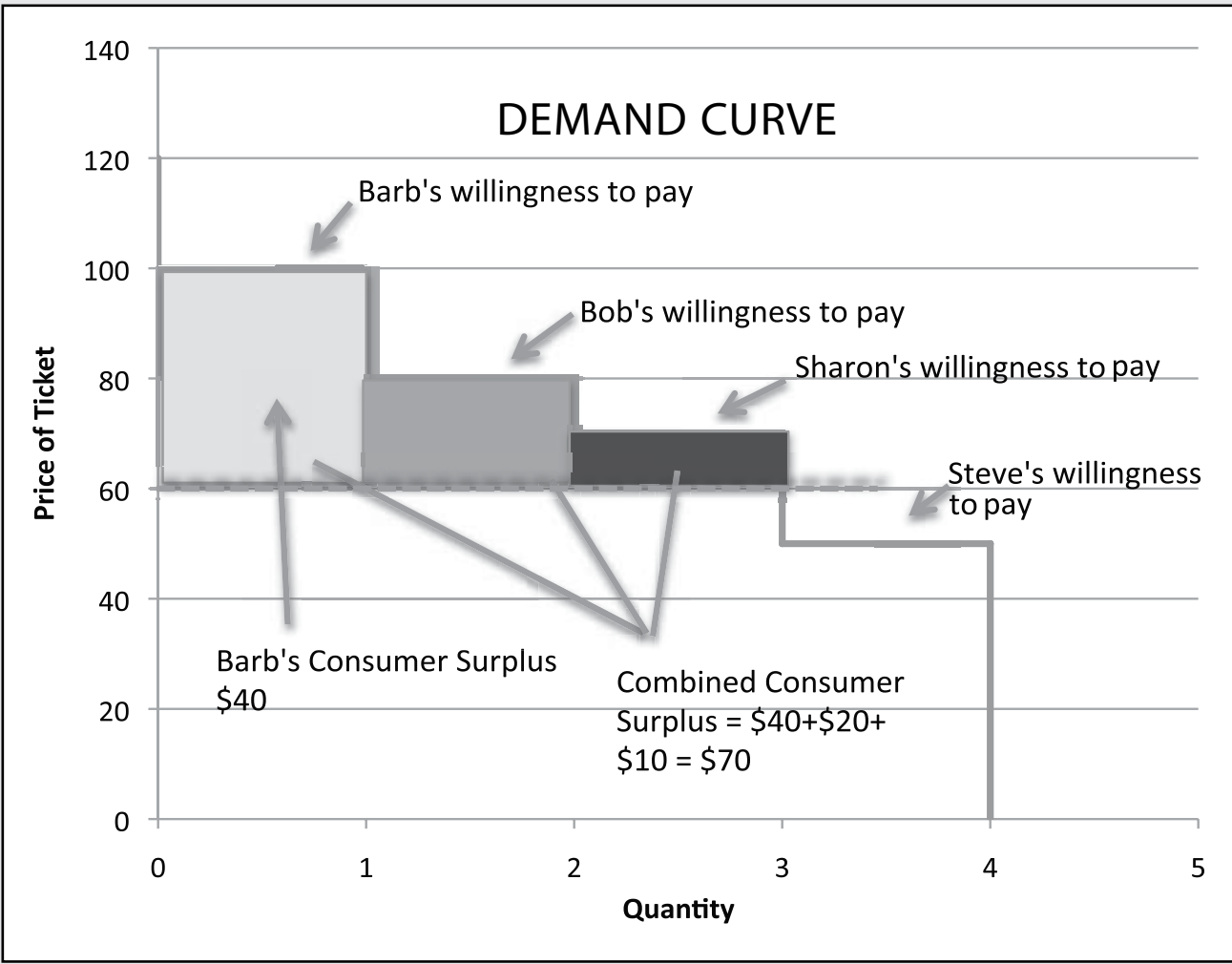
To see that the competitive market equilibrium indeed

FIGURE 8

BUYER	WILLINGNESS TO PAY
Barb	\$100
Bob	\$80
Sharon	\$70
Steve	\$50

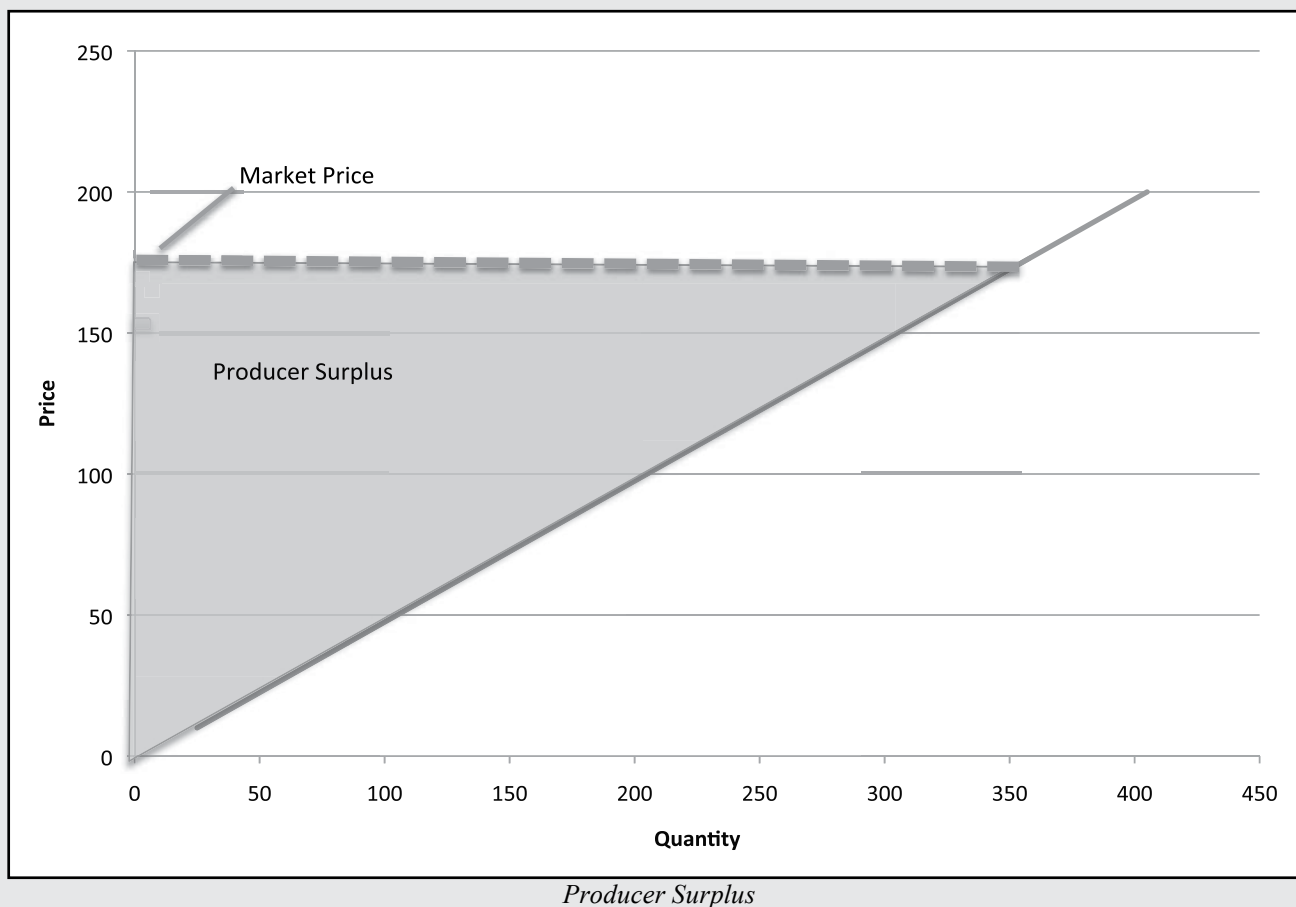
DEMAND SCHEDULE

PRICE	BUYERS	QUANTITY DEMANDED
more than \$100	None	0
\$80 to \$100	Barb	1
\$70 to \$80	Barb, Bob	2
\$50 to \$70	Barb, Bob, Sharon	3
\$50 or less	Barb, Bob, Sharon, and Steve	4



The Demand Curve Represents Buyers' Willingness to Pay

FIGURE 9



meets the efficiency criterion and maximizes total surplus, let's consider Figure 10. Suppose first that a quantity Q_1 , which is less than the equilibrium quantity, was exchanged in the market. At this point, the value of the good to buyers exceeds the cost to sellers of supplying the good. A slight increase in the quantity in such a market would yield an increased benefit to both parties. So Q_1 , or any other point to the left of the market equilibrium, cannot be efficient. Now, suppose that the quantity traded in the market is Q_2 , an amount greater than the equilibrium quantity. At Q_2 the supply curve is above the demand curve, indicating that the cost to producers exceeds the value to consumers. Such an exchange cannot be accomplished voluntarily, but if it did take place, then buyers or sellers would suffer a loss in welfare. Moving to the left would raise overall well-being.

To achieve an efficient outcome, a market planner would need to know the value each consumer places

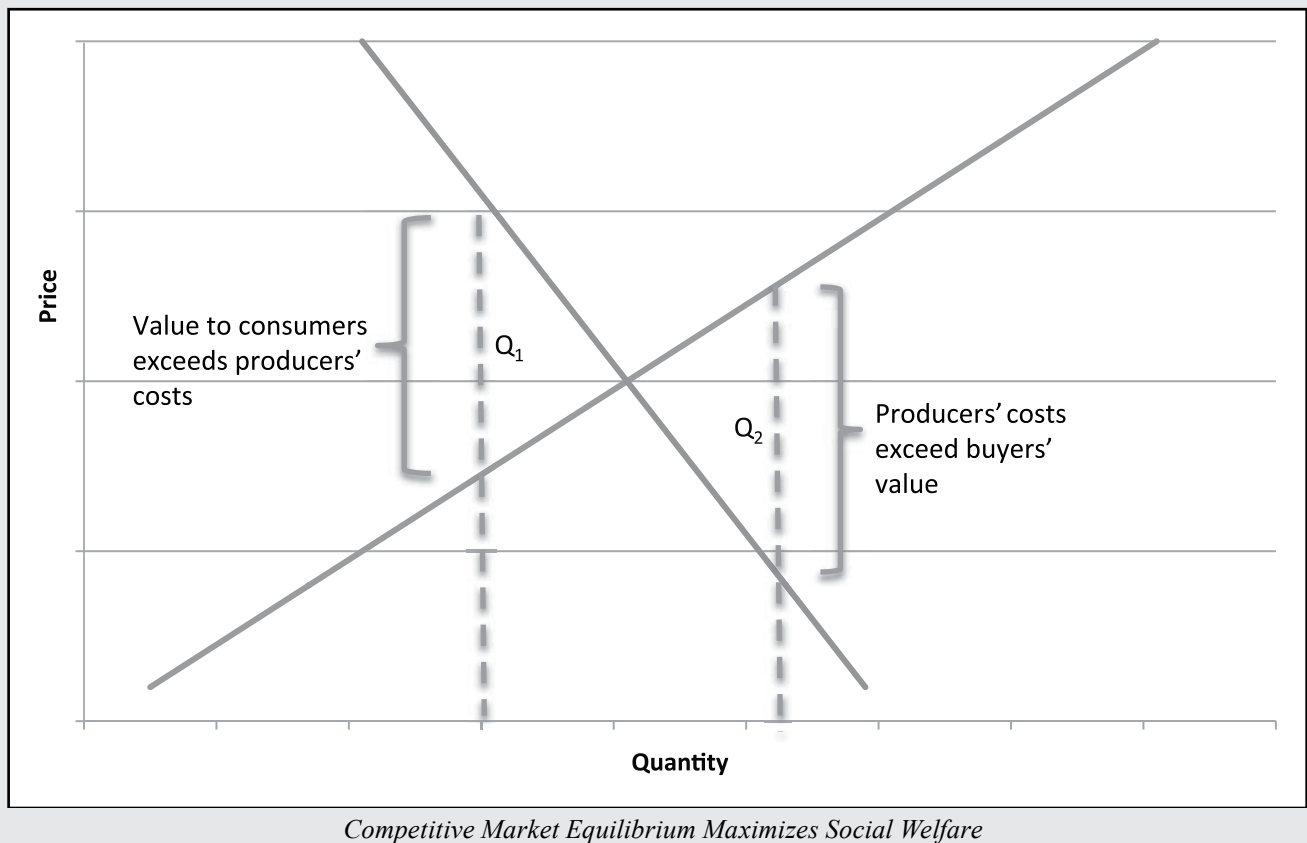
on the good in question, and the cost of producing each unit, and would have to determine how much should be produced, by whom, and to whom it should be given. While such a task would be extremely difficult, a competitive market achieves the same result simply through the self-interested actions of its participants, responding only to the signals provided by the market price.

APPLICATIONS OF THE COMPETITIVE MARKET MODEL

Changes in Market Equilibrium

Now that we have seen how to use the concepts of supply and demand to find the equilibrium price and quantity in a competitive market, we can use our market model to make predictions about how shifts in the economy will affect the market. Let's consider

FIGURE 10



some examples illustrating how the competitive market model can be used to analyze important issues.

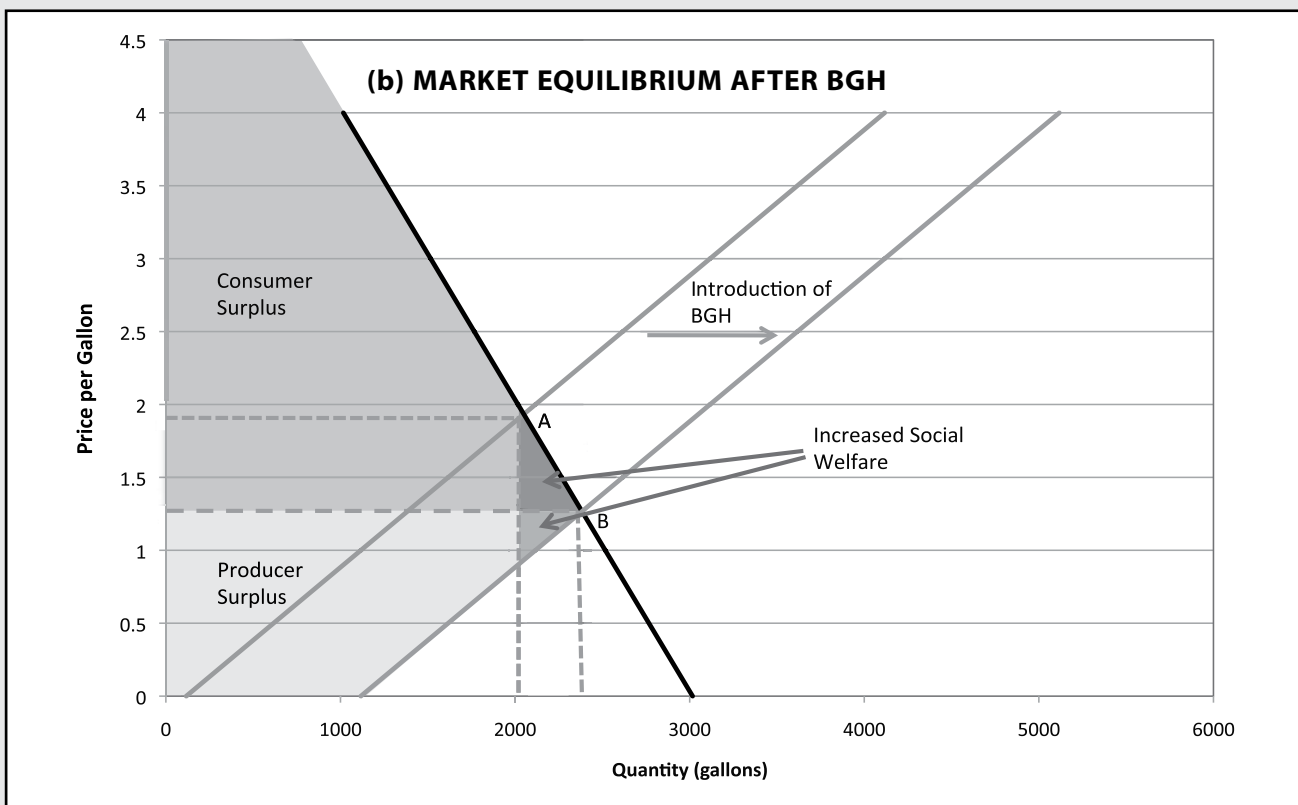
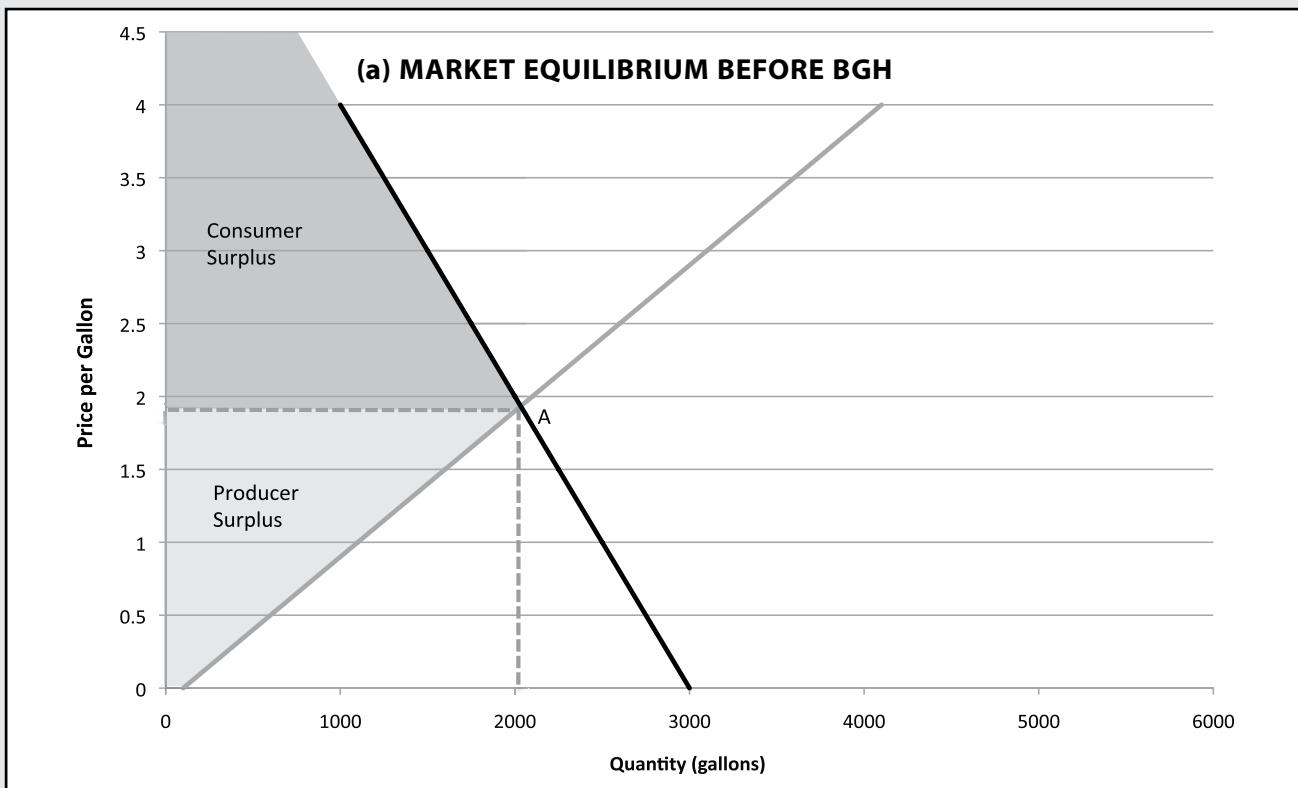
One of the defining characteristics of our modern economy is technological progress. New inventions are continually being developed that allow suppliers to produce more at lower costs. One example is the development of synthetic Bovine Growth Hormone (BGH), which allows dairy farmers to increase milk production by between 10 and 15 percent at little additional cost. The direct effects of this innovation are illustrated in Figure 11. As is often the case, the introduction of a new technology has other, more subtle effects, called externalities, that are not immediately obvious from an analysis of the market that is immediately affected.³ We will discuss how to incorporate externalities into our analysis later in this section of the resource guide.

The first panel shows the market equilibrium before the introduction of BGH. The shaded regions indicate

the consumer and producer surplus at this equilibrium. The introduction of BGH is illustrated in the second panel of Figure 11. This innovation allows dairy farmers to increase the quantity of milk they supply at any price, so the supply curve for milk shifts to the right. As a result, the point at which supply and demand intersect moves down along the demand curve from point A to point B. In the new equilibrium, the price is lower, and the quantity is higher.

It is clear that the total surplus has increased as well, since the shaded area between the supply and demand curves is now larger. Consumers are unambiguously better off as a result of the innovation. Since the market price is now lower, everyone who previously purchased milk receives a larger surplus. In addition, at the lower price consumers purchase additional quantities of milk. The effect on producers is more ambiguous. The increase in sales causes an increase in producer surplus, but the lower price reduces the producer surplus on the quantity that was previously being sold.

FIGURE 11



Effects of BGH on the Market for Milk

Whether producers benefit depends on the balance of these two effects.

Let's consider another example of how shifts in supply and demand affect market equilibrium. Public health officials have long recognized that cigarette smoking is harmful. As a result, policymakers would like to reduce smoking. One approach is to reduce the demand for cigarettes through public education campaigns and the inclusion of warning labels on packages of cigarettes. Assuming that these efforts do in fact cause buyers to demand fewer cigarettes, what is the effect on the market for cigarettes?

The answer can be found by examining Figure 12. To illustrate the effect of public efforts to reduce smoking, Figure 12 shows the demand curve for cigarettes shifting to the left. As a result, the intersection of the supply and demand curves shifts down and to the left along the market supply curve for cigarettes. After this shift, the equilibrium price and quantity both decrease.

Elasticity

The competitive market model we have developed allows us to predict the direction in which equilibrium price and quantity will change in response to changes in market supply or demand. But to fully understand the impact of these changes, it is important to be able to measure the size of the changes in prices and quantities as well as their direction. To do this, we need to introduce the concept of price **elasticity**.

The **price elasticity of demand** measures how much the quantity demanded responds to a change in price. We calculate the price elasticity of demand using the following formula:

$$\text{Price elasticity of demand} = \frac{(\text{Percentage change in quantity demanded})}{(\text{Percentage change in price})}$$

Recall that because of the law of demand, the quantity demanded of a good is negatively related to its price, so this ratio will always be negative. It is conventional to ignore this sign when discussing the elasticity of demand. In other words, in practice, we use the absolute value of the price elasticity of demand.

The price elasticity of demand reflects how responsive consumers are to changes in the price of a good. The greater the elasticity, the greater the proportionate change in the quantity consumers demand due to any

given change in the price. Demand is said to be elastic if a one percent change in price results in a greater than one percent change in the quantity demanded. Demand is said to be inelastic if a one percent change in price results in a less than one percent change in the quantity demanded. And demand is said to be unit elastic if a one percent change in price results in a one percent change in the quantity demanded.

Economists use elasticity because it provides a measure of the responsiveness of demand to price changes that is independent of the units of measurement. For example, if we express the quantity of gasoline demanded in liters, then we will find that the demand curve has a different slope from the one that would result if we measured demand in gallons. However, the elasticity will be the same in both cases.

Measuring the actual elasticity of demand for particular products is an important activity of applied economics. Nonetheless, we can state some general guidelines about the factors that influence the price elasticity of demand.

- ◆ **Substitutes.** Goods with close substitutes will tend to have relatively high price elasticities of demand because it is easy for consumers to switch from one product to another. For example, the price elasticity of demand for a particular cola drink is likely quite high because consumers can easily switch to a different brand if the price rises. Conversely, when there are no close substitutes, the price elasticity of demand will tend to be lower.
- ◆ **Necessities.** Items that are regarded as necessities will generally have lower price elasticities of demand than luxuries. Many people must drive to and from work and use their cars to run important errands. As a result, the demand for gasoline has a low price elasticity of demand.
- ◆ **Market Definition.** The price elasticity of demand will depend on how we define the market. The broader the market definition, the fewer close substitutes there will be and the lower the elasticity of demand. The price elasticity of demand for soft drinks will be lower than the price elasticity of demand for any particular brand of cola drink.
- ◆ **Time Horizon.** Fully adjusting to changes in prices may take time. Take the example

of gasoline prices considered earlier. At first there is not much people can do to reduce their consumption when the price of gasoline rises. But, over time people will buy more fuel-efficient cars, move closer to their work, and make other changes that will allow them to more significantly reduce their demand.

Elasticity is related to the slope of the demand curve. If two demand curves pass through the same point, the curve that is flatter will have a higher elasticity. It is important to note that as we move down along a linear demand curve, the elasticity will be falling continuously. To see this, note that a linear demand curve must have a constant slope $\Delta P/\Delta Q = e$, (where we use the Greek letter Δ to denote the change in price and quantity along the demand curve). The ratio $\Delta Q/\Delta P = 1/e$, is also a constant.⁴ Consequently the elasticity of demand is equal to $(1/e) \cdot (P/Q)$. As we move down and to the right along the demand curve, P is falling and Q is rising, so the ratio P/Q must be decreasing. Since $1/e$ is constant, the elasticity must also be falling.

Figure 13 shows five different possible demand curves illustrating the range of possible elasticities. In the extreme case (a) demand is *perfectly inelastic*; the quantity demanded does not depend on price at all. The remaining panels show progressively more elastic cases: (b) inelastic, (c) unit elastic, (d) elastic, and the other extreme case (e) *perfectly elastic*, where the demand curve is completely flat.

The price elasticity of supply is defined analogously to the price elasticity of demand. It is calculated as:

$$\text{Price elasticity of supply} = \frac{\text{(Percentage change in quantity supplied)}}{\text{(Percentage change in price)}}$$

The elasticity of supply reflects the ease with which suppliers can alter the quantity of production. We can establish some general guidelines that allow us to identify factors that are likely to affect this responsiveness.

- ◆ **Ease of entry and exit.** If it is easy for new businesses to begin supplying a product or for those in the market to leave, then supply will tend to be more elastic. The supply of airline flights on a particular route is quite elastic because airlines can easily shift planes from one route to another to respond to changes in prices.

- ◆ **Scarce resources.** If an input required to produce a good is scarce, then the supply will be inelastic. For example, the supply of beachfront vacation homes is highly inelastic because the amount of beachfront property is limited.
- ◆ **Time horizon.** The longer the time horizon is, the greater the elasticity of supply will be. Over short time horizons, firms may not be able to hire and train additional workers or add the necessary equipment to increase production. Over a longer horizon, they can do this more easily.

As was the case with the price elasticity of demand, if two supply curves pass through the same point, the flatter curve will be the more elastic one. Figure 14 illustrates the variety of possible supply curves. Again there are five cases. In the extreme case (a) the supply is *perfectly inelastic*, indicating that the quantity supplied will not change at all as the price changes. The supply of Van Gogh sunflower paintings is perfectly inelastic since there is no way to produce more of these. The remaining cases illustrate (b) inelastic supply, (c) unit elastic supply, (d) elastic supply, and the other extreme case (e) *perfectly elastic supply*.

Using Elasticity

To see how measurements of elasticity can be used, let's return to the example of the introduction of Bovine Growth Hormone that we considered earlier. As a starting point, we need to consider how the elasticity of demand affects **total revenues** available to producers in this market.

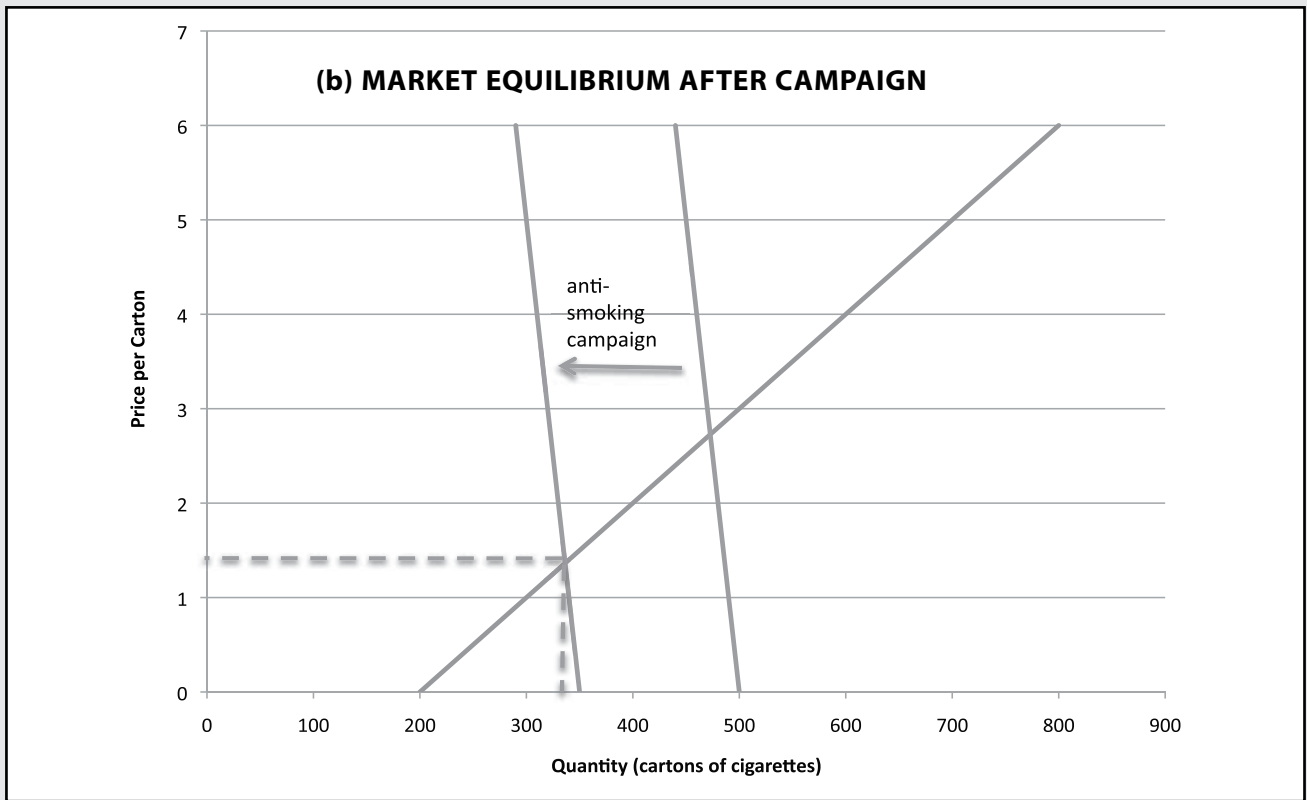
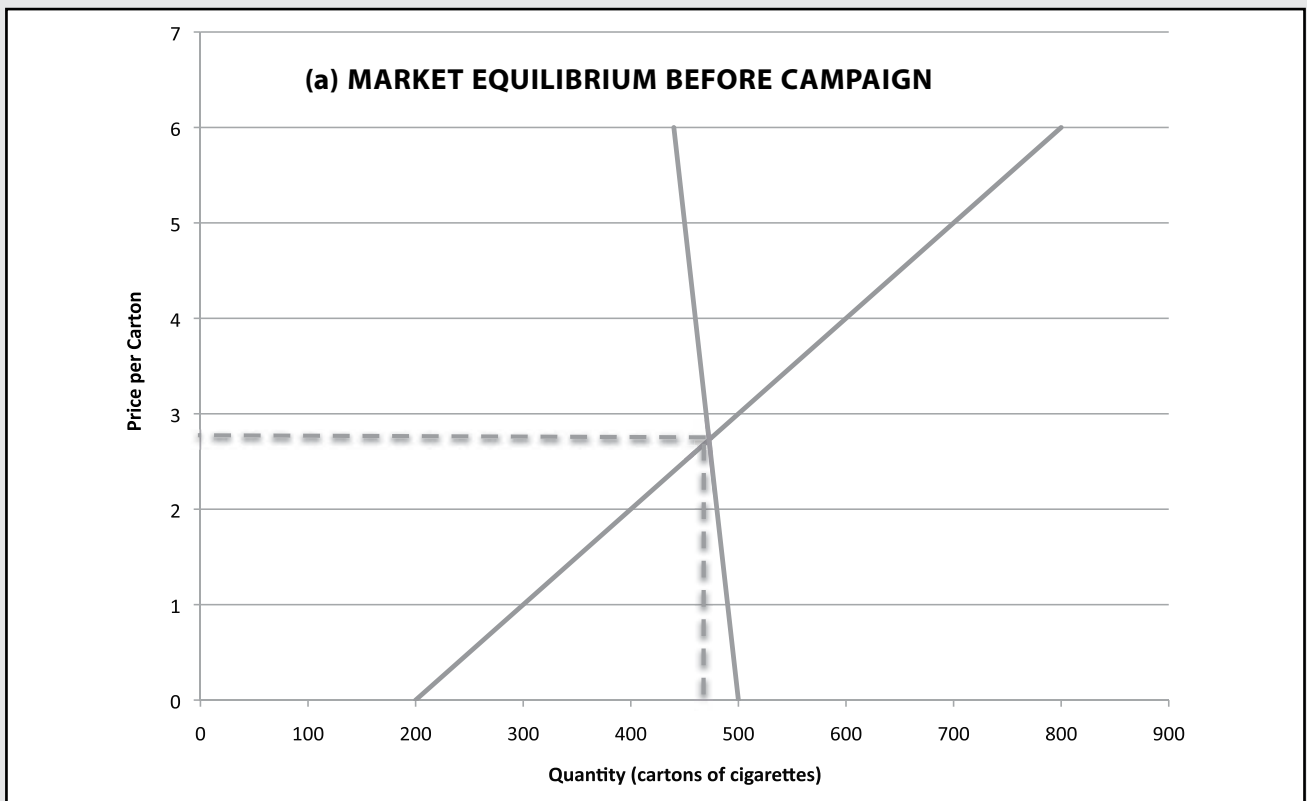
Total revenue is the equilibrium price multiplied by the equilibrium quantity:

$$\text{Total Revenue} = P \times Q$$

The total revenue can be depicted graphically as in Figure 15. As the price falls, we move down along the demand curve: the height of the box is reduced as its width increases. If the demand is elastic, total revenue will increase since the proportionate change in quantity will be greater than the proportionate increase in the price. But, if demand is inelastic, then total revenue will decrease when prices fall.

Empirical estimates suggest that the demand for milk is relatively inelastic. Milk is a necessity, and it does not have many close substitutes. As a result, declining

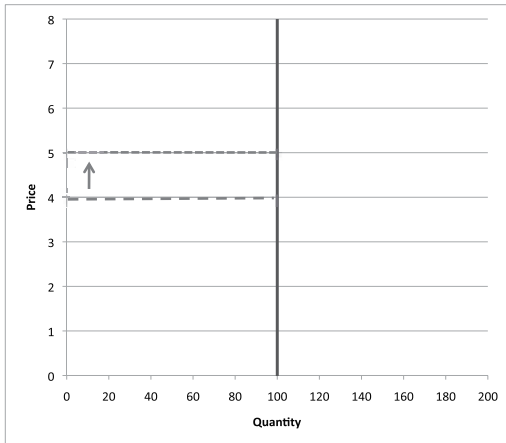
FIGURE 12



Effects of a Reduction in Market Demand

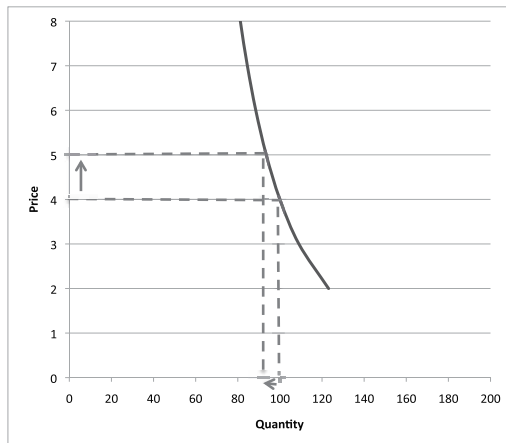
FIGURE 13

(a) PERFECTLY INELASTIC



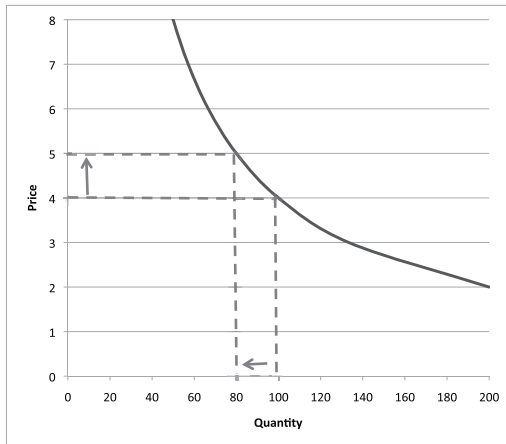
A 22% increase in price and no change in quantity.

(b) INELASTIC DEMAND: ELASTICITY IS LESS THAN 1



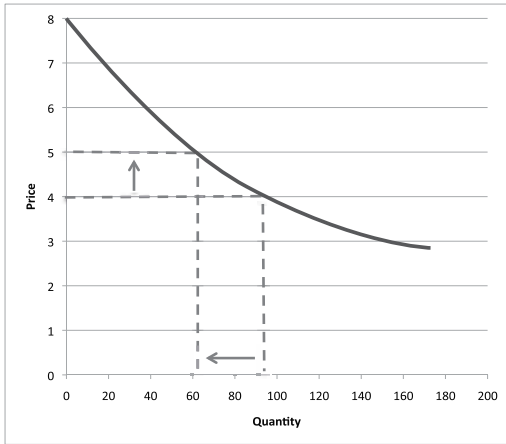
A 22% increase in price leads to a 7% reduction in quantity.

(c) UNIT ELASTIC DEMAND: ELASTICITY EQUALS 1



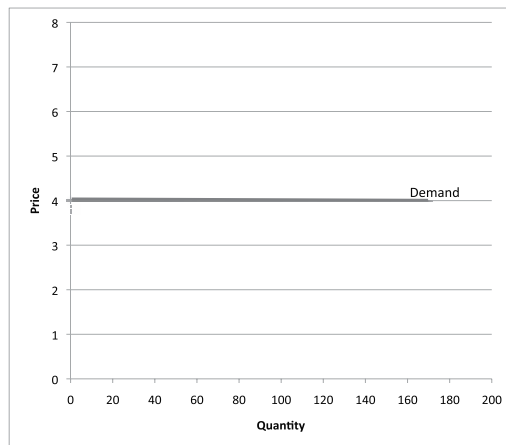
A 22% increase in price leads to a 22% reduction in quantity.

(d) ELASTIC DEMAND: ELASTICITY IS GREATER THAN 1



A 22% increase in price leads to a 44% decrease in quantity.

(e) PERFECTLY ELASTIC DEMAND: ELASTICITY EQUALS INFINITY



At \$4, consumers will buy any quantity; if the price is above \$4, they will buy none, and if the price is below \$4, they will buy an infinite quantity.

The Price Elasticity of Demand

prices do not induce a large increase in the quantity demanded. On the other hand, the supply of milk is relatively elastic over a time horizon of a year or more. There are a great many dairy farms, and it is easy for these farms to expand or contract their production.

In Figure 15, the demand curve is drawn as inelastic at the initial price and quantity pair. As the price of milk falls from an initial level of \$2 a gallon to \$1.50, the quantity demanded per day rises only from 2,000 gallons to 2,250. In this case, the price has fallen by 25 percent, and the quantity demanded has increased by just 12.5 percent, which implies an elasticity of -0.5 ($= 12.5 / -25$). As a result, total farm revenue falls from \$4,000 to \$3,375. In aggregate, dairy farmers are now earning significantly less revenue than before.

If using BGH reduces farm income, why do dairy farmers adopt this technology? The answer is that in a competitive market they have no choice. Each farmer supplies only a small amount of the total output, and his or her choice about whether to use BGH has no effect on the market price. Given the existing market price, each farmer can increase his or her sales by using BGH. As a result, competition causes them to all adopt the technology, increasing the market supply and driving down prices.⁵

As farm revenue falls, it is likely that some farmers will choose to cease producing, allowing the remaining farmers to maintain or increase their standard of living by producing a greater quantity. This is, in fact, more or less what has happened in the farm sector over the past two hundred years. Successive technological innovations have increased the ability of farmers to produce greater quantities of crops, though this advance has been accompanied by a steady decline in the number of farmers.