Answers to Thinking Critically Questions

1. When economists assume that people are rational, they assume that people use all available information as they act to achieve their goals, weighing the benefits and costs of each action and choosing an action only if the benefits outweigh the costs. By not changing jobs or retiring, these physicians have decided that economic and financial uncertainty have made the prospect of moving or retiring riskier and, therefore, moving or retiring has a higher cost than remaining in their current positions.

2. In developing an economic model, economists generally follow these five steps:
   1. Decide on the assumptions to use in developing the model.
   2. Formulate a testable hypothesis.
   3. Use economic data to test the hypothesis.
   4. Revise the model if it fails to explain well the economic data.
   5. Retain the revised model to help answer similar economic questions in the future.

The primary assumption you would probably make is that the physicians are interested in being financially stable when they do choose to retire. The article states that insurance reimbursement rates are declining, so your hypothesis might be that the decline in insurance reimbursement rates is directly related to the decline in the retirement rate of physicians. You would need to collect data on the changes in insurance reimbursements that doctors have received over several years as well as the actual retirement rate of doctors over those same years. You would also want to look at additional information, such as regulatory changes, medical malpractice insurance rates, and potential changes in the industry due to health care reform, and use this information to revise your model if the original model fails to explain well your original data. Once you have a model that does explain your economic data, you would retain that model and use it to help answer additional, similar questions in the future.

1.1 Three Key Economic Ideas (pages 60–64)

Learning Objective: Explain these three key economic ideas: People are rational, people respond to incentives, and optimal decisions are made at the margin.

Review Questions

1.1 Marginal analysis is the analysis of economic decisions at the margin of performing a particular economic activity—such the consumption or production of one additional unit of a
commodity—and comparing the marginal costs and benefits associated with such an activity. Rational economic agents will always make optimum decisions at the margin, where marginal benefits and costs may be traded off against one another.

1.2 Scarcity is the situation in which unlimited wants exceed the limited resources available to fulfill those wants. Economics is the study of the choices consumers, business managers, and government officials make to attain their goals. Scarcity is central to economics because scarcity requires people to make choices about how to use their resources to best fulfill their wants.

Problems and Applications

1.3 As noted in the chapter, the economic incentive to banks is clear—it is less costly to put up with bank robberies than to take these additional security measures.

1.4 a. An effective grading system is important because students respond to economic incentives when deciding how to study a course. Such a system would ensure that students study the course appropriately and get the most out of it.

b. Students would probably respond by working hard towards the end of the semester and by focusing on questions that are more likely to appear in the assessment. They would be less likely to read regularly through the term.

c. A grading system which rewards students who read ahead of a class and who actively participate in classroom discussion could encourage students to participate.

1.5 Health insurance lessens the incentive for employees to improve or maintain their health, which increases medical expenses and, therefore, health insurance premiums paid by corporations and universities. The wellness programs corporations and universities use give employees an additional incentive to stay healthy, which reduces medical expenses and ultimately health insurance premiums.

1.6 a. Obese workers tend to suffer more medical problems than do people who are not overweight and so incur higher medical costs. The higher medical costs increase the health insurance premiums that firms must pay for the employer-provided health insurance, which raises the firm’s costs. In essence, obese workers, at the same wage, raise the costs of a firm more than workers who are not obese. Paying lower wages to obese workers helps firms to offset these higher costs.
b. Bhattacharya and Bundorf found that firms that provide health insurance pay lower wages to obese workers than to workers who are not overweight, but that firms that do not provide health insurance pay obese workers the same as workers who are not overweight. These findings imply that obese workers incur higher medical costs, pushing up health insurance premiums, and would be consistent with the idea that health insurance provides people with an incentive to become obese.

1.7 If you can charge $3 more per ticket for a 3-D movie, then you must sell 25,000 tickets to 3-D movies to cover the additional $75,000 equipment cost ($3 per ticket \times 25,000 tickets = $75,000). If you believe you will be able to sell at least 25,000 additional tickets for 3-D movies, then you will be able to cover your additional cost of equipment, and the investment is a good idea. For any tickets sold beyond the first 25,000, the marginal benefit will be greater than the marginal cost and your profits will increase. Given that since 2009 the proportion of total box-office spending on 3-D movies has been relatively flat, you would want to be careful not to overestimate the number of additional tickets you will sell for 3-D movies, and you might be concerned about whether you will be able to continue to charge $3 more per ticket.

1.8 Jill is correct because profit equals revenue minus cost, so the additional revenue minus the additional cost will equal the additional profit.

1.9 The friend’s reasoning is faulty because she is not making an optimal decision about fixing the car at the margin. The money that has already been spent on fixing the car should have no effect on her decision to spend more money. Instead, she should evaluate whether an investment of $500 in the car is likely to generate benefits in terms of using the car again.

1.10 A complete explanation for the connection between majoring in economics and success in business would involve many factors. But we can say that economics teaches us how to look at the trade-offs involved in every decision we make. Those who cannot understand the costs of an action and weigh them against its benefits are unlikely to make good decisions. Climbing the corporate or governmental ladder requires making a wider and wider array of such decisions.

The Economic Problem That Every Society Must Solve (pages 64–68)
Learning Objective: Discuss how an economy answers these questions: What goods and services will be produced? How will the goods and services be produced? Who will receive the goods and services produced?
Review Questions

2.1 The opportunity cost of an economic activity is the cost of the highest-valued or next-best alternative to that economic activity.

2.2 In market economies, economic decisions are taken in the marketplace through the interaction of different economic agents. In centrally planned economies, these decisions are taken by a single decision-making authority—typically, the government. Finally, in mixed market economies, decisions on what to produce and how to produce are often left to the marketplace, but the government may intervene to influence the distribution of goods and services that are produced.

2.3 Voluntary exchange is a situation in a market economy where both buyer and seller are made better off after a mutual transaction. An efficient market is one that is characterized by voluntary exchange up to the point where no one person can be made better off without somebody being made worse off—an efficient outcome.

2.4 Market outcomes are theoretically efficient but sometimes it can take a long time for markets to arrive at an efficient outcome. Moreover, market outcomes do not ensure any kind of equity in the distribution of income or resources. Governments may intervene either to ensure an efficient outcome in a scenario where markets are taking too long to approach such a scenario or to ensure a more equitable distribution of resources.

Problems and Applications

2.5 All economic agents face scarcity; however, they differ from each other in terms of their preferences for certain goods and services and in terms of their budgets. Bill Gates will have different preferences and a different budget from a poor farmer in Bangladesh. As a result, he will face a very different set of trade-offs.

2.6 In a market economy, all the key economic decisions are taken directly or indirectly by consumers or to satisfy consumer. Firms must produce the goods which consumers want to purchase; in order to compete for customers, they must produce goods at the lowest possible cost; finally, it is consumers who receive the goods and services through payment for their labour and other inputs. The market economy, therefore, theoretically leads to both productive efficiency—where firms produce goods at the lowest possible cost—and allocative efficiency—where the choice of what to produce is based on consumer preferences.

2.7 The modern mixed economy is one where most economic decisions are taken in the marketplace but where the government plays a key role in determining the allocation of resources. The modern mixed economy emerged in the wake of the Great Depression in the
1930s, where high levels of unemployment and poverty forced the governments of many countries, including the United States to take steps to raise the incomes of its poorest people.

2.8 a. It is doubtful that centrally planned economies have been less efficient purely by chance. The underlying reason seems to be that centrally planned economies don’t provide as strong incentives for hard work and innovation as market economies do. In addition, the people running centrally planned economies cannot make the most efficient decisions because they don’t have the information that is in the minds of all the decentralized decision makers in a market economy.

b. You might still prefer having a centrally planned economy if you considered it to be more equitable. (Also, you might prefer a centrally planned economy if you were in charge.)

2.9 A progressive tax system is implemented by a government in most modern mixed economies in order to ensure a fair distribution of resources among its people. Since an economy with a progressive tax system would tend to diverge from a pure market economy, we would expect efficiency to decline, since pure market economies are associated with efficiency. However, countries introduce progressive tax systems because they care about inequity of income distributions.

2.10 If all of an economic system’s resources were devoted to health care provision, then there would be other important goods and services, such as food, housing, clothing, and education that would not be provided. An economic system that provided its citizens state-of-the-art health care but so little food that most were on the verge of starvation, and no housing so that many were sleeping in streets and fields, and no schooling so most were illiterate, would generally be regarded as inefficient and treating the population unfairly be depriving them of such important goods and services. A market economy restricts access to health care, just as it restricts access to all goods and services, by charging a price at which less than an unlimited quantity of health care is demanded.

2.11 a. The groups that are most likely to get the tickets will be those for whom the expected marginal benefits of going to City Hall on Monday morning are greater than the expected marginal costs. These might include people who have a very low opportunity cost of traveling to City Hall and standing in line, such as people who don’t have a job in the morning and those who live or work very close by. These might also include people who see a large benefit from going to get the tickets, such as die-hard NASCAR fans or professional ticket resellers (“scalpers”).
b. The major opportunity cost of distributing the tickets this way is the cost to
the people who attempt to get the tickets—the cost of travel to City Hall, the
activities that cannot be done (such as earning money at work) while standing in
line, and the costs to all those people who try to get tickets but don’t get there soon
enough. There’s also the cost of people blocking traffic in and around City Hall.

c. This isn’t an efficient way to distribute the tickets because it wastes so much
time. Perhaps the most efficient way to distribute the tickets is to hand them out
unannounced to people walking by—this would take only a few minutes.
Alternatively, the city could sell them back to NASCAR and have them distribute
the tickets. Auctioning off the tickets to the highest bidder would ensure that those
who were willing to pay the highest price would obtain the tickets.

d. Equity is hard to define. Some people will see this as equitable, because only
the deserving, true fan will put up with the hassle of getting the tickets. Some
people might also argue that this system is equitable because the tickets are being
distributed for free, making it possible for people with very low incomes to obtain
them. Others will disagree, saying that people with a strong desire to obtain the
tickets, but who are unable to be at City Hall at the designated time, would have no
chance to get the tickets. Other people might argue that the system was not
equitable because no money was raised for the taxpayers of the city, who deserve
to get the benefits of selling the tickets because they fund the police department.

1.3 Economic Models (pages 68–72)
Learning Objective: Understand the role of models in economic analysis.

Review Questions

3.1 Economists use models for the same reason that any other scientist (and indeed
everyone else) does—to make a complicated world simple enough that it can be understood
and analyzed, so that questions about it can be usefully answered. Useful models will
generate testable predictions. If these predictions are consistent with economic data, then the
model isn’t rejected and can be used to understand the economy. Testing models with data
can be very difficult, however, because the economy is always changing, and it is difficult to
conduct controlled economic experiments.

3.2 The scientific method is a way of analyzing empirical evidence and using it to test
hypotheses. In economics, the scientific method is used to develop models of economic
behavior, which are based on certain assumptions. Hypotheses are formulated on the basis of
these models and they are then tested against measurable data. If necessary, the model is then revised and the assumptions reconsidered to better explain economic behavior.

3.3 Positive economic analysis concerns what is; that is, it deals with how the economy actually behaves. Normative economic analysis concerns what ought to be. Economics is mainly concerned with positive analysis—conceptualizing and measuring the costs and benefits of different courses of action. Decision makers (including voters and government officials) can use the trade-offs and costs and benefits identified by positive economic analysis in normatively deciding what course of action should be taken.

Problems and Applications

3.4 Economists assume that people are rational in the sense that their actions are intended to achieve their goals. This does not mean that economists assume everyone is a genius or always makes the “right” decision in every circumstance. It does mean that economists assume that the actions of consumers and businesses reflect their attempts to achieve their goals.

3.5 This statement is largely true. Faulty assumptions underlying a model can lead to inaccurate economic predictions; when the hypotheses of such models are tested, they may turn out to be invalid. However, just because assumptions are used to simplify reality in a model, doesn’t mean that the model cannot give us important economic insights, when those assumptions are correct.

3.6 This statement ought to be a positive statement: one which can be tested in reality. If an experimenter drops a buttered slice of bread repeatedly and counts the number of times it falls buttered side down, she will be able to form a hypothesis about the probability with which it falls buttered side down. This theory is, perhaps, not particularly useful since it is largely used as a normative statement—expressing one’s views on life—rather than as a positive statement about bread.

3.7 It would be helpful to know what role tuition plays in a student’s decision about whether to attend medical school. Have tuition increases had a large effect or a small effect on the number of applications to medical school, particularly for students interested in primary care? How much would paying $50,000 per year during residency affect whether medical students become primary-care physicians or specialists? These economic statistics would help inform the debate, but would not resolve it due to the many normative issues, such as whether people making $200,000 to $350,000 average incomes should be receiving medical school tuition breaks.
3.8  a. Consumers pay restaurants and hardware stores directly for the goods and services they sell, but doctors’ practices get paid indirectly, in many cases by private health care insurers, and the government’s Medicare and Medicaid programs. Private health insurers as well as the federal and state governments set the amount that doctors receive for certain medical treatments. The amount of paperwork that doctors must complete in order to be paid for treating patients has increased in recent years.

b. The costs of running a private practice have increased because of increased paperwork and for other reasons, while the revenue received has often declined as health insurers and the government have reduced the amounts they will reimburse doctors for some procedures. So, the economic incentives have increased for doctors in private practice to switch to being salaried employees of a hospital.

3.9  a. Positive
b. Normative
c. Positive
d. Normative

3.10  a. The system helps protect consumers by providing high-quality training for physicians.

b. This system allows physicians in a specialty to limit the number of physicians in that specialty. Increasing the number of physicians in a specialty is likely to reduce the incomes physicians earn.

c. Occupational licensing is a major topic in economics. While the licensing requirements—in this case the control of the size of residency programs—help ensure high-quality training for physicians, they also are in the self-interest of physicians because the requirements help maintain physicians’ salaries. Given this trade-off, whether the system is a good one is a normative question.
Review Question

4.1 Microeconomics is the study of how households and firms make choices, how they interact in specific markets, and how the government influences their choices. “Micro” means small, and microeconomics deals with individual decision makers. Macroeconomics is the study of the economy as a whole. “Macro” means large, and macroeconomics deals with economy-wide outcomes, such as the inflation rate, the unemployment rate, and the economic growth rate.

Problems and Applications

4.2 a. Microeconomics
   b. Macroeconomics
   c. Macroeconomics
   d. Microeconomics

4.3 This statement is not entirely correct. While the definitions of micro and macroeconomics are reasonably accurate, the two subjects are not mutually exclusive. For example, insights from microeconomics are often used in the formation of macroeconomic theories, particularly when aggregating over many economic agents, each of whom behaves in a manner predicted by microeconomic theories. For instance, employment can be studied as a microeconomic subject—at the level of the firm or the labourer—as well as a macroeconomic subject—studying trends in aggregate labour demand and supply.

SOLUTIONS TO CHAPTER 1 APPENDIX

1A.1 a. The relationship is negative because as price decreases, the quantity of pies purchased increases.
   b.
The slope = ∆y/∆x = rise/run = −1/1 = −1.

1A.2

1A.3 Answers will vary somewhat depending on the values determined from the time-series graph. The calculations below use Ford sales rounded to the nearest thousands.

<table>
<thead>
<tr>
<th>Period</th>
<th>Percentage Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001 to 2002</td>
<td>([(3.411 – 3.774)/3.774]) × 100 = −9.6%</td>
</tr>
<tr>
<td>2002 to 2003</td>
<td>([(3.256 – 3.411)/3.411]) × 100 = −4.5%</td>
</tr>
<tr>
<td>2003 to 2004</td>
<td>([(3.112 – 3.256)/3.256]) × 100 = −4.4%</td>
</tr>
<tr>
<td>2004 to 2005</td>
<td>([(2.967 – 3.112)/3.112]) × 100 = −4.7%</td>
</tr>
<tr>
<td>2005 to 2006</td>
<td>([(2.735 – 2.967)/2.967]) × 100 = −7.8%</td>
</tr>
<tr>
<td>2006 to 2007</td>
<td>([(2.402 – 2.735)/2.735]) × 100 = −12.2%</td>
</tr>
<tr>
<td>2007 to 2008</td>
<td>([(1.915 – 2.402)/2.402]) × 100 = −20.3%</td>
</tr>
<tr>
<td>2008 to 2009</td>
<td>([(1.621 – 1.915)/1.915]) × 100 = −15.4%</td>
</tr>
<tr>
<td>2009 to 2010</td>
<td>([(1.945 – 1.621)/1.621]) × 100 = 20.0%</td>
</tr>
</tbody>
</table>

Sales fell at the fastest rate between 2007 and 2008.
1A.4 Percentage change in real GDP 2008-09 = $(13,088-12,703)/$12,703 = 0.0303 = 3.03%.

This is commonly referred to as the annual growth rate of real GDP.

1A.5

a. 

b. At $2.50, the total revenue equals rectangles $A + B = $250,000 (because $2.50 \times 100,000 = $250,000). At $1.25, the total revenue equals rectangles $B + C = $250,000 (because $1.25 \times 200,000 = $250,000).

1A.6 The triangle’s area = 0.5 \times 60,000 \times $0.75 = $22,500.

1A.7 The slope is calculated using the formula:

\[
\text{Slope} = \frac{\text{Change in value on the vertical axis}}{\text{Change in value on the horizontal axis}} = \frac{\Delta y}{\Delta x} = \frac{\text{Rise}}{\text{Run}}.
\]

At point $A$: rise = 300 − 175 = 125, run = 7 − 5 = 2. Therefore, the slope = 125/2 = 62.5.

At point $B$: rise = 900 − 700 = 200, run = 14 − 12 = 2. Therefore, the slope = 200/2 = 100.
Ch2 SOLUTIONS TO END-OF-CHAPTER EXERCISES

Answers to Thinking Critically Questions

1. In 2009, maximum production is 10,000 Volt powertrains or 10,000 Converj powertrains, so to gain one Volt powertrain, one Converj powertrain must be given up. In 2013, maximum production is 10,000 Volt powertrains or 30,000 Converj powertrains, so to gain one Volt powertrain, three Converj powertrains must be given up. Therefore, the opportunity cost of one Volt powertrain in 2009 is one Converj powertrain, and the opportunity cost of one Volt powertrain in 2013 is 3 Converj powertrains.

2. The production alternative of 25,000 Volts and 10,000 Converjs lies outside the 2013 production possibilities frontier and is therefore an impossible production alternative. The production possibilities frontier represents maximum production, and according to the figure, the maximum number of powertrains that can be produced for use in these vehicles is 30,000. If GM filled the 25,000 Volt orders, it would have only 5,000 powertrains left to use for Converj production. If GM filled the 10,000 Converj orders, it would have only 20,000 powertrains left to use for Volt production.

2.1 Production Possibilities Frontiers and Opportunity Costs

Learning Objective: Use a production possibilities frontier to analyze opportunity costs and trade-offs.

Review Questions

1.1 The opportunity cost of an economic activity is the cost of the highest-valued or next-best alternative that has been given up for this activity. According to this definition, every activity will have some opportunity cost. Since there are no resources that are inherently “free” or non-scarce, there will always be an opportunity cost to the use of any resource in an economic activity.
1.2 A production possibilities frontier (PPF) is a curve showing the maximum attainable combinations of two products that may be produced with available resources and current technology. Points that lie on the curve are technically efficient while points that lie beyond the curve or outside the curve are unattainable with the given set of resources.

1.3 A typical PPF curves outward or away from the origin in a simple graph. This shape reflects the increasing marginal opportunity costs of producing one particular good over another. These increasing costs occur because certain resources are less suited to the production of one good than another; devoting more resources to one good will decrease the payoff from every additional unit of resource that is redeployed. This implies that there are natural limits to economic growth from simply redistributing resources: at some point, the gains from redistribution will run out altogether.

Problems and Applications

1.4 a. The production possibilities frontiers in the figure are bowed to the right from the origin because of increasing marginal opportunity costs. The drought causes the production possibilities frontier to shift to the left (see graph below in part b.).

b. The genetic modifications would shift to the right the maximum soybean production (doubling it), but not the maximum cotton production.

1.5 Increased safety will decrease gas mileage, as shown in the figure below. Trade-offs can be between physical goods, such as cotton and soybeans in problem 1.4, or between less tangible features like mileage and safety.
1.6 The statement is correct. Since there is nothing which is not scarce in an economic sense, there will always be an opportunity cost to the use of an economic resource. The cost of a free lunch would be, to the consumer, the cost of what could have consumed instead of the lunch and to the producer, the cost of the alternative use to which those resources could have been put.

1.7 a. The production possibilities frontier will be bowed out like Figure 2.2 because some economic inputs are likely to be more productive when making capital goods, and others are likely to be more productive when making consumption goods.
b. Because it will have more machinery and equipment, Country B is likely to experience more rapid growth in the future.

1.8 a. Point $E$ is outside the production possibilities frontier, so it is unattainable.

b. Points $B$, $C$, and $D$ are on the production possibilities frontier, so they are efficient.

c. Point $A$ is inside the production possibilities frontier, so it is inefficient.
d. At point B, the country is devoting the most resources to producing capital goods, so production at this point is most likely to lead to the highest growth rate. The more capital goods the country produces, the greater the capacity of the country to produce goods and services in the future.

1.9 a.

If you spend all five hours studying for your economics exam, you will score a 95 on the exam; therefore, your production possibilities frontier will intersect the vertical axis at 95. If you devote all five hours studying for your chemistry exam, you will score a 91 on the exam; therefore, your production possibilities frontier will intersect the horizontal axis at 91.

b. The points for choices C and D can be plotted using information from the table. Moving from choice C to choice D increases your chemistry score by four points, but lowers your economics score by four points. Therefore, the opportunity cost of increasing your chemistry score by four points is the four point decline in your economics score.

c. Choice A might be sensible if the marginal benefits of doing well on the chemistry exam are low relative to the marginal benefits from doing well on the economics exam—for example, the chemistry exam is only a small portion of your grade, but the economics exam is a large portion of your grade; or if you are majoring in economics and don’t care much about chemistry; or if you already have an A sewn up in chemistry, but the economics professor will replace a low exam grade with this exam grade.
If the federal government has a fixed budget for medical research, then the opportunity cost of funding more research on heart disease is the reduction in funding for research on other diseases. The decision should be made at the margin: to maximize the benefits from government spending on medical research, the last dollar devoted to research on heart disease should result in the same marginal benefit—less disease and fewer deaths—as the last dollar spent on research for other diseases. If the additional funding for research on heart disease comes at the expense of other non-medical research expenditures, then the opportunity cost will be different, but a similar analysis should be conducted.

1.10 Any answer is acceptable here as long as the student discusses the need to examine the cost of developing tidal energy plants, the benefits from those plants and alternative uses to which the federal government could put its resources, particularly other sources of alternative energy such as solar or wind energy plants. When deciding to invest in tidal energy, the government must trade off the benefits of more, clean energy against the costs of developing this particular form.

1.11 Nothing is priceless. Every day we make decisions, such as driving a car or flying in a plane, that increase by at least a small amount the chances that we will be hurt or killed. If health and life were literally priceless, every decision we make would have the sole objective of minimizing the chances of our being injured or killed. In a broader sense, we do not devote all of our resources to improving health care because resources devoted to, say, saving lives through medical resources are not available for other needs, such as improving education. We always have to consider the opportunity cost of using resources in one way rather than in another.

1.12 A prospective student should consider the net benefits of a higher salary as a graduate (over and above the salary as a non-graduate) as well as the cost of education and trade the two off against each other. Other factors include the probability that she will get a particular job after college, the potential for change in the labour market over the five years she is in college and the prospect of earnings beyond the ten-year horizon.

1.13 Resources used to reduce pollution are not available for other uses, such as saving lives via medical research, so it is more ethical to take into account the opportunity cost of reducing pollution.

1.14 The behavior of the people of Oz could only be considered rational if there was no scarcity in Oz. In the absence of scarcity, rationality is of limited relevance. However, if there was some form of economic scarcity, then their behavior would not be rational as it does not take into account any opportunity costs in making economic decisions.
Comparative Advantage and Trade

Learning Objective: Understand comparative advantage and explain how it is the basis for trade.

Review Questions

2.1 Both scenarios are possible since absolute advantage measures the cost at which a country can produce a certain good while comparative advantage measures the opportunity cost within that country of producing a certain good.

2.2 By specializing in the production of goods in which countries have a comparative advantage, they are able to increase aggregate production of all tradable commodities. This allows them to consume beyond their PPF at previously unattainable points. By moving beyond their own PPF, countries gain from trade.

Problems and Applications

2.3 In the example in Figure 2.4 the opportunity cost of 1 pound of apples is one pound of cherries to you, and two pounds of cherries to your neighbor. Any price of apples between one and two pounds of cherries will be a fair trading price, and because ten pounds of apples for fifteen pounds of cherries is the same as one pound of apples for 1.5 pounds of cherries, it falls within this range. We could take any other value in this range to complete the table. Let’s take, for example, 1.25 pounds of cherries per pound of apples. We will keep the pounds of apples traded as before at ten. The completed table will now be:

**TABLE 2.1: A Summary of the Gains from Trade**

<table>
<thead>
<tr>
<th></th>
<th>You</th>
<th>Your Neighbor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Apples (pounds)</td>
<td>Cherries (pounds)</td>
</tr>
<tr>
<td>Production and consumption without trade</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Production with trade</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>Consumption with trade</td>
<td>10</td>
<td>(10 \times 1.25 = 12.5)</td>
</tr>
<tr>
<td>Gains from trade (increased consumption)</td>
<td>2</td>
<td>(12.5 - 12 = 0.5)</td>
</tr>
</tbody>
</table>

Note that both you and your neighbor are better off after trade than before trade. Note also that this rate of trading cherries for apples is better for your neighbor than the original rate of trading and worse for you.
2.4  a. Canada has the comparative advantage in making boots. Canada’s opportunity cost of making one boot is giving up one shirt. In the United States, the opportunity cost of making one boot is giving up three shirts. The United States has the comparative advantage in making shirts. In the United States, the opportunity cost of making one shirt is giving up one-third of a boot, but Canada’s opportunity cost of making one shirt is one boot.

b. Neither country has an absolute advantage in making both goods. The United States has the absolute advantage in shirts, but Canada has the absolute advantage in boots. Remember, both countries have the same amount of resources. If each country puts all their resources into shirts, then the United States makes twelve shirts, but Canada makes only six shirts. If each country puts all their resources into boots, then Canada makes six boots, but the United States makes only four boots.

c. If each country specializes in the production of the good in which it has a comparative advantage and then trades with the other country, both will be better off. Let’s use the case in which each country trades half of what it makes for half of what the other makes. The United States will specialize by making twelve shirts and Canada will specialize by making six boots. Since each gets half of the other’s production, they both end up with six shirts and three boots. This means they are better off than before trading, because they end up with the same amount of boots, but twice as many shirts. Other trades will also make them better off.

2.5  Yes, the United States would have benefited from importing those products for which Britain had a comparative advantage, which, in fact, is what happened.

2.6  a. When Spain produces two extra bottles of wine, it produces two bottles less of olive oil. Therefore, Spain’s opportunity cost of one bottle of wine is one bottle of olive oil. When Portugal produces 3 extra bottles of wine, it produces 3 bottles less of olive oil. Therefore, Portugal’s opportunity cost of 1 bottle of wine is 1 bottle of olive oil as well. Neither country has a comparative advantage in producing wine.

b. These countries will not benefit (in cost terms) from trading wine and olive oil because both Spain and Portugal have the same opportunity cost of producing either commodity.

2.7  a. When Germany produces 1 more car, it produces 2 less TVs. Therefore, its opportunity cost of producing cars is 2 TV units. When Japan produces 1 more car, it produces 4 fewer TVs. Therefore, its opportunity cost of producing cars is 4 TV units. With a lower opportunity cost, Germany has a comparative advantage in
producing cars. Similarly, Germany has an opportunity cost of producing TVs of 0.5 cars and Japan has an opportunity cost of producing TVs of 0.25 cars. Therefore, Japan has a comparative advantage in producing TVs.

b. If Germany specializes in the production of cars, while Japan specializes in TV sets, then both countries can be made better off.

<table>
<thead>
<tr>
<th></th>
<th>Before trade</th>
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<th>After trade</th>
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<tr>
<td></td>
<td>Cars</td>
<td>TVs</td>
<td>Cars</td>
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<tr>
<td>Germany</td>
<td>3</td>
<td>6</td>
<td>6</td>
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<tr>
<td>Japan</td>
<td>2</td>
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</table>

Total production of cars and TVs has increased and both economies can now trade the surplus between each other at a rate of between 2 TVs per car and 4 TVs per car.

2.8 By specializing in the production of a good in which a country has a comparative advantage and trading with another country, both countries are able to increase the aggregate production of the tradable commodities. By increasing gross production and then trading good with one another, countries will be able to increase consumption beyond their original level and move beyond the production possibilities frontier.

2.9 Since Sri Lanka is a smaller country with fewer resources than Malaysia, it produces less of both rubber and timber. However, as long as the production of both goods in the two countries has a different opportunity cost, it will be beneficial for both countries to specialize in the good in which they have a comparative advantage and trade with one another. If Malaysia has a demand greater than that which Sri Lanka can supply, then the two it will have to meet the difference in desired consumption by itself. Even if Malaysia produces both goods at a lower cost per unit (has an absolute advantage in the production of both goods), all that is required for trade to take place is a difference in opportunity costs of production within each economy (comparative advantage).

2.10 Following specialization and trade, we know that consumption in both A and B has increased in aggregate. However, A is now specializing in wheat while B is specializing in cotton. Wheat farmers in A will benefit from the increased demand for their goods but cotton farmers will find themselves out of a job and will have to adjust to the new structure of demand. In the short run (which may often last for a very long time, in practice), cotton farmers will be worse off and the benefits from trade will be distributed disproportionately to the wheat farmers. This suggest that while there are aggregate benefits to trade, the distribution of these benefits may be very skewed.
2.11 If countries stop trading with one another, the level of production and consumption in all countries will fall as they return to their original PPFs, associated with closed economies. The reduced output in each country translated into lower household income and consumption on average, and this makes all countries worse off.

2.12 Falling transportation costs allowed people to trade more easily and to specialize on the basis of comparative advantage. If people were able to specialize, they could be more productive and, in turn, earn more income.

2.13 While there are clear aggregate benefits to trade, the distribution of these benefits may be skewed to favour those industries in which a country has a comparative advantage while hurting other industries which are comparatively more expensive. For instance, steel in the United States would lose out to competition from other countries, leading a decline in output in the US and requiring capital and labour employed in steel to be redeployed in other competitive sectors.

### The Market System

**Learning Objective:** Explain the basic idea of how a market system works.

**Review Questions**

3.1 The circular-flow diagram illustrates how participants in markets are linked. It shows that in factor markets, households supply labor and other factors of production in exchange for wages and other payments from firms. In product markets, households use the payments they earn in factor markets to purchase the goods and services produced by firms.

3.2 The factors of production are natural resources, labour, capital and entrepreneurship. Households ultimately supply all factors of production since they own them and eventually earn the rate of return due to each one – rents, wages, return on capital invested and profits.

3.3 A free market is one where all economic decisions are taken within the marketplace where different economic agents interact and the government places no restrictions on economic activity. Flexible prices are the most important feature of free markets since the relative price of goods acts as signal to all economic agents and adjust so as to ensure that productive and allocative efficiency is achieved.

3.4 An entrepreneur operates a business. Entrepreneurs play a key role in the economy by bringing together the factors of production—labor, capital, and natural resources—to produce goods and services for sale. Entrepreneurs decide what to produce and how to produce it. They put their own funds or borrowed funds at risk when they start a business.
3.5 Firms are likely to produce more of a good or service if consumers want more of it. As consumer demand rises, price will rise, which will lead firms to produce more. If demand falls, price will fall, which will lead firms to cut back on production.

3.6 Private property rights are the rights individuals or firms have to the exclusive use of their property, including the right to buy or sell it. If individuals and firms believe that property rights are not well enforced, they will be reluctant to risk their wealth by opening new businesses. Therefore, the enforcement of property rights and contracts is vital for the functioning of the economy. Independent courts are crucial because property rights and contracts will be enforced only if judges make impartial decisions based on the law, rather than decisions that favor powerful or politically connected individuals.

Problems and Applications

3.7 a. Product market; firm supplies the product to households  
b. Product market; firm supplies the product to other firms  
c. Factor market; households supply the factor to firms  
d. Factor market; household supplies the factor to firms

3.8 Adam Smith was making the “invisible hand” argument that, in pursuing their self-interest, business people end up producing the goods and services most desired by consumers.

3.9 The managers in all of these firms just need to know that there is a demand for their individual components and how the components are produced. The manufacturer of the memory chip does not need to know how to manufacture the radio frequency transceiver. The CEO of Blackberry does not need to know the details of how the components are produced but does need to understand which components go into the phone. The CEO does not need to know in detail how the components are assembled in a smartphone but does need to understand the assembly process in general in order to recognize possible areas where efficiency could be improved.

3.10 A guild was an organization of producers which could set prices and determine the quantity supplied of a particular good in the 18th century. Guilds would find it in their interest to increase prices of the goods they supplied and increase their profits. If a government banned the guilds, we would expect prices to fall. Increased competition for customers between the different suppliers who formerly constituted the guild would lead to lower prices.

3.11 A free market system is one where economic decisions are made within a marketplace through the interaction of economic agents and where the government does not
place any restrictions on economic activity. In such a market, relative prices play an important role in signaling information to the different economic agents about the relative scarcity of a good. Relative prices act as an “invisible hand” which ensures that consumer preferences are satisfied (by achieving allocative efficiency) at the lowest possible cost (productive efficiency).

3.12 Adam Smith realized—as economists today realize—that people’s motives can be complex. But in analyzing people in the act of buying and selling, economists have concluded that in most instances, the motivation of financial reward provides the best explanation for the actions people take. Moreover, being self-interested—looking out for your own well-being and happiness—and being selfish—caring only about yourself—are not exactly the same things. Many successful business people are, in fact, generous: donating to charity, volunteering for activities, and otherwise acting in a generous way. This is not inconsistent with making business decisions that maximize profits for their companies.

3.13 Whether self-interest is an “ignoble human trait” is a matter of opinion. There are certainly more noble traits than self-interest, but without at least some self-interest, a person wouldn’t survive. A market system encourages self-interest in the sense that it paradoxically allows people to enrich themselves by fulfilling the needs of others; that is, by producing goods and services that fulfill the wants of consumers.

3.14 a. “Psychic rewards” refer to the psychological benefits of, in this case, buying lottery tickets, which provide the excitement of playing the lottery and the chance of winning big.

b. An entrepreneur might receive the psychic rewards of creating and running his or her own business along with the chance of making large profits.

c. Answers will vary here. Elements of being an entrepreneur do appear to be similar to buying a lottery ticket with the psychic rewards of playing the game along with the possibly of large returns. Other elements may differ, such as the probability of success.

3.15 Intellectual property refers to all creative goods such as books, films, music, innovations in technology or innovations in products. The protection of intellectual property rights through the issue of patents encourages firms and entrepreneurs to invest in developing these new ideas since they can be assured of earning returns from such investment. Therefore, intellectual property rights are associated with a higher rate of technological innovation in an economy and, since technological improvements allow a country to shift its PPF outward, with higher economic growth.
Answers to Thinking Critically Questions

1. A shortage occurs when the quantity demanded is greater than the quantity supplied at the current selling price. Raising the selling price will simultaneously increase the quantity supplied and decrease the quantity demanded until the shortage is eliminated. In the case of tablet computers, if the quantity supplied is limited due to a component shortage, the price would need to increase up to the point where the quantity demanded is equal to the physical quantity that the tablet computer manufacturers are able to supply.

2. The increase in demand will shift the demand curve to the right, from $D_1$ to $D_2$. The shortage of display screens, which resulted in an increase in the price of the screens, will decrease the supply of tablet computers, shifting the supply curve to the left from $S_1$ to $S_2$. All else equal, the increase in demand and decrease in supply will definitely increase the equilibrium price of tablet computers. The equilibrium quantity may increase, decrease, or stay the same, depending on the magnitudes of the demand and supply shifts. On the graph in this solution, the shift of the demand curves is shown as being greater than the shift of the supply curve, so the equilibrium quantity has increased.

3.1 The Demand Side of the Market
Learning Objective: Discuss the variables that influence demand.
Review Questions

1.1 A demand schedule is a table showing the relationship between the price of a product and the quantity of the product demanded. A demand curve is a curve that shows the relationship between the price of a product and the quantity of the product demanded.

1.2 Ceteris paribus means “everything else equal”—that is, holding everything else constant when examining the relationship between two variables.

1.3 A “change in demand” refers to a shift of the demand curve, while a “change in quantity demanded” refers to a movement along the demand curve as a result of a change in the product’s price.

1.4 The law of demand states that, all else being equal, the quantity demanded of a particular good will fall as the price of the good increases. The change in the quantity demanded in response to a price change is divided into a substitution effect – the change in the quantity demanded that results from the change in price – and an income effect – the change in the quantity demanded that results from the change in the purchasing power of the consumer, due to the change in price. Normal goods are those where the income effect is positive – when income increases, consumers increase their purchase of the good. Inferior goods are those goods for which the income effect is negative – when income increases, consumers decrease their purchase of the good.

1.5 Substitutes for a good are goods that can be used in its place while complements are goods that are bought in conjunction with the original good. A rise in the price of a substitute for a good will cause the demand for the good to increase at all prices: the demand curve shifts outward. A rise in the price of a complementary good will cause the demand for the good to decrease at all prices: the demand curve shifts inward.

Problems and Applications

1.6 a. Laptops and cellphones are unrelated, though with smartphones there is a growing market to develop cellphones that are substitutes for laptops as well as cellphones that complement laptops
   b. Substitutes
   c. Complements
   d. Unrelated

1.7 A complement for an app that synchronises music collections could be an app that downloads album and artist details from the internet for music on the phone. A substitute for an android app could be an iPhone app.
1.8 a. Demand curve shifts out  
   b. Movement along the demand curve  
   c. Demand curve shifts in  
   d. Demand curve shifts in  
   e. Demand curve shifts out

1.9 The demand curve for UGG boots has shifted outward. Two variables that could explain this shift include higher incomes and a rise in the price of boots manufactured by rival companies.

1.10 A movement along the demand curve from point A to point B would be caused by a decrease in the price of rib eye steaks. A shift outward of the demand curve from point A to point C could be caused by an increase in the price of chicken or pork, an increase in national income assuming rib eye steaks are normal goods, an increase in the taste (preference) for steaks as a result of a successful advertising campaign, or by other factors increasing demand.

1.11 An increase in income would lead the student to buy a car, since her preference is for reducing her travel time. Therefore, car travel is a normal good for her while bus travel is an inferior good: if her income increases sufficiently, she will stop travelling by bus.

1.12 a. Retirement homes, prescription medication, wheelchairs  
   b. Diapers, formula food, baby toys  
   c. Education services, health services, houses

1.13 China’s one-child policy has increased the relative demand for goods and services consumed by the population over age fourteen and has increased the relative demand for goods and services consumed by boys relative to girls.

1.14 Not necessarily because the data does not allow us to distinguish between a change in quantity demanded and a change in demand. If we assert that the change in quantity demanded is only account of the change in price then the demand curve is downward sloping. However, other factors could have caused a change in the demand for Priuses as well.

1.15 As given by the reporter, Posner’s statement confuses a change in demand and a change in quantity demanded. The reduction in the cost of books—the price of books—will increase the quantity demanded of books. It will not cause the demand curve to shift outward.

1.16 It would be difficult to forecast the demand for a new product because there is little historical data to use to measure the response of consumers. If consumers see tablets as close substitutes for laptop computers, then the future demand for tablets will be larger than if consumers do not see these two products as being close substitutes. The reaction of
consumers in this respect is difficult to predict. In addition, forecasting the demand for tablet computers is particularly difficult due to changing technology in the tablet industry and in the laptop computer and desktop computer industry.

3.2 The Supply Side of the Market

Learning Objective: Discuss the variables that influence supply.

Review Questions

2.1 A supply curve represents the relationship between the price of a good and quantity of it that is supplied by manufacturers. It is typically upward sloping, or the quantity supplied of a good increases with its price.

2.2 A “change in supply” refers to a shift of the supply curve, while a “change in quantity supplied” refers to a movement along the supply curve as a result of a change in the product’s price.

2.3 An increase in the cost of production will reduce the quantity supplied of a good at all prices of the good: causing the supply curve to shift inward. An increase in the price of substitutes in production will lead to increased production of the substitute rather than the original good causing supply to fall and the supply curve to shift inward.

Problems and Applications

2.4 a. This is an increase in quantity supplied as consumer preferences have led to increased demand for ice creams.

   b. This is an increase in supply as more firms enter the market and the supply curve shifts out.

   c. This is an increase in quantity supplied as demand for the good has increased due to higher prices of the substitutes. To some extent, the supply curve could also shift out if firms forecast an extended oil shortage into the future.

2.5 A movement along the supply curve from point A to point B would be caused by an increase in the price of rib eye steaks. A shift outward of the supply curve from point A to point C could be caused by a decrease in the price of feed for cattle, a technological advance in processing steaks, an increase in the number of cattle ranches, or other factors that cause an increase in supply.

2.6 The supply of UGG boots has increased with the supply curve shifting outward. Two factors which could have caused this include a reduction in the price of inputs and technological improvements in the process of distribution.
Changes in technology can change the cost of production, thereby changing the supply of a good. With a technological improvement, the cost of production falls and the supply curve shifts out. A negative technological change would increase the price of production. Negative technological shocks are not very common but can exist; an example is the recent earthquake-tsunami in Japan, which destroyed the equipment of many firms, reducing their productivity.

The break-up of OPEC into several of its constituent suppliers could lead to a decline in the price of oil. The formation of a cartel implies that it is able to raise prices more easily, while several suppliers would compete with one another to drive down prices.

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### Market Equilibrium: Putting Demand and Supply Together

**Learning Objective:** Use a graph to illustrate market equilibrium.

**Review Questions**

3.1 Market equilibrium is a situation in which quantity demanded equals quantity supplied. Competitive market equilibrium is a market equilibrium in a market characterized by many buyers and many sellers.

3.2 In equilibrium, quantity demanded will exactly equal quantity supplied and there will be no surplus or shortage of the good.

3.3 If there is a surplus of a good, prices will fall, leading to higher demand for the good and reduced supply, until the surplus is eliminated. If there is a shortage of a good, prices will rise, leading to reduced demand for the good and increased supply, until the shortage is eliminated.

**Problems and Applications**

3.4 You should disagree. If there is a shortage, firms will raise the prices they charge. The quantity supplied will increase, the quantity demanded will decrease, and equilibrium will be reached at a higher price.

3.5 Begin by drawing two demand curves. Label one “Demand for diamonds” and the other “Demand for water.” Make sure that the water demand curve is much farther to the right than the diamond demand curve. Based on the demand curves you have just drawn, think about how it might be possible for the market price of water to be lower than the market price for diamonds. The only way this can be true is if the supply of water is much greater than the supply of diamonds. Draw on your graph a supply curve for water and a supply curve for diamonds that will result in an equilibrium price of diamonds that is much higher than the equilibrium price of water.
3.6 Begin by drawing two supply curves. Label one “Supply of Mantle autographs” and the other “Supply of Ford autographs.” Make sure that the Mantle supply curve is much farther to the right than the Ford supply curve. Based on the supply curves you have just drawn, think about how it might be possible for the market price of Ford autographs to be lower than the market price for Mantle autographs. The only way this can be true is if the demand for Mantle autographs is much greater than the demand for Ford autographs. Draw on your graph a demand curve for Mantle autographs and a demand curve for Ford autographs that will result in an equilibrium price of Mantle autographs that is higher than the equilibrium price of Ford autographs.

3.7 Yes. When the market is in equilibrium, there is neither a surplus nor a shortage of the good in the economy. As a result, there is no reason for the price to change until the market moves out of equilibrium, due to shifts in the demand or supply curves.

3.8 a. The truck market was not in equilibrium because there was a huge surplus of trucks in the market. At the prevailing price, demand was well below supply.
b. Expected future prices were high at the beginning of the year, which resulted in an outward shift in the supply curve.

c. The slowing of the economy led to a reduction in demand because of lower incomes. The demand curve shifted inward, leading to an oversupply of trucks at the existing market price.

### 3.4 The Effect of Demand and Supply Shifts on Equilibrium

**Learning Objective:** Use demand and supply graphs to predict changes in prices and quantities.

**Review Questions**

4.1 When the demand curve shifts to the right, the equilibrium price and equilibrium quantity both rise. The first graph that follows illustrates this case. When the supply curve shifts to the left, the equilibrium price rises, but the equilibrium quantity falls. The second graph that follows illustrates this case.

![Demand and Supply Graphs](image)

4.2 If the demand curve shifts to the right more than the supply curve does, the equilibrium price will rise. Figure 3.11 (a) on page 144 of the text illustrates this case. If the supply curve shifts to the right more than the demand curve, the equilibrium price will fall. Figure 3.11 (b) on page 144 of the text illustrates this case.

**Problems and Applications**

4.3 The more expensive fuel additives for warm weather and the increased maintenance shutdowns of refineries decreases the supply of gasoline and the increased summer driving increases the demand for gasoline. As shown in the graph below, the decrease in supply and the increase in demand both increase the price of gasoline during the summer.
4.4 With the increased price of corn causing farmers to cut back on soybean crops, the supply of soybeans shifts to the left. As shown in the graph below, the decrease in the supply of soybeans raises the price of soybeans.

4.5 a. 

b.
c. If the EPA agreed to increase the amount of ethanol in gasoline, this would increase the demand for corn, raising the price of corn. The increased price of corn would decrease the supply of tortillas, raising the price of tortillas.

4.6 Because demand is falling, and the exit of some smaller firms will cause supply to fall, the equilibrium quantity will definitely decrease. You cannot tell for certain if the new equilibrium price will be higher or lower than the old equilibrium price. If the decrease in demand is greater than the decrease in supply, the new equilibrium price will be lower. If the decrease in demand is less than the decrease in supply (as is shown on the graph), the new equilibrium price will be higher.

4.7 Draw a demand and supply graph showing the market equilibrium in the winter, label both the demand and supply curves “winter,” and label the equilibrium price created by these curves “winter.” Add to your graph the demand curve for summer, making sure it is to the right of the winter demand curve. Look at the graph to see how the equilibrium price in the summer could be lower than the equilibrium price you have established for the winter. The only way for this to happen is for the summer supply curve to shift to the right by enough to cause the equilibrium price to be lower in the summer than it is in the winter. The demand for watermelon does increase in the summer compared with the spring, but the increase in the supply of watermelon in the summer is even greater, so the equilibrium price falls.
4.8 Draw a demand and supply graph showing the market equilibrium before Labor Day. Label both the demand and supply curves “Before Labor Day,” and label the equilibrium price created by these curves “Before Labor Day.” Add to your graph the demand curve for “After Labor Day,” making sure it is to the left of the “Before Labor Day” demand curve, as the vacationers have gone home. Add to your graph the supply curve for after Labor Day, making sure it is to the right of the “Before Labor Day” curve, because fishing conditions are good. Because demand has decreased and supply has increased (or perhaps stayed the same, if the good fishing conditions are a continuation from the summer conditions), the equilibrium price will definitely go down in the fall.

4.9 a. The apple producer was assuming that apples and bananas are substitutes.
b. The tariff on imported bananas, as shown in the graph below on the left, decreases the supply of bananas, raising the price of bananas. As shown in the graph below on the right, the higher price of bananas increases the demand for apples, raising the price and quantity of apples.

4.10 The student’s analysis is correct. The decrease in demand will decrease the equilibrium price and the equilibrium quantity. The increase in supply will decrease the equilibrium price and increase the equilibrium quantity. The equilibrium price, therefore, will definitely decrease, but the equilibrium quantity could increase or decrease, depending on which change is larger—the decrease in demand or the increase in supply. The graph shows changes in demand and supply of equal magnitude, so the equilibrium quantity does not change.

4.11 Refrigeration allowed for the storage of perishable products. This removed some of the supply during the peak season, shifting the supply curve to the left from $S_1$ to $S_2$ and driving the price up from $P_1$ to $P_2$. During the off-season, the refrigerated supply could be offered for
sale, shifting right the relatively small supply from $S_3$ to $S_4$ and causing the price to fall from $P_3$ to $P_4$.

4.12 a. FALSE. If demand and supply of a product decrease, the equilibrium quantity of a product will also decrease.
   
   b. FALSE. If demand and supply both increase, equilibrium price may remain unchanged if both change by the same amount. Otherwise, the effect on price will depend on the relative changes in demand and supply.
   
   c. FALSE. Increasing demand and falling supply will both cause the equilibrium price to rise.

4.13 The student’s reasoning is incorrect. He should have said: “Increased production leads to a lower price, which increases the quantity demanded. There is a movement along the demand curve, but the demand curve does not shift.”

4.14 The student’s analysis is incorrect—the shift from $D_1$ to $D_2$ will not happen. There will be a movement along the demand curve, $D_1$, due to the price change, but the demand curve will not shift.

4.15 a. 4  
   b. 3  
   c. 1  
   d. 2

4.16 The rising costs will cause the supply curve to shift to the left, from $S_1$ to $S_2$, while the improvement in quality will cause the demand curve to shift to the right from $D_1$ to $D_2$. Because we don’t know if the demand curve shifts to the right more than the supply curve
shifts to the left, we don’t know if the equilibrium quantity purchased will increase or decrease. If the shift in the supply curve is greater, as shown in the figure, the equilibrium quantity will fall. We do know that the equilibrium price of childcare will rise as a result of the regulation.

4.17 The first graph represents the demand for heaters in Antarctica. Since the heaters are essential, the demand for these products is fixed at a certain level and does not respond to changes in price. The second graph represents the demand for Dell computers which is responsive to changes in price. Both supply curves are upward sloping as manufactures of heaters and computers will respond to changes in price.
Answers to Thinking Critically Questions

1. The reduction in supply would shift the supply curve to the left from $S_1$ to $S_2$. The point where supply curve $S_2$ intersects the price ceiling of $1,048.72$ represents the new quantity supplied, $Q_3$, and the shortage of apartments will increase to the difference between $Q_3$ and $Q_2$.

![Graph showing supply curves and price ceiling]

2. The deadweight loss is represented by the shaded triangle in the graph. The deadweight loss is caused by the reduction in economic surplus resulting from the market not being in competitive equilibrium, which in this case would occur at a price of $2,318$. For the deadweight loss to equal zero, the supply curve would have to be vertical, where the same quantity of apartments would be supplied at every price, so rent control would not reduce the quantity of apartments supplied.
**4.1 Consumer Surplus and Producer Surplus**

Learning Objective: **Distinguish between the concepts of consumer surplus and producer surplus.**

**Review Questions**

1.1 Marginal benefit is the additional benefit to a consumer from consuming one more unit of a good or service. The demand curve shows consumers’ willingness to pay for a product. The amount that they are willing to pay for one more unit will equal the extra benefit they will receive from consuming it; therefore, the demand curve equals the marginal benefit curve for consumers.

1.2 Marginal cost is the additional cost to a firm of producing one more unit of a good or service. Supply curves show the willingness of firms to supply a product at different prices. The willingness to supply a product depends on the cost of producing it. The lowest price a firm is willing to accept is the additional cost of making an additional unit of the good; therefore, the supply curve equals the marginal cost curve.

1.3 Consumer surplus is the difference between the highest price a consumer is willing to pay for a good or service and the price the consumer actually pays. It is measured by the area under the demand curve and above the market price for the good.

1.4 Producer surplus is measured by the difference between the price a producer actually receives for a good or service and the minimum price at which the producer is willing to sell
the good. It is measured by the area under the market price for the good and above the supply curve.

Problems and Applications

1.5 Because the frost will cause the equilibrium price to increase and the equilibrium quantity to decrease, consumer surplus will decrease. Before the decline in supply caused by the frost, consumer surplus was equal to areas $A + B + C + D$. After the frost, consumer surplus is equal to area $A$. Price increases, but quantity decreases, so the effect on producer surplus is uncertain. Before the frost, producer surplus was equal to areas $E + F + G$. After the frost, producer surplus is equal to the areas $B + E$. If the value of area $B$ is greater than the value of area $F + G$, then producer surplus will be increased by the frost. If the value of area $B$ is less than the value of area $F + G$, then producer surplus will be decreased by the frost.

1.6 With a fall in supply as measured by an inward shift in the supply curve will lead to a fall in the consumer surplus for the average citizen of the country since prices will now be higher with lower quantities of food bought and sold. The impact on producer surplus will be unclear as the higher prices will increase producer surplus but the lower quantity of goods supplied will reduce producer surplus.

1.7 Consumer surplus equals the total benefit consumers receive from consuming a product minus the price consumers pay for the number of units purchased. Total benefit measures the benefits consumers receive from purchasing the product, without subtracting the amount consumers pay for the product. Consumer surplus would equal total benefit if the price of the product were zero. Producer surplus equals the total revenue firms receive from selling a product minus the cost to firms of producing the amount sold. Total revenue equals the revenue obtained from selling the product, without subtracting the cost to firms of producing
the good. The producer surplus would equal total revenue if the marginal cost of production were zero.

1.8 A vertical demand curve implies that there is no limit to the price consumers are willing to pay, resulting in an infinite consumer surplus. In the markets we have studied up to this point, consumer surplus was always finite.

1.9 Consumer surplus equals the area of the blue triangle or \((73.89 - 36) \times \frac{1}{2} \times 47\) million = $890,415,000, which is approximately, $890.5 million.

1.10 The producer surplus in this market is a rectangle, rather than a triangle (as is typical in most markets). The producer surplus equals \(P \times 15,000\), so all of the revenue is producer surplus because the marginal cost of supplying the concert is zero.

1.11 Total consumer surplus for items bought on eBay is likely to be higher than it would have been if the items had been purchased for fixed prices in retail stores. With an online auction, the winning bid is often lower than the price in a retail store—otherwise, the bidder would presumably have bought the good in a retail store rather than on eBay.

1.12 a. Answer+graph from solutions manual since question in unchanged

b. Filesharing reduces producer surplus because it reduces the quantity of goods supplied to the market as well as the market price that can be supported in equilibrium. In the long run, filesharing could force suppliers of entertainment out of production if the market price is below the lowest price at which firms are willing to supply music.

4.2 The Efficiency of Competitive Markets

Learning Objective: Understand the concept of economic efficiency.

Review Questions

2.1 Economic surplus is the sum of consumer surplus and producer surplus. It is maximized in competitive market equilibrium.

2.2 Deadweight is the reduction in economic surplus that results when a market is not in equilibrium. Since economic surplus is no longer being maximized, as it is in equilibrium, it is considered inefficient.
Problems and Applications

2.3 The statement is correct. Economic surplus is maximized in equilibrium in a competitive market. However, the distribution of surplus between consumers and producers will depend on the features of the market; specifically, the shape and form of the demand and supply curves.

2.4 Mike’s consumer surplus is his willingness to pay less the price he actually pays, which in this case is $20-10 or $10.

2.5 Alice’s producer surplus is the price of her labour less the price she is willing to sell her labour at, which in this case is 20,000-0 = $20,000.

Since Max places no value on a computer game, he will not benefit from a gift card voucher for games and his surplus will be 0.

2.6 The statement is a normative statement. For society as a whole, economic surplus should be maximized for an efficient outcome. Whether the surplus is distributed more to producers and less to consumers is a subjective question.

2.7 Since economic surplus is maximized in a competitive market equilibrium, free market economies tend to be associated with a higher level of economic surplus. Planned economies have not always been able to identify accurately the efficient level of quantity to be supplied and the price, and economic surplus may be lower in such an economy. Economic surplus translates into income gains for society as a whole.

2.8 The deadweight loss is given by the area in the triangle bounded by the demand and supply curves and the vertical line passing through quantities Q₁ (when Q₁ is produced) and Q₂ (when Q₂ is produced).

4.3 Government Intervention in the Market: Price Floors and Price Ceilings

Learning Objective: Explain the economic effect of government-imposed price floors and price ceilings.

Review Questions

3.1 A price floor is a statutorily determined minimum price for a good while a price ceiling is a maximum price. The government introduces floors to protect the interests of certain
producers and ceilings to protect the interests of consumers, to ensure they retain a certain level of surplus.

3.2 A price ceiling will limit the price of a good and increase consumer surplus for those who are able to obtain the good at lower prices. However, it may exclude many individuals from receiving the good at all due to a shortage in the market for the good. For these individuals, consumer surplus might fall.

3.3 A black market is an illegal market to trade a commodity that is subject to a price ceiling at prices above the ceiling. It tends to reduce consumer surplus and increase producer surplus, with an uncertain impact on economic surplus. If the black market is large enough, the market could even return to the competitive market equilibrium, with economic surplus maximized.

3.4 Since the free market equilibrium maximizes economic surplus, any deviation from this equilibrium will reduce surplus and introduce inefficiency. This is true for government interventions which move the market away from equilibrium.

Problems and Applications

3.5  
   a. 28 million crates
   
   b. A surplus of 6 million crates
   
   c. The apple producers will benefit. Their revenue will increase from $8 \times 30,000,000 = $240,000,000 to $10 \times 28,000,000 = $280,000,000.

3.6  
   a. The equilibrium quantity is 100 million crates of kumquats per year and the equilibrium price is $20 per crate. Kumquat producers receive revenue of $2 billion.
b. Consumers will purchase 80 million crates of kumquats. Kumquat producers receive revenue of $2.4 billion.

c. Kumquat producers will receive the revenue in b. plus $30 \times 100$ million crates, for a total of $5.4$ billion. The government will spend $3$ billion purchasing the 100 million crates of surplus kumquats. Or we can calculate directly the total amount kumquat producers will receive as $30 \times 80$ million crates = $5.4$ billion.
3.7  

a. \( P_E \) is the competitive equilibrium price. \( P_F \) is the price floor. \( Q_1 \) is the quantity sold in competitive equilibrium. \( Q_2 \) is the quantity sold with the price floor.

b. Economic surplus without a price floor = \( A + B + C + D + E \). Economic surplus with price floor = \( A + B + D \).

3.8 To determine whether providing a stable income farmers is a good policy goal, government officials must realize that even as they fix producer surplus at a certain level, they reduce consumer surplus for the consumers of dairy products. Any cost-benefit analysis of this policy must take both effects into account. By fixing a minimum price, government can assure a stable income for dairy farmers, as long as demand stays roughly stable. Earned income tax credit is a way to provide dairy farmers with a more dependable income by reducing the tax they have to pay without distorting the price in the economy. The cost of providing a stable income to dairy farmers is shifted directly to the government (and indirectly to society) but no longer falls directly on the consumers of dairy products.

3.9
3.10 The black market has been created in response to the setting of official prices of sugar, which are clearly subject to a price ceiling. Since producers are not willing to sell their product at the price ceiling, they are taking the sugar onto the black market and selling it for a higher price. The presence of the black market will lead to a fall in consumer surplus, since some consumers are forced to buy sugar at a higher price, a rise in producer surplus, since some producers are earning a higher price for their product, and a decline in government revenues because of a fall in tax receipts from the black economy.

3.11  

a. Price = $20, Quantity = 100,000

b. Price = $30, Quantity = 79,200

c. With no medallion requirement, consumer surplus = $A + B + C$, and producer surplus = $D + E + F$. Consumer surplus = \( \frac{1}{2} (10 \times 79,200) + (10 \times 79,200) + \frac{1}{2} (10 \times 20,800) = 1,292,000 \). Producer surplus = \( (10 \times 79,200) + \frac{1}{2} (10 \times 20,800) + \frac{1}{2} (10 \times 79,200) = 1,292,000 \).

d. With the medallion requirement, consumer surplus = $A$, producer surplus = $B + D + F$, and deadweight loss = $C + E$. The consumer surplus = \( \frac{1}{2} (10 \times 79,200) = 396,000 \). The producer surplus = \( (10 \times 79,200) + (10 \times 79,200) + \frac{1}{2} (10 \times 79,200) = 1,980,000 \). The deadweight loss = \( \frac{1}{2} (10 \times 20,800) + \frac{1}{2} (10 \times 20,800) = 208,000 \).
e. The new quantity of taxi rides per day would be 79,200 plus 1,500 × 6, which equals 88,200. Assume with the new quantity of taxi rides that the price per ride falls to $27. In the graph below, consumer surplus increases by the sum of areas \( G \) and \( H \), producer surplus changes by area \( I \) plus area \( J \) minus area \( G \), and the deadweight loss decreases by the sum of areas \( H \), \( I \), and \( J \).

3.12 Younger workers tend to earn a lower wage than older workers and supply their labour at lower wage levels. When a minimum wage is implemented, a surplus of workers is created. Those workers who are willing to work at the minimum wage or hired would be more likely to be hired, as opposed to younger workers who were willing to work at less than the minimum wage. Younger workers, therefore, would be more affected by the minimum wage law.

3.13 Rent controls. Rent controls created a shortage of apartments in San Francisco with applicants trying to impress the landlord to get an available apartment.

3.14 a. In the absence of rent control, the equilibrium price is $800 and the equilibrium quantity is 300,000. In this case, every renter who is willing to pay the market price of $800 will find an apartment and every landlord willing to accept the market price of $800 will find a renter. The demand and supply curves are shown in the figure, along with the equilibrium price \( (P_E) \) and quantity \( (Q_E) \).

b. At a price ceiling of $600, the quantity demanded is 350,000 but the quantity supplied is only 250,000, so there is a shortage of 100,000 apartments.
c. If all landlords abide by the law, the quantity sold will fall to 250,000. As shown in the figure, consumer surplus with the price ceiling enforced is $A + C$, producer surplus is $E$, and deadweight loss is $B + D$.

\[ \text{Price (rent per month)} \]

\[ \begin{align*}
A \quad &\quad B \quad &\quad C \quad &\quad D \quad &\quad E \quad &\quad S \\
900 \quad &\quad 800 \quad &\quad 700 \quad &\quad 600 \quad &\quad 500 \quad &\quad \text{Quantity (number of apartments)} \quad 0 \quad \quad 250,000 \quad \quad 300,000 \quad \quad 350,000 \quad \quad Q_E \end{align*} \]

\[ \text{Price per month} \]

\[ \begin{align*}
P_E = 800 \quad &\quad &\quad &\quad \quad P_C = 600 \\
\$1000 \quad &\quad &\quad &\quad \quad \$1000 \\
900 \quad &\quad &\quad &\quad \quad 900 \\
800 \quad &\quad &\quad &\quad \quad 800 \\
700 \quad &\quad &\quad &\quad \quad 700 \\
600 \quad &\quad &\quad &\quad \quad 600 \\
500 \quad &\quad &\quad &\quad \quad 500 \\
0 \quad &\quad &\quad &\quad \quad 0 \end{align*} \]

\[ \begin{align*}
A \quad &\quad B \quad &\quad C \quad &\quad D \quad &\quad E \quad &\quad S \\
900 \quad &\quad 800 \quad &\quad 700 \quad &\quad 600 \quad &\quad 500 \quad &\quad \text{Quantity (number of apartments)} \quad 0 \quad \quad 250,000 \quad \quad 300,000 \quad \quad 350,000 \quad \quad Q_E \end{align*} \]

d. If landlords supply only 250,000 apartments and ignore the price ceiling, they can charge $1,000. $1,000 is the highest rent that consumers are willing to pay to rent 250,000 apartments.

3.15 Scarcity is a characteristic of all economic goods and services which have an opportunity cost, whether in or out of equilibrium. Shortage refers to a situation where there is insufficient supply of a good to meet the prevailing demand at a given price. While scarcity is always prevalent in any economic outcome, shortage is associated with disequilibrium in markets, and, as a result, a less-than-optimal economic surplus.
3.16 The first sentence of the student’s argument is correct. The second sentence is incorrect. A price ceiling increases the quantity that consumers demand, but because it also reduces the quantity that sellers supply, it reduces the amount of the product that consumers are actually able to buy. In the graph that follows, without a price ceiling, consumers buy \( Q_1 \), but with a price ceiling consumers buy only \( Q_2 \).

![Graph showing demand and supply with and without price ceiling]

3.17 a. The demand for hotel rooms, as shown in the figure below, increases during home football games. If prices for rooms are not allowed to rise above \( P_o \), which is the equilibrium price during weekends without home football games, during weekends without home football games there will be a shortage of hotel rooms equal to \( Q_{D} \) minus \( Q_{S} \).

![Graph showing demand and supply with and without home football games]

b. Out-of-town football fans will have trouble finding a hotel room. They will have to try to secure hotel rooms far in advance, secure hotel rooms in neighboring communities, or not attend the games.

c. Over time, the supply of hotel rooms will most likely decline. With lower prices of hotel rooms reducing economic profits, some hotels will exit the industry. The exit
of hotels makes the shortage of hotel rooms during home football game weekends more severe.

d. Ski resorts and vacation spots face peak seasons. Laws limiting the prices hotels can charge during peak seasons would decrease the quantity of hotel rooms available, and, therefore, the number of tourists visiting these communities and spending money on local businesses.

3.18 The advocate’s reasoning is incorrect. A fall in price will increase the quantity of kidney transplants demanded, but not the demand for kidney transplants. Although the price ceiling will increase the quantity demanded, the quantity supplied will fall, and fewer kidney transplants will occur. In the graph that follows, without a price ceiling, patients receive \( Q_1 \) kidney transplants, and with a price ceiling, patients receive only \( Q_2 \). (Note that, for simplicity, we are assuming that $250,000 is the equilibrium price, even though the fact that over 1,000 people each year die while on waiting lists for kidney transplants indicates that there is a shortage of kidneys at the current price.)

![Demand and Supply Graph]

3.19 Renters who cannot rent apartments in Woburn will look for apartments in Peabody. This will shift the demand curve in Peabody from \( D_1 \) to \( D_2 \), which will cause an increase in both equilibrium quantity and price in the market for apartments in Peabody.
3.20  

a. A current renter will now be paying $400 rather than $500 for her apartment, making her better off.

b. Someone moving next year will also be paying $400 but supply of apartments will have fallen, making it harder to find an apartment. This will have an uncertain impact on the prospective renter.

c. This landlord will be unambiguously worse off since she will be receiving less rent for her apartment.

d. This landlord will be better off with rent control since it will increase the price of apartments supplied on the black market to above the original market equilibrium.

3.21 The tenant was blacklisted by landlords throughout the United States because of his previous law suit and was excluded from the rental market. In a competitive market equilibrium, such exclusion would have been impossible but with the presence of a rent ceiling in New York, there is a shortage of apartments for rent and landlords are able to select their tenants on the basis on multiple factors—including whether they have been involved in law suits against their previous landlords.

3.22  

a. After the decrease in supply, with no price ceiling, the equilibrium price would be $4.00, and the equilibrium quantity would be 40 million gallons. With a price ceiling of $3.00 and no black market, the price will be $3.00, the quantity demanded will be 45 million gallons, and the quantity supplied will be 30 million gallons, resulting in a shortage of 15 million gallons.
b. Consumer surplus = \( A + B + C \), producer surplus = \( D \), and deadweight loss = \( E + F \).

c. Consumers are willing to pay, at most, $6.00 for the last gallon of gasoline suppliers are willing to supply at a price ceiling of $3.00. Consumer surplus = \( A \), producer surplus = \( B + C + D \), and deadweight loss = \( E + F \).

d. Assuming there is no black market, some consumers are made better off by the price ceiling as they can purchase gas at a lower price than they otherwise could. However, some consumers will not be able to find gas at a price of $3.00 and will be worse off. Consumer surplus without the price ceiling is \( A + B + E \), but with the price ceiling it would be \( A + B + C \). (\( C \) is larger than \( E \). The area of \( E \) is \( \frac{1}{2} \times 10,000,000 \times 2.00 = 10,000,000 \), while the area of \( C \) is \( 1.00 \times 30,000,000 = 30,000,000 \).)
b. By legalizing the buying and selling of organs, the price would begin to rise, and the quantity supplied would also rise. As a result, the shortage of organs could be eliminated. However, by making the sale of kidneys legal, some members of society who are less educated or less well-informed might end up selling their kidneys even if it was not in their long-run best interest. There may be other solutions that would avoid the ethical problems of making kidney sales legal. Some economists, including Alvin Roth of Harvard University, have helped set up a kidney exchange that matches up compatible kidney donors and recipients.

**The Economic Impact of Taxes**

**Learning Objective:** Analyze the economic impact of taxes.

**Review Questions**

4.1 Taxes will tend to reduce economic surplus by introducing a deadweight loss, which does not exist in market equilibrium.

4.2 The excess burden of a tax is the deadweight loss introduced by a tax, or the loss in economic efficiency introduced by a tax relative to a market equilibrium with no taxes.

4.3 Tax incidence is the division of the burden of a tax between buyers and sellers. This is important for government policy because the question of incidence is different from the question of who actually pays a tax. Government officials would want to accurately identify the group of people they want to tax and design a mechanism which places the tax incidence on this group, rather than just collect a tax from this group.
Problems and Applications

4.4

4.5  a. The tax is $1.25 per pack.

b. Producers receive $3.25 per pack.

c. The government receives tax revenues of $1.25 \times 18 \text{ billion} = $22.5 \text{ billion} a year.

4.6  a. The demand curve for cigarettes would shift down vertically by the amount of the tax and the supply curve would not shift.

b. The new equilibrium price that buyers pay producers of cigarettes would be $3.25 per pack.

c. Including the tax, the total amount that cigarette buyers pay per pack would be $4.50.
4.7 This reasoning is incorrect. The demand curve for pizzas slopes downward and the supply curve slopes upward, just as in other industries. So, as shown in the figure, the tax will be split between the buyers and sellers. The tax shifts the supply curve up from $S_1$ to $S_2$. The price paid by the buyers increases from $P_E$ to $P_B$, while the after-tax price received by the suppliers decreases from $P_E$ to $P_S$. $P_B - 1 = P_S$.

4.8 In most cases it is easier to collect the tax from sellers. There are fewer sellers than buyers, and it is easier to make sure that taxes are paid.

4.9 The $1 per hour of work payroll tax decreases the demand for labor by $1 at every quantity of labor. With a vertical supply curve for labor, the wage rate drops by the full $1 tax. Workers bear the full burden of the payroll tax.
4A.1 In a linear demand equation, the intercept on the price axis tells the price at which the quantity demanded is zero. No consumer is willing to pay this price or above for the product. Similarly, in a linear supply equation, the intercept on the price axis tells the price at which the quantity supplied is zero. No firm is willing to produce the good at this price or less.

4A.2 The price that maximizes economic surplus is the equilibrium price. At this price there is no deadweight loss.

4A.3 Consumer surplus measures net benefit by subtracting the price paid from the total benefits received from the good or service.

4A.4 Deadweight loss is an interesting turn of phrase. It measures the loss of surplus, the gains to consumers and producers that could have been realized but were lost as a result of the price control (or other policy) that drags us away from efficiency like a heavy “weight” pulling the economy down.

4A.5 Market equilibrium: \( L^D = L^S \)

Or \( 100 - 4W = 6W \)

Or \( W = \$10 \)

Labour supply and demand in equilibrium \( L^* = 100 - 4(10) = 60 = 6(10) \)

If the minimum wage is \$11, then \( L^D = 100 - 4(11) = 56 \)

\( L^S = 6(11) = 66 \).

Surplus labour = \( L^S - L^D = 66 - 56 = 10 \)

4A.6 The minimum wage will have the larger impact in the top figure. Because its demand curve is so flat, employers will reduce the quantity of labor demanded considerably more than in the bottom figure.
**4A.7** In equilibrium, \( Q^D = Q^S \)

Or \( 48 - 2P = -15 + P \)

\( P = 21 \)

Consumer surplus = \( \frac{1}{2} x (Q^* \times (Q^D - Q^S)) \) where \( Q^* \) and \( P^* \) are equilibrium values of \( Q \) and \( P \) and \( Q^D \) is evaluated at \( P=0 \) (or the intercept of the demand curve).

\[ CS = \frac{1}{2} \times (21 - 15) \times (48 - 21) \]

\[ CS = 81 \]

Producer surplus = \( \frac{1}{2} x (Q^* \times (P^* - Q^S)) \) where \( Q^* \) and \( P^* \) are equilibrium values of \( Q \) and \( P \) and \( Q^S \) is evaluated at \( P=0 \) (or the intercept of the supply curve).

\[ PS = \frac{1}{2} \times (21 - 15) \times (21 - (-15)) \]

\[ PS = 108 \]

**4A.8**

a. The deadweight loss from the price floor equals \( C + E \). \( C = 0.5 \times $1 \times 10,000 = $5,000 \) and

\( E = 0.5 \times $1 \times 10,000 = $5,000 \). So, deadweight loss = $10,000. Or, we can calculate the area of the deadweight loss triangle directly: \( \frac{1}{2} \times (20,000 - 10,000) \times (3 - 1) = $10,000 \).

b. The price floor transfers area \( B \) from consumers to producers. The value of area \( B \) is \( $1 \times 10,000 = $10,000 \).
c. Producer surplus after the price floor is imposed is equal to areas $B + D + F = ($1 \times 10,000) + ($1 \times 10,000) + (1/2 \times $1 \times 10,000) = $25,000.

d. Consumer surplus after the price floor is imposed is equal to area $A$. The value of area $A$ is
\[\frac{1}{2} \times $1.00 \times 10,000 = $5,000.\]

### 4A.9

The supply curve for rental property is given by $Q_S = -450,000 + 1,300P$

When $P$ is set at $1,250$ under a system of rent control, the supply of apartments will be given by

$$Q_S = -450,000 + 1,300 \times 1,250 = 1,175,000$$

The demand curve is given by $Q_D = 3,000,000 - 1,000P$

At the supplied quantity of 1,175,000 units, this implies a market-clearing price of

$$P = \frac{(3,000,000 - 1,175,000)}{1000} = $1,825$$

Area of triangle $B = \frac{1}{2} \times (1,500,000 - 1,175,000) \times (1,825 - 1,500) = 52,812,500$

Area of rectangle $A = (1,500 - 1,250) \times 1,175,000 = 293,750,000$

Area of triangle $C = \frac{1}{2} \times (1,500,000 - 1,175,000) \times (1,500 - 1,250) = 40,625,000$

New consumer surplus = $1,125,000,000 - 52,812,500 + 293,750,000 = 1,365,937,500$

New producer surplus = $865,500,000 - 293,750,000 - 40,625,000 = 531,125,000$

Deadweight loss = $52,812,500 + 40,625,000 = 93,437,500$

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<th>Deadweight loss</th>
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**Ch5 SOLUTIONS TO END-OF-CHAPTER EXERCISES**

**Answers to Thinking Critically Questions**

1. With a command-and-control approach, the government imposes quantitative limits on the amount of pollution that firms are allowed to emit, or they require firms to install specific pollution control devices. This may not be the most economically efficient solution to the pollution problem because the polluting firms would likely have very different costs of reducing pollution, with some firms having to pay much higher costs to meet the new standards than other firms.

2. Before the implementation of the tax, the price consumers pay and the price producers receive is represented by $P_{\text{Market}}$, and the quantity produced is represented by $Q_{\text{Market}}$. With the tax, the supply curve shifts up from $S_1$ to $S_2$, raising the price paid by consumers to $P_{\text{Efficient}}$, reducing the quantity produced to $Q_{\text{Efficient}}$, and lowering the price received by producers to $P$. The cost of the smog is equal to the amount of the tax, which is represented by the vertical distance between $S_1$ and $S_2$, which is the same as the vertical distance between $P_{\text{Efficient}}$ and $P$.

![Graph showing supply and demand curves with tax](image)

**5.1 Externalities and Economic Efficiency**

Learning Objective: Identify examples of positive and negative externalities and use graphs to show how externalities affect economic efficiency.

**Review Questions**

1.1 A positive externality is a benefit to people who are not directly involved in the production or consumption of a good or service while a negative externality is a cost to such people. When a positive externality exists, the good will tend to be under-provided in equilibrium. Similarly, when a negative externality exists, the good will tend to be overprovided. In both instances, there is a deadweight loss and economic efficiency declines.
1.2 Competitive market equilibrium will only hold in the absence of externalities because it only equilibrates the private demand and supply of a commodity, rather than include the social demand and supply for a good. Where externalities exist, the social net benefit will diverge from the sum of all private benefits to consumers of the good. Competitive market equilibrium does not account for this difference.

1.3 Economic efficiency occurs when the marginal benefit to consumers of the last unit produced is equal to its marginal cost of production, and where the sum of consumer surplus and producer surplus is maximized. Externalities generally reduce economic efficiency because buyers and firms ignore the external cost or benefit, which leads firms to either overproduce the good if there is an external cost, or underproduce the good if there is an external benefit.

1.4 Market failure is the failure of the market to produce the efficient level of output. Externalities, public goods, and common resources all cause market failure (as does monopoly, which will be covered in a later chapter).

1.5 Externalities exist primarily due to the absence of property rights governing the use of a particular resource or the inability to enforce existing rights. Without property rights, the benefits or costs related to goods cannot be internalized and made private; as such, there exist externalities over and above the private benefits or costs.

Problems and Applications

1.6 Under these circumstances, consumption of Big Macs causes a small negative externality. These types of externalities also exist on highways, particularly at rush hour, when your decision to drive on the highway causes other motorists to take slightly longer to complete their trips. Governments sometimes deal with traffic externalities by charging higher tolls during peak commuting hours. Governments are unlikely to intervene to relieve congestion in lines at MacDonald’s, however. Because the people being inconvenienced by you are also MacDonald’s customers, the firm is in the best position to decide how best to deal with congestion in its stores.

1.7 The bees are a positive externality for neighbours who grow any kind of crops since they facilitate pollination and the continued growth of the crop. However, neighbours also run the risk of being stung by the bees, which imposes a negative externality on them.

1.8 By feeding the sharks for tourism purposes and luring them close to the coast, it is argued by some people that surfers and swimmers in the area are at heightened risk of being attacked by sharks. The shark-diving tourism industry, according to this argument, imposes a negative externality on surfers and swimmers.
1.9 Driving cars increases traffic congestion and air pollution. Bikers and bike lanes could decrease both congestion and air pollution. Whether a city should install more bike lanes depends partly upon how many additional people would bike rather than drive.

1.10 The efficient amount of alcohol consumption is $Q_2$, but because the negative externality is ignored, actual consumption is $Q_1$. The deadweight loss is area $A$.

![Image of a graph illustrating the concept of efficient and inefficient consumption of alcohol, with price of alcohol on the y-axis and quantity of alcohol on the x-axis, showing marginal social cost (S2), marginal private cost (S1), efficient equilibrium at point A, and deadweight loss area A.]

1.11 **a.** A positive externality arises from studying.

**b.** Tom’s demand for studying is $D_2$, the marginal social benefit curve, which adds together his marginal private benefit and the marginal external benefit to his future children. He studies $Q_T$ hours, which is the efficient amount. Jacob’s demand for studying is $D_1$, the marginal private benefit curve. Jacob studies only $Q_J$, which is inefficient because the marginal social benefits from studying more exceed the marginal costs.
1.12 It is a positive externality in production. Because of the way the cable provider packages channels, popular programs on one channel will increase sales of other channels. It is possible to think of a private agreement in which other cable channels assume some of the production costs of popular shows, but negotiating such an agreement would be difficult.

1.13 By market failures, he means that an unregulated market will result in more than the economically efficient amount of development of farmland. Inefficient land allocation refers to the conversion of farmland into developed land. Because the market fails to take into account the external cost of lost farmland, an inefficiently large quantity of land ($Q_1$) is developed. The efficient level of land development is $Q_2$, which is determined by the intersection of demand and $S_2$. 
5.2 Private Solutions to Externalities: The Coase Theorem

Learning Objective: Discuss the Coase theorem and explain how private bargaining can lead to economic efficiency in a market with an externality.

Review Questions

2.1 The economically efficient level of pollution is the quantity at which the marginal cost of eliminating another unit just equals the marginal benefit from eliminating it. The economically efficient quantity of pollution isn’t zero in most cases. Eliminating all pollution would incur costs that are greater than the benefits.

2.2 A private solution to externalities is possible as long as transactions costs are low and economic agents can engage in private bargaining to ensure production or consumption of a good takes place at an efficient level. This is the statement of the Coase Theorem. Additional qualifications to the theorem include the requirement that all bargaining parties have full information about the costs and benefits of the externality.

2.3 Transactions costs are the costs in time and resources that are incurred in a process of negotiation and execution of an exchange of goods or services. Transactions costs are typically low when the number of negotiating parties is small or a large number of affected parties are represented by a single economic agent. Since transactions costs must be low to facilitate a private solution to the problem of externalities, this implies that private solutions are most likely to be found when the number of affected parties is small.

Problems and Applications

2.4 An increase in pollution could make society better off if the current level of pollution is below the efficient quantity. For example, government restrictions could be so strict that they require pollution reductions to level $A$ in the figure. The marginal costs of the last unit of pollution reduction exceed the marginal benefit, so society would be better off if pollution reduction was only level $B$—the efficient quantity.
2.5 The efficient level of litter on the streets will be that quantity of litter at which the marginal benefit of having less litter is equal to the marginal cost of cleaning up the litter. Assuming that the clearing of litter is costly, this efficient level will not necessarily be equal to zero, even though litter has negative externalities.

2.6 The marginal cost of reducing crime would include resources devoted to police, courts, and prisons. The marginal benefit to reducing crime would include the reduction in losses to crime victims, including losses due to personal injury and anxiety. Just as with pollution, it would not be economically efficient to reduce the amount of crime to zero.

2.7 As the level of pollution falls, further cleanup becomes increasingly costly. Developing countries that have significant air pollution can use existing technology. Proven pollution reduction methods can be implemented at the beginning of the cleanup process, so air pollution resulting from automobile use or factory production can be addressed. Because significant technological advances have already been made in these areas, the cost of implementation would be relatively low. Cleaning up the last 10 percent would be considerably more expensive because a viable method to completely eliminate air pollution in populated, urban areas has yet to be developed. An important trade-off involves spending resources to develop a method to completely eliminate air pollution versus using those resources for other purposes.

Although there would be health benefits of reducing pollution further, it is not clear that the government should take action to do so. Remember that if the marginal benefit of reducing air pollution is greater than the marginal cost, further reductions will make society better off. But if the marginal cost of reducing air pollution is greater than the marginal benefit, reducing air pollution will actually make society worse off. The government needs to quantify the
marginal cost and the marginal benefit of a further reduction in air pollution, and take steps to reduce air pollution further only if the marginal benefit exceeds the marginal cost.

2.9 This statement is not necessarily true. The optimal decision to position the flight path will be taken at the margin: where the marginal benefit from shifting the path is equal to the cost. Depending on the costs and benefits involved, it may be efficient to position some part of the flight path over certain residential areas, even though this imposes negative externalities on the residents.

2.10 If the group affected by the air pollution offered the steel plant an amount to curtail production that was equal to or greater than the marginal cost of the air pollution, it would be in the interest of the steel plant to internalize the cost of the air pollution. The amount offered to curtail each unit of production would be an opportunity cost (because the steel plant would lose the funds if it did not curtail production) and would become part of the steel plant’s marginal cost of production. The property right to clean air does not need to be assigned to the victims of air pollution to get the steel plant to reduce pollution. As just noted, if the steel plant has the property right, but the victims offer the plant an amount at least equal to the marginal cost of the air pollution, then the plant will internalize the cost of the air pollution.

2.11 The negative externality in this case is the pollution generated through emissions which can damage health and potentially cause long term damage to the environment and to climate patterns. In the absence of a government system to regulate emissions, market-determined emission production will be too high. By capping total emissions and trading, and by allowing firms to bargain with each other, firms are forced to account for the social cost of more emissions by paying for the right to generate more emissions. By trading off marginal costs and benefits of one more unit of emissions, it is hoped that firms will reduce emissions to the efficient level.

5.3 Government Policies to Deal with Externalities

Learning Objective: Analyze government policies to achieve economic efficiency in a market with an externality.

Review Questions

3.1 A tax which is levied to eliminate externalities can restore the market outcome to the equilibrium level and eliminate deadweight losses. An example of such a tax or subsidy is the Pigovian tax which is levied by the government to ensure that consumption and production of a good takes place at the optimum level. An example is a subsidy to college students to ensure that an efficient level of education is consumed by students.
3.2 To internalize an externality means that the producer or consumer that creates the externality bears or receives the cost or benefits of the externality. A tax equal to the cost of a negative externality will cause producers to internalize the negative externality and a subsidy equal to the benefits of a positive externality will cause consumers to internalize a positive externality. A private solution along the lines of the Coase theorem would also internalize an externality.

3.3 The command-and-control approach to managing pollution is a non-market based approach to reducing externalities through the imposition of quantitative limits by the government on the amount of pollutions firms can emit. Since the final production is determined outside the market place by government statute, it cannot be considered a market-based approach.

Problems and Applications

3.4 Excessive alcohol consumption can have a negative externality through, for example, increased crime, worse health and an increased burden on the state-run healthcare system, and poorer parenting, which can affect the welfare of many children, with potential intergenerational effects. The decision as to whether the government should act to reduce this negative externality should be taken at the margin, equating the marginal benefit from lower alcohol consumption with the cost of investing additional funds in an awareness programme.

3.5 The production of antibiotics creates a positive externality to the extent that the value of new antibiotics for society exceeds the returns the antibiotics provide to the drug companies. Whether every firm producing a good with a positive externality should receive a subsidy depends partly on how large the positive externality is. The positive externality would need to be larger than the transactions cost or administrative cost of using a subsidy to cause firms to internalize the externality.

3.6 The negative externality causes a deadweight loss of area $A$ where the marginal benefit is less than the marginal social cost of output from $Q_{Efficient}$ to $Q_{Market}$. A Pigovian tax equal to the cost of the negative externality per unit of output would internalize to the firm the cost of the externality. The supply curve would shift from $S_1$ to $S_2$, and output would decrease to $Q_{Efficient}$. A positive externality causes a deadweight loss of area $B$ where the marginal social benefit is greater than the marginal cost of output from $Q_{Market}$ to $Q_{Efficient}$. A Pigovian subsidy equal to the benefit of the positive externality per unit of output would internalize to the consumer the benefit of the externality. The demand curve would shift from $D_1$ to $D_2$, and output would increase to $Q_{Efficient}$. 
3.7 Basic infrastructure, particularly in developing countries, generates many positive externalities by improving transport and communications, increasing productivity and encouraging a higher level of private investment. In the absence of government support, private companies will tend to under-invest in infrastructure, particularly since many private companies would want to free ride on the development of infrastructure by another party. Direct investment by the government could more closely approximate the efficient outcome. Government could also induce private investment through a Pigovian subsidy which would reduce the cost of investment to private companies and raise the amount of infrastructure.

3.8  

a. The tax should be the amount necessary to shift up the supply curve from $S_1$ to $S_2$. That amount is $7.50 - 7.15 = 0.35$ per item dry-cleaned.

b. The deadweight loss from excessive dry cleaning arises because the efficient amount of items to dry clean is 600,000 per week, but the market outcome is 750,000 per week. The following graph shows that the deadweight loss equals the amount by which the marginal social cost ($S_2$) of cleaning the last 150,000 items exceeds the marginal benefit (the height of the demand curve for each of these items). This is shown by area $A$ of the figure: $0.5 \times 0.35 \times 150,000 = 26,250$. (Note: We know that the base of the deadweight loss triangle must be $0.35$ because $S_2$ is parallel to $S_1$, so the distance between them is constant.)
3.9 The negative externality from consuming sweetened soda causes a deadweight loss of area $A$, where the marginal cost exceeds the marginal social benefit for the quantity of sodas from $Q_{\text{Efficient}}$ to $Q_{\text{Market}}$.

a. The government should not prohibit the consumption of sweetened soda, but should instead implement a way to get the consumers of sweetened soda to internalize the negative externality. Prohibiting sweetened sodas would cause the equilibrium quantity to fall to zero, which is not the economically efficient level of output.

b. The government could impose a tax on sweetened soda.

3.10 a. Crime imposes a significant negative externality on households and businesses by reducing individual welfare, creating an unsafe environment, raising economic losses and leading to reduced investment by businesses. It also undermines the rule of law and creates social and political rifts. The more serious the crime, the bigger the externality.
b. A safety fee is similar to a Pigovian tax in that it forces criminals to directly pay to compensate for the costs imposed by the externality. However, the success of the tax will depend on whether it can deter crime to a greater extent than the existing system of criminal justice.

3.11 A normal good is a product that consumers demand more of as income rises. Environmental protection is a normal good. Western, developed nations already had higher incomes than third world countries do today when the West first began to take significant steps to protect the environment. Because third-world countries have low incomes, they do not demand nearly as much environmental protection as developed countries do. As an economy develops and people get richer and can afford to pay more for a clean environment, their willingness to pay for a clean environment rises—so the marginal benefit curve for pollution reduction rises. Economic development also brings new technologies that reduce the marginal cost of reducing pollution.

3.12 a. Marginal external cost is the difference between the marginal social cost and the marginal private cost curve. In this case, the marginal external cost must be rising as output increases, so the gap between the marginal private cost curve and the marginal social cost curve gets larger as output increases.

b. The optimal Pigovian tax can be found by first finding the efficient level of output, which is found at the intersection of the demand curve and the marginal social cost curve. At this output, the optimal tax equals the gap between the social cost and the private cost curves—that is, it equals the amount of the marginal external cost. Therefore, in the large city the optimal tax is $6.60 − $5.40 = $1.20, but in the small city the optimal tax is only $5.60 − $5.00 = $0.60. The efficient tax is larger in the large city because demand is greater and marginal social cost increases as the quantity of items cleaned per week increases.

3.13 a. Managers may prefer certainty on deadlines to a scenario where the limits fluctuate frequently, making it difficult for them to take investment and operational decisions. Also, managers may prefer a higher limit under a market-based system over a lower-limit under a command and control-system because they value the flexibility of the market-based system.

b. The market-based alternative to command-and-control is to set a total cap and allow power plants to trade between each other so as to pay for the amount of emissions that are most efficient for them.
The success of using tradable permits to reduce sulfur dioxide emissions has led many economists to believe that they may be similarly successful in reducing emissions of carbon dioxide. Tradable permits are likely to reduce carbon dioxide emissions more efficiently than would command-and-control proposals that would mandate certain reductions in emissions. Some economists, though, favor using a Pigovian tax on carbon-based fuels, sometimes referred to as a “carbon tax,” as an alternative to tradable permits. Because there are many more sources of carbon dioxide emissions than there are sources of sulfur dioxide emissions, some economists do not believe tradable permits will be as effective in reducing carbon dioxide emissions.

### Four Categories of Goods

**Learning Objective:** Explain how goods can be categorized on the basis of whether they are rival or excludable, and use graphs to illustrate the efficient quantities of public goods and common resources.

### Review Questions

**4.1** A private good is one whose consumption is both rival—if one person consumes the good then no one else can consume it—and excludable—only people who pay for the good can consume it. Most goods are private goods—such as food bought from a supermarket. Public goods are both non-rival and non-excludable, such as the national defence system.

**4.2** A quasi-public good is one which is excludable but not rival, such as cable television. Since consumers who do not pay for the good can be excluded from consuming it, this type of good is not often associated with market failure. There is no social benefit that emerges for consumers who do not pay for the good, thereby eliminating externalities.

**4.3** The tragedy of the commons is the tendency of a common resource to be overused. It can be avoided if there is a way to block overuse. One method is to give someone or some group a property right to the resource, which would give the person or group the incentive to use it efficiently. However, this won’t work well if the person or group cannot easily enforce the property right.

### Problems and Applications

**4.4 a.** The optimal quantity of a public good is the quantity where the public’s marginal benefit from the good—as represented by the demand curve—is equal to the marginal cost of providing the good. To solve the problem, we need to know the demand curve for the city park and the marginal cost to the town of providing acres of park land. To calculate their overall demand, we need to add the dollar amounts that Jill and Joe are willing to pay for each quantity:
The graph shows that the optimal size park—where marginal social cost equals marginal social benefit—is 4 acres.

**b.** The marginal cost of supplying the second acre is $13. But the demand curve tells us that the marginal benefit Jill and Joe receive from the second acre is $21. Because the marginal benefit to society is well above the marginal cost, two acres cannot be the optimal size for the town park.

**4.5** Agree. Since there are no property rights enforced on many highways (where there are no toll taxes), it becomes impossible to restrict the use of the highways. Every individual uses the highways to a level that is higher than the efficient level even though the aggregate usage and congestion on the highway imposes costs on all users.

**4.6** The digital commons are similar to the agricultural commons because they are rival but not excludable. Organising the information on the internet is cost-effective for society as a whole but too costly for individuals to pay for the service, especially when it is possible to search for information at a lower cost. As a result, there is under-investment in efforts to organize the internet and an over-production of low-value information, which imposes a cost on all users of the internet.

**4.7** The tragedy of the commons arises because each person using the commons neglects the effects his use has on other users. This is similar to each person neglecting to take into account the effects on others—in the form of creating resistant microorganisms that cause hard-to-treat infections—from using antibiotics.

**4.8** a. Quasi-public good (consumers can be excluded from watching cable TV by requiring subscriptions but one person’s subscription does not stop another person from subscribing)
b. Quasi-public good (Facebook can exclude people from creating accounts or joining certain groups or networks, but one person’s account will not stop another person from having an account or joining a network)

c. Assuming all students have the right to go to school, public schools should be a public good. In practice, however, it may act more as a common resource where all students have access to public school but the more students there are, the lower the value of schooling to each student due to overcrowding or other reasons.

d. Private good—where students can be excluded from schools according to various criteria and where there is an ideal class size beyond which the consumption of schooling becomes rival.

e. Quasi-public good, upto a point (cinema-goers can be excluded by requiring them to buy tickets but watching the film is not rival until the capacity of the theatre is reached). Once the cinema is full, it is a private good.

f. Usually a private good, where only one person owns a music system and listens to the music (excluding the case of noise pollution).

4.9 The statement is partially true. The value of education is certainly undeniable and there are aspects of education that have the characteristics of a public good. However, the decision for the government to supply the public good would depend on whether it is possible for the market to reach an efficient solution through private bargaining, as well as the marginal net benefit of government investment in education. We would expect that it is efficient for the government to provide some level of education or to subsidize the providers of, say, primary education.

4.10 Private gyms are able to exclude consumers through the requirement that they pay a fee to use the facilities. Since consumers pay for the benefits of the pool, it is possible to enforce the efficient level of usage of the pool and prevent congestion. Public pools, however, do not usually have the ability to exclude members of the community through a direct fee. As a result, the use of the pool is non-excludable and it is impossible to internalize the cost of congestion in the pool.

4.11 The use of bandwidth is similar to the problem of the commons. While the use of the internet is not excludable, the good is certainly rival because over-usage by individuals imposes a cost of lower connection speeds. In the absence of regulation of internet usage, most students will over-use the available bandwidth leading to inefficient speeds.
4.12 The village elders were trying to prevent the tragedy of the commons. Their solution worked quite well given the small size of the village.
Ch6 SOLUTIONS TO END-OF-CHAPTER EXERCISES

Answers to Thinking Critically Questions

1. You should disagree. Even though the overall demand for gasoline is inelastic, the demand for gasoline at Joe’s Gas-and-Go is likely to be elastic. If Joe increases his price but other gas stations do not raise their prices, the quantity demanded for Joe’s gas will likely fall significantly and Joe’s revenue will decrease.

2. If Walmart and Costco begin selling gasoline at lower prices than the conventional service stations, this will cause the demand curves faced by the conventional service stations to shift to the left and become more elastic, which will lower the equilibrium price of gasoline at these stations.

6.1 The Price Elasticity of Demand and Its Measurement

Learning Objective: Define price elasticity of demand and understand how to measure it.

Review Questions

1.1 Price elasticity of demand = (percentage change in quantity demanded)/(percentage change in price). Price elasticity of demand isn’t measured by the slope of the demand curve because the slope depends on the units measurement. The slope of the demand curve will change by a factor of 100 if you use cents instead of dollars, for example. Or, for another example, consider six-packs of soda versus cans of soda: If the price drops by $1.00 per six-pack and this causes quantity demanded to increase by two six-packs, then that is the same thing as quantity demanded going up by 12 cans. So, you could calculate the slope either as $−1/2$ six-packs, or as $−1/12$ cans. In addition, using percentage changes in the elasticity formula allows for meaningful comparisons of demand responsiveness between very different kinds of goods: for example, breakfast cereal versus health care. Because the slope uses physical units of quantities, such comparisons are impossible.

1.2 Price elasticity of demand = $−30%/15% = −2$

Demand for Nescafe coffee is elastic.

1.3 In calculating the percentage change in price and quantity, the midpoint formula divides by the average of the starting and ending values.
Midpoint formula: \[
\frac{(Q_2 - Q_1)}{(Q_1 + Q_2)} \div \frac{(P_2 - P_1)}{(P_1 + P_2)}
\]

Percentage changes can also be calculated by using the starting or ending value without averaging, but this gives different results depending on whether the starting or ending value is used.

1.4 A perfectly inelastic demand curve is shown by a vertical line, as shown at the bottom of Table 6.1. Such a good will have no substitutes—for example, a life-saving drug.

![Graph showing vertical demand curve](image)

Problems and Applications

1.5 The demand is inelastic. The percentage change in quantity demanded is less than the percentage change in price.

1.6 a. \( \Delta Q/\Delta P = 6,000,000 \text{ pounds} / -$2 = -3,000,000 \text{ pounds per$} \)

b. \( \Delta Q/\Delta P = 6 \text{ millions of pounds} / -$2 = -3 \text{ millions of pounds per$} \). The answer per $ is the same as in part 1.

c. Price elasticity of demand = \( \frac{6/[(6+12)/2]}{-2/[(2+4)/2]} = (6/9)/(-2/3) = -1 \)

This is different from the answers in 1 and 2 because it takes into account the % change in quantity demanded in response to a % change in price, rather than in terms of absolute units.
1.7 For $D_1$:

Percentage change in quantity demanded = \( \frac{60-30}{45} \times 100 = 66.7\% \)

Percentage change in price = \( \frac{\$2 - \$3}{\$2.5} \times 100 = -40\% \)

Elasticity = \( \frac{66.7\%}{-40.0\%} = -1.7 \)

For $D_2$:

Percentage change in quantity demanded = \( \frac{40-30}{35} \times 100 = 28.6\% \)

Percentage change in price = \( \frac{\$2 - \$3}{\$2.5} \times 100 = -40\% \)

Elasticity = \( \frac{28.6\%}{-40.0\%} = -0.7 \)

1.8 Percentage increase in tuition fees = \( \frac{29,454-24,751}{24,751} = 19\% \)

Percentage decline in enrollment = \( \frac{1,131-1,469}{1,469} = -23\% \)

Price elasticity of demand = \( \frac{-23\%}{19\%} = -1.21 \)

With a price elasticity of demand of greater than 1, we would expect total revenues to fall, rather than rise, with a rise in prices. Therefore, Pace University's strategy would have led to lower revenues, failing to improve the financial situation.

1.9 Price elasticity = \( \{1,500/[(500,000+501,500)/2]\}/\{1/[(440+439)/2]\} = 1.32 \)

1.10 This analysis is incomplete because we have no information on the price elasticity of demand for the magazines. The analysis will be correct only if the price elasticity of demand for magazines is equal to 1. If it is greater than 1 then the firm will continue to lose money. If it is less than 1 then the firm will start to make a profit.

6.2 The Determinants of the Price Elasticity of Demand

Learning Objective: Understand the determinants of the price elasticity of demand.
Review Questions

2.1 The more substitutes that are available for a given good, the more elastic will be the demand for that good with respect to price since consumers will have more options to switch away from the consumption of that good in response to an increase in its price.

2.2 The price elasticities of demand for necessities is low because consumers are often compelled to buy certain goods at any price. Conversely, the price elasticity of demand for luxuries is high.

Problems and Applications

2.3 a. Inelastic, since it is a necessity, but demand for individual brands will be elastic
   b. Elastic since it is non-essential in general and there are substitutes, both in brands and in terms of libraries
   c. Elastic since it is non-essential and there are substitutes available
   d. Inelastic because they are necessities for people who need them and there may be few available substitutes

2.4 The more narrowly a market is defined, the more elastic demand will be, because more substitutes are available. The price elasticity of Coca-Cola (or any specific brand of soda) will be higher than for soda as a product, because there are more substitutes available for a specific product like Coca-Cola than there are for a product category like soda.

2.5 It usually takes consumers some time to adjust their buying habits when prices change. The more time passes, the more elastic the demand for a product becomes.

2.6 The price elasticity of demand for gasoline was most likely higher in 2008, because the larger the percentage of income a product consumes, the larger the price elasticity of demand tends to be. Because the average household spent 4.0 percent of its income on gasoline in 1999 and 11.5 percent of its income on gasoline in 2008, price elasticity of demand for gasoline was most likely higher in 2008 than in 1999.

2.7 a. We can’t know with certainty from the information given whether in this case demand will be elastic or inelastic. We can say, though, that with a normal downward-sloping demand curve, the quantity demanded is lower at a price of $25 than at a price of $12. Along such demand curves, elasticity is not constant at every point. When the price is high and the quantity demanded is low, demand is more likely to be elastic. So we would expect the demand by visitors in private, noncommercial vehicles to be elastic.
b. Once again, we can’t answer this question with certainty from the information given. But with a normal downward-sloping demand curve, the quantity demanded is lower at a price of $25 than at a price of $12. Along such demand curves, elasticity is not constant at every point. When the price is high and the quantity demanded is low, demand is more likely to be elastic. So we would expect the demand by visitors in private, noncommercial vehicles to have the largest price elasticity of demand. By similar reasoning, when the price is low and the quantity demanded is high, the demand is more likely to be inelastic. So we would expect the demand by visitors on foot, bikes, and skis to have the smallest price elasticity of demand.

### 6.3 The Relationship between Price Elasticity of Demand and Total Revenue

**Learning Objective:** Understand the relationship between the price elasticity of demand and total revenue.

**Review Questions**

**3.1** Total revenue is the product of the price of a good and the quantity of that good which is sold. When demand is less elastic, a rise in the price of the good will lead to a rise in the total revenue earned from the sale of that good.

**3.2** We say that the commodity has unit-elasticity or a price-elasticity of demand of 1. This means that the effect of the change in price on total revenue is completely offset by the change in quantity sold.

**Problems and Applications**

**3.3** Elasticity = (percentage change in quantity/percentage change in price). The article states that consumption decreases by 3 to 5 percent in response to a 10 percent increase in price, so the range of elasticity is: \((-3/10) = -0.3\) to \((-5/10) = -0.5\). Demand for cigarettes is inelastic, because the elasticity values computed are both less than 1 in absolute value. Because demand is inelastic, if price increases, revenue will also increase.

**3.4** The Port Authority is assuming that an increase in tolls will increase the total amount collected, so they must be assuming that demand is inelastic. The Port Authority might have reasoned that the demand for using bridges and tunnels to cross the Hudson River was inelastic because commuting is more of a necessity than a luxury, and for many commuters there may not be any good substitutes.
3.5  a. We can calculate the price elasticity along $D_1$ between points $A$ and $C$ as follows:

\[
\text{Percentage change in quantity demanded} = \frac{300 - 200}{250} \times 100 = 40.0\%
\]

\[
\text{Percentage change in price} = \frac{2.50 - 3.00}{2.75} \times 100 = -18.2\%
\]

So, the price elasticity of demand $= \frac{40.0\%}{-18.2\%} = -2.2$

Similarly, the price elasticity of demand along $D_2$ between points $A$ and $B$ can be calculated as follows:

\[
\text{Percentage change in quantity demanded} = \frac{225 - 200}{212.5} \times 100 = 11.8\%
\]

\[
\text{Percentage change in price} = \frac{2.50 - 3.00}{2.75} \times 100 = -18.2\%
\]

So, the price elasticity of demand $= \frac{11.8\%}{-18.2\%} = -0.65$

Because the quantity response is much larger to the same price cut, demand curve $D_1$ is much more elastic.

b. Along $D_1$, revenue increases from $3 \times 200 = 600$ to $2.50 \times 300 = 750$. Revenue rises by $150$ as the price is cut because this demand curve is elastic. Along $D_2$, revenue falls from $600$ to $2.50 \times 225 = 562.50$. Revenue falls by $37.50$ as the price is cut because $D_2$ is inelastic.

3.6  The sportswriters analysis implies that the demand for Yankees tickets is inelastic with respect to price. This is a reasonable claim because a Yankees fan's decision to buy a ticket for a game depends only partly on price and partly on emotional and social reasons. Additionally, a Yankees fan would much rather watch a Yankees game than any other game, making this match much harder to substitute for. This yields a relatively inelastic demand.

3.7  Manager two is reasoning that cola has a high price elasticity—which will cause revenue and price to move in opposite directions—and beer has a low price elasticity. According to the estimates provided in the chapter, this reasoning appears to be quite accurate.

3.8  As price falls along a linear demand curve, demand becomes increasingly inelastic. When the price of a good with elastic demand is cut, revenues tend to rise; when price of an inelastic good is cut, revenues will fall. This implies that revenues increase as price is cut
along a linear demand curve, reaching a maximum at the point where elasticity is equal to 1, after which revenues begin to fall.

3.9 High-definition LED TVs are expensive luxury goods with a high elasticity of demand. If prices are cut, the total revenues from the sale of such goods will increase. Portable TVs are cheaper goods which are less luxurious and are likely to have a lower elasticity. If we assume they have an elasticity of greater than 1, then a price cut will also increase revenues but larger price cuts will be required for a similar percentage change in revenue.

3.10/3.11 First calculate the demand for parking slots from the revenue and the prices. Demand in December 2007 is 1,390,000/10 = 139,000 parking spots. Demand in December 2008 is 1,450,000/16 = 90,625. Price elasticity of demand = {(90,625-139,000)/[(90,625+139,000)/2]}/[16-10]/[(16+10)/2] = -0.91. The jump in revenues after increasing the price is consistent with the price elasticity of demand, which is relatively inelastic.

3.12 The paperback edition is a reasonably good substitute for the e-book edition. Publishers are experimenting with the prices of e-books because they are relatively new products, which makes estimating price elasticity difficult.

6.4 Other Demand Elasticities

Learning Objective: Define cross-price elasticity of demand and income elasticity of demand and understand their determinants and how they are measured.

Review Questions

4.1 Cross-price elasticity of demand equals the percentage change in quantity demanded of one good divided by the percentage change in the price of another good. If the cross-price elasticity is negative, then the goods are complements; if it is positive, then they are substitutes.

4.2 Normal goods are those with a positive income elasticity of demand: as income increases, consumers demand more of the good. Inferior goods have a negative income elasticity: as income increases, consumers demand less of the good. Luxury goods are a subset of normal goods with a high income elasticity of usually greater than 1: as incomes increases, consumers demand a much higher proportion of the good.
Problems and Applications

4.3  

a. Lettuce has the higher price elasticity because the percentage change in quantity demanded following a price increase is much larger for lettuce.

b. Positive. As the price of lettuce rises, the quantity demanded of the other green vegetables rises, so they are substitutes.

4.4  

To find the cross-price elasticity, divide the percentage change in the quantity demanded of buns by the percentage change in the price of hot dogs. At the initial price of buns ($1.20), the quantity demanded rises from 10,000 to 12,000, so this is the change in quantity demanded that should be used.

\[
\text{Percentage change in quantity demanded} = \frac{12,000 - 10,000}{11,000} \times 100 = 18.2\%
\]

\[
\text{Percentage change in the price of hot dogs} = \frac{$1.80 - $2.20}{$2.00} \times 100 = -20.0\%
\]

So, the cross-price elasticity = \(\frac{18.2\%}{-20.0\%} = -0.91\)

Because the cross-price elasticity of demand is negative, we know these two goods are complements.

4.5  

a. Negative. Milk and sugar are usually complements.

b. Negative. Shoes and socks are complements.

c. Positive. Tea and coffee are usually substitutes.

d. Positive. Android phones and iPhones are substitutes.

4.6  

a. The cross-price elasticity of gasoline and any gasoline-powered vehicles is negative, because gasoline and gasoline-powered vehicles are complements.

b. Gasoline and subcompact cars are complements, as are gasoline and SUVs. Subcompact cars and SUVs are substitutes.

4.7  

A typical ordering would be salt, potatoes, frozen pizza and caviar. Any order is acceptable as long as the student can justify that the goods with the lowest income elasticities are inferior or normal goods and goods with higher income elasticities are luxury goods.

4.8  

Wine and spirits are probably substitutes so that the cross-price elasticity should be positive. More people drink wine than drink spirits, partly because spirits have a higher alcohol content than wine. As people’s incomes rise, they often increase their consumption of
wine—and begin to buy more expensive wines—while they are less likely to consume much more spirits.

4.9 People in poor countries have low incomes and are unable to afford a high level of food consumption. As income in these countries increases, the consumption of food will increase—with the greatest increases taking place for the poorest and the most deprived countries. In richer countries, the consumption of food is already at a comfortable level, sufficient to sustain a healthy lifestyle. With rising incomes, the consumption of food may increase but not quite so substantially. We can argue that income elasticities of food are highest for poor countries, and that this elasticity declines as the country becomes more rich.

6.5 Using Elasticity to Analyze the Disappearing Family Farm

Learning Objective: Use price elasticity and income elasticity to analyze economic issues.

Review Questions

5.1 Increasing productivity in agriculture has brought about lower prices for food products. Because the price elasticity of demand for food is low, the lower prices have not caused a large increase in quantity demanded. The increase in incomes over time has not increased the demand for food much because the income elasticity for food is low. Farmers therefore need to sell larger and larger quantities of food at lower and lower prices to raise the same revenue. This means that small farms can no longer be as profitable as they once were.

Problems and Applications

5.2 a. \( \Delta Q = \Delta P \times \text{Price elasticity} = 30\% \times -0.25 = -7.5\% \) reduction in consumption of cigarettes. With an initial demand of 350 billion, we expect demand to fall to 323.75 billion cigarettes.

b. The more elastic the demand for cigarettes, the greater will be the decline in quantity demanded of cigarettes in response to a tax.

5.3 1. In the long term, the price of gasoline rises by $0.70. By plugging values into the midpoint formula, we get \( \Delta Q = \text{Price-elasticity} \times \frac{(5.70-5.00)}{(5.70+5.00)/2} = -7.2\% \). Therefore, gasoline demanded will fall by 7.2% to 111.36 billion gallons per year. Therefore, since demand is relatively inelastic, the tax will not reduce consumption of gasoline in a substantial way.
2. The federal government receives revenues \( R = 111.36 \text{ billion gallons} \times $1.00 = $111.36 \text{ billion per year} \). Since demand for gasoline is inelastic, a gasoline tax is a good way to raise revenue without affecting consumption too much.

3. The elasticity for demand is higher in this case than in the solved problem, therefore, the decline in consumption is greater here. However, more revenue is raised from the tax in the solved problem than in this problem.

5.4 For the government policy to be effective, the demand for bribes must be elastic. The more elastic the demand curve, the more effective the policy will be. On the graph, the burden of corruption before the policy is enacted is represented by the area \( 0Q_1AP_1 \). The burden of corruption after the policy is enacted is represented by the area \( 0Q_2BP_2 \).

5.5 His reasoning is correct: Because the demand for kumquats is elastic, a price increase resulting from the implementation of a price floor will decrease the revenue received by kumquat producers.

5.6 We measure the loss of efficiency by the deadweight loss. When demand is elastic, the deadweight loss in the figure is \( A \). When demand is inelastic, the deadweight loss is \( A + B \). Therefore, the loss of economic efficiency from a price ceiling is greater when demand is price inelastic.
6.6 The Price Elasticity of Supply and Its Measurement

Learning Objective: Define price elasticity of supply and understand its main determinants and how it is measured.

Review Questions

6.1 Price elasticity of supply $= \frac{5\%}{8\%} = 0.63$

Supply is inelastic

6.2 A perfectly inelastic supply curve is vertical with respect to the x or quantity axis. Perfectly inelastic supply cannot adjust in response to changes in price: such as the artistic works of the painter, Vincent Van Gogh, who lived in the nineteenth century.

Problems and Applications

6.3 If the supply of oil becomes more elastic, it will intersect demand curve $D_2$ (Point $C$) at a price lower than $140 (P_2)$ and at a quantity higher than 84 million barrels per day ($Q_2$).
6.4 To find price elasticity of supply, divide the percentage change in quantity supplied by percentage change in price. In panel (a), the percentage change in quantity supplied = \( \frac{1,400 - 1,200}{1,300} \times 100 = 15.4\% \), and the percentage change in price = \( \frac{\$4 - \$2}{\$3} \times 100 = 66.7\% \). So, the price elasticity of supply = \( \frac{15.4\%}{66.7\%} = 0.23 \). In panel (b), percentage change in quantity supplied = \( \frac{2,100 - 1,200}{1,650} \times 100 = 54.5\% \), and the percentage change in price = \( \frac{\$2.50 - \$2.00}{\$2.25} \times 100 = 22.2\% \). So, the price elasticity of supply = \( \frac{54.5\%}{22.2\%} = 2.45 \).

6.5 Over a sufficiently long period of time, champagne producers can eventually increase the supply of champagne by planting more grapes and preparing more champagne. However, since Picasso is now dead, the supply of his paintings is never going to increase, aside from the discovery of as yet unseen paintings by him; the elasticity of supply of Picasso paintings is not likely to change over time.

6.6 The supply of houses will not be able to respond rapidly in the short-run (inelastic supply) since the construction of new houses takes time—requiring the investment of resources as well as the necessary permits. Over the long term, the supply of new houses will be more elastic. Rental houses, however, will be more elastic over the short and long-term since, with a sufficiently high increase in price, home-owners with more than one home or with large houses may be willing to rent their homes or part of their homes to earn additional income.
6.7  a.

b. Based on this information, we don’t know much at all about the price elasticity of demand for roses. The demand curve has shifted, so the rise in the quantity of roses demanded is not caused by the rise in their price—and we can’t calculate the demand elasticity. We have a movement along the supply curve, so we can calculate the price elasticity of supply for roses.

The supply elasticity = (percentage change in quantity supplied)/(percentage change in price) =

\[
\frac{30,000 - 8,000}{19,000} \cdot \frac{\$2 - 1}{\$1.50} = \frac{1.158}{0.667} = 1.74.
\]

The fact that the elasticity doesn’t have a negative sign is a reminder that with an upward-sloping supply curve, increases in price to lead to increases in the quantity supplied, so the price elasticity of supply must be positive.
Answers to Thinking Critically Questions

1. If Jennifer Lopez became involved in an embarrassing scandal, her popularity may fade and fewer people would be willing to purchase the Venus razor, shifting the demand curve to the left.

2. Sunk costs are costs that have already been incurred. Making optimal decisions requires ignoring sunk costs and focusing on the marginal benefit and marginal cost of continuing with an activity. The money a firm has already spent on making the ads is a cost that the firm has already incurred, which makes it a sunk cost. Therefore, money paid to a celebrity should play no part in the firm’s decision to continue running the ads. However, if the ad campaign requires additional spending, say an additional $1 million, to implement, then the firm faces a more difficult decision. Assuming that the arrest reduces the celebrity’s popularity and reduces his or her ability to attract customers, the firm needs to decide if the celebrity remains popular enough to still increase revenues by more than the $1 million cost. If the firm estimates that continuing the campaign will lead to increased revenues of at least $1 million, it should continue with the ad campaign; otherwise, it should cancel the campaign.

10.1 Utility and Consumer Decision Making

Learning Objective: Define utility and explain how consumers choose goods and services to maximize their utility.

Review Questions

1.1 Preferences are the rankings of alternative options that determine the choices economic agents make. Utility is the satisfaction people receive from consuming goods and services. It is measured in value terms or in terms of units of utility, such as utils.

1.2 Optimal decisions are made by trading off the costs and benefits of an additional unit of consumption, for example, or at the margin. For consumption decisions, this requires equating the marginal utility of the last dollar spent on every commodity consumed by a person.

1.3 The budget constraint is the limited amount of income available for a consumer to spend on goods and services. The rule of equal marginal utility per dollar spent states that a consumer will make the optimal decision by allocating his or her budget so that the marginal utility per dollar spent is the same for all goods and services being consumed.
1.4 Substitution effect and income effect operate in the same direction in the case of a normal good and in opposite directions in the case of inferior goods.

Problems and Applications

1.5 The law of diminishing marginal utility might not hold true in every case and might not hold over certain ranges of consumption. One example would be increasing from less than a full dose of a medicine to a full dose. Also, some people would argue that the marginal utility of potato chips is increasing until a significant quantity has been consumed.

1.6 The last dollar saved should give consumers the same additional utility as the last dollar spent on goods and services.

1.7 a. A rational student would equalize the marginal utility (additional points) of an additional hour of studying economics with an additional hour of studying psychology. The following table of marginal utilities can be constructed.

<table>
<thead>
<tr>
<th>Economics</th>
<th>Psychology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours</td>
<td>Marginal Score</td>
</tr>
<tr>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
</tr>
</tbody>
</table>

Since the student can only study for six hours in total, the student would study just over 3 hours of economics and just under 3 hours of psychology.

b. Now, psychology scores are equivalent to three times the same score in economics.

<table>
<thead>
<tr>
<th>Economics</th>
<th>Psychology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours</td>
<td>Marginal Score</td>
</tr>
<tr>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
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<td>4</td>
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<td>5</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
</tr>
</tbody>
</table>
By equating marginal utilities, the student will study just over 2 hours of economics and just under 4 hours of psychology.

1.8 Joe will buy 2 packets of Twinkies and 6 packets at Ho-Hos. At this point, the marginal utility from increasing consumption to this level is equal at 8. The cost of 2 packets of Twinkies and 6 packets of Ho-Hos is $14 ($1*2 + $2*6), which is the maximum amount that Joe can spend. Therefore, he is maximizing total utility at this point.

1.9 Joe is not maximizing total utility because he has not equated the marginal utility of the last apple with that of the last orange. Moreover, Joe is spending only $55 dollars while he has $60 and it should be possible for him to increase total utility by spending his entire budget.

1.10 Both the substitution and income effect will be positive. If there are lots of substitutes to Starbucks coffee, the substitution effect is likely to be larger than the income effect because coffee is a widely consumed good by many people and its consumption is unlikely to be very sensitive to changes in income.

1.11 Mary is not maximizing utility because (assuming she assigns the same value to a unit of corn chips and a unit of soda), she has not equalized the marginal utility from the last unit of corn chips and soda. At this point, she would want to consume more soda.

1.12 If pizza were an inferior good, the income effect would lead you to consume less pizza as its price falls. It is possible that a lower price would lead you to buy less if the income effect were larger than the substitution effect. In reality, though, the income effect is almost always smaller than the substitution effect.
10.2 Where Demand Curves Come From
Learning Objective: Use the concept of utility to explain the law of demand.

Review Questions

2.1 A consumer’s demand curve can be derived by relating the amount of a good a consumer will purchase at a given price. The additional amount a consumer will purchase in response to a fall in the price will depend on the marginal utility a consumer receives from consuming more of a good.

2.2 The market demand curve is derived from adding horizontally the individual demand curves. So, for each price, the quantities demanded for each buyer are added together to get the total quantity demanded in the market.

2.3 The law of demand is the phenomenon by which the demand for a commodity is inversely related to the price of a commodity. It is violated in the case of Giffen goods—inferior goods where the positive income effect outweighs the negative substitution effect.

Problems and Applications

2.4 An inferior good is one with a negative income effect. A Giffen good is a special case of an inferior good where the negative income effect outweighs the substitution effect. Inferior goods have negatively sloped demand curves while Giffen goods have positive sloped demand curves.

2.5 This statement is correct for inferior goods. Where the income effect is negative and operates in an opposite direction to the substitution effect, the law of demand will hold if the income effect is smaller than the substitution effect.

2.6

<table>
<thead>
<tr>
<th>Price</th>
<th>Josh Quantity demanded (cones per week)</th>
<th>Jon Quantity demanded (cones per week)</th>
<th>Tim Quantity demanded (cones per week)</th>
<th>Market demand Quantity demanded (cones per week)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.75</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>1.50</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
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<td>6</td>
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<td>3</td>
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</tr>
<tr>
<td>1.00</td>
<td>7</td>
<td>6</td>
<td>4</td>
<td>17</td>
</tr>
<tr>
<td>0.75</td>
<td>9</td>
<td>7</td>
<td>5</td>
<td>21</td>
</tr>
</tbody>
</table>
2.7 With a rise in the wage rate, the opportunity cost of leisure will increase and the substitution effect will lead to consumers consuming less leisure and increasing hours of work. The rise in wages, however, leads to an increase in income and the income effect will cause consumers to consume more of every normal good, including leisure. The net effect of a change in the wage rate will depend on the relative sizes of the two effects.

2.8 No, when the price of pizza falls, the marginal utility per dollar spent on pizza will not always equal the marginal utility per dollar spent for Coke. However, the marginal utilities per dollar spent for the last slice of pizza and the last cup of Coke will eventually become equal (or very close) as the consumption of pizza and Coke changes. As the price of pizza falls, the quantity demanded of pizza will rise due to the income and substitution effects.

2.9 a. Giffen behavior means that as the price of the good increases, the quantity demanded of the good will increase as well, leading to an upward-sloping demand curve.

b. For a good to be a Giffen good, it must be an inferior good and consumers must spend a large portion of their incomes on it so that the income effect is greater than the substitution effect. The poorest of the poor have very low (if any) income to start with, so for these consumers the income effect might not be greater than the substitution effect.

c. Unless the good makes up a large portion of a consumer’s budget, the income effect cannot be greater than the substitution effect. For example, when the price of an inferior good increases, the average consumer in a country will spend only a small fraction of his or her budget on the good. So, the income effect will be very small relative to the substitution effect and the consumer will buy a smaller quantity of the good following the price increase.
Social Influences on Decision Making

Learning Objective: Explain how social influences can affect consumption choices.

Review Questions

3.1 Social influences are likely to be higher in the purchase of sunglasses because these goods are far more visible to outsiders. Floor cleaner is used at home, so the choice of the product would depend more on individual preferences.

3.2 Companies assume that celebrity endorsers can sell goods either because they are knowledgeable about the product or because people look up to them and are likely to buy similar products. If they are involved in scandals which have a negative effect on their reputation, then this latter effect disappears and companies risk their products becoming associated with the scandal.

3.3 Network externalities are the positive benefits that emerge when more people use a particular good or service. Switching costs are the costs related to changing products while path dependence is the tendency to continue to buy a particular type of product due to the existence of switching costs. If these costs are large, this could lead to market failure as consumers may become locked into inferior products simply because it is too difficult to switch away from them.

3.4 The dictator game is an experimental test of how much consumers value fairness. In this two-player game, one player is given two possible divisions of $20: either to keep $18 for themselves and give $2 to the other player or an even division of $10 for themselves and $10 for the recipient. If players are found to select more money for themselves, then they would be acting in a way that implies that fairness is not valued by them.

3.5 Because consumers apparently value fairness, businesses will sometimes set their prices below the equilibrium level, giving up some profits in the short run to keep their customers happy and increase their profits in the long run.

Problems and Applications

3.6 Facebook and Blu-Ray DVDs will have the biggest network externalities. Facebook is more satisfying when more friends are also connected to Facebook while Blu-Ray DVDs require the use of special hardware which can only play Blu-Ray DVDs and is cost-effective only if there are sufficient DVDs available in this format. Computer software is also associated with some externalities to the extent that the use of one type of software restricts the use of other software or requires other users to use the same software in order to interact with one another.
3.7 By not adopting the plug adapters used in other European countries, the Swiss are not taking advantage of network externalities. As Daniel Hamermesh found out, universal plug adapters are useless in Switzerland and the three-prong adapters that must be used in Switzerland are useless in other countries. This severely limits the market for and the usefulness of the Swiss adapters.

3.8 Snoopy has been around in the Peanuts comic strip for decades, so he is very well known and many people like him. One advantage of using Snoopy in commercials is that there is unlikely be any scandal and negative publicity tied to him, as opposed to the negative publicity that can occur when a real person gets into trouble. A disadvantage to using Snoopy is that he does not talk and cannot verbally endorse a company’s product.

3.9 Many consumers may be influenced to buy a product endorsed by a celebrity even though they may not be consciously aware of it. Some people may associate a product with a particular celebrity, in the back of their mind but may not believe this association has influenced their decision to purchase the product.

3.10 Stetson has to pay Tom Brady for his endorsement, and they would do so only if they expected to receive a benefit that exceeds the cost. The benefit must come in the form of consumers buying more Stetson cologne, consumer willingness to pay more for Stetson cologne, or some combination of the two. In other words, the marginal utility from a bottle of Stetson cologne must increase for at least some consumers, and the demand curve for Stetson cologne must shift to the right.

3.11 The government may believe that local residents have a right to visit symbols of their own heritage at a lower price, particularly if they are poor. The setting of a lower price for local residents (as opposed to a market price for foreigners) can be seen as an act of fairness.

3.12 Manchester United might be concerned that changes in ticket prices would be seen as unfair to its core consumers who support the team during all matches. The rise in popularity of a high-profile game would be at least partly due to outside interest in the match, which may be seen as unfair to home supporters.

3.13 The company runs a full service because it wants to be seen as giving a fair deal to all its customers rather than exploiting them during busy times. Since students and residents of Oxford are likely to be loyal users of the public transport service, the company might calculate that it is better in the long term to be seen to be fair than to earn any additional profit from differential pricing.

10.4 Behavioral Economics: Do People Make Their Choices Rationally?
Learning Objective: Describe the behavioral economics approach to understanding decision making.

Review Questions

4.1 Behavioral economics is the study of situations in which people make choices that do not appear to be economically rational. Consumers may act irrationally because they may ignore nonmonetary opportunity costs, they may fail to ignore sunk costs or they have unrealistic assumptions about their future behavior.

4.2 Non-monetary costs are opportunity costs which are not explicitly paid for but ought to be accounted for in making economic decisions. Sunk costs are costs that have already been made and cannot be reversed. The endowment effect is the tendency of people to be unwilling to sell a good they already own even if they are offered a price that is greater than the price they would be willing to pay to buy the good if they didn’t already own it.

Problems and Applications

4.3 This is due to the endowment effect. Consumers are much less likely to remove products they are already presented with than they are likely to add those same products at the same price when they are not presented with them.

4.4 The endowment effect refers to the tendency of people to be unwilling to sell a good they already own even if they are offered a price that is greater than the price they would be willing to pay to buy the good if they didn’t already own it. Thaler states that he was not planning to sell the wine, and now that he is being paid for his loss by his insurance company, he will not take this money to replace the stolen bottles of wine. Not being willing to sell the wine he already owned, while at the same time, not being willing to repurchase the wine with the insurance payment is inconsistent behavior.

4.5 You would be irrational if you are not willing to sell the Harry Potter book if someone offered you more than $200 for it. The most you are willing to pay for the book is $200, but if someone offers you $250, the nonmonetary opportunity cost of owning the book becomes $250.

4.6 The columnist’s analysis is correct. The opportunity cost of continuing to own the townhouse is the price you could sell the townhouse for. In that sense, by not selling the townhouse, the person is in effect buying it. The price the owner originally paid for the townhouse is a sunk cost and is, therefore, irrelevant to the decision about whether or not to sell it.
4.7 The cost of the ticket is a sunk cost, which Neyer should ignore. Once he’s at the game, it would be rational to weigh the marginal cost of moving into the shade (a slightly worse view) versus the marginal benefit (greater physical comfort).

4.8 Her reasoning is irrational. The effort already spent in the ten hours is a sunk cost which can never be recovered and should play no role in her decision making.

4.9 The $3,000 in recent refinancing fees is a sunk cost and should be ignored.

4.10 The cost of signing up for the marathon is a sunk cost, which Roth should ignore. On the day of the marathon, it would be rational to weigh the marginal cost of participating in the race (the potential for additional injury and pain) versus the marginal benefit (the satisfaction of achieving his goal of completing the marathon).

4.11 True. Many customers would believe that they are more likely to go to the gym than they actually would. If they were better able to forecast attendance at the gym, the demand for memberships would fall.

4.12 By “long-run self,” they mean a person’s long-run objectives, such as succeeding in school or remaining thin. Going to the movies rather than studying or eating donuts rather than sticking to a healthy diet are two examples of pursuing immediate gratification.

4.13 This reflects unrealistic assumptions by consumers about their own behaviour. Students expect to study a lot more than they actually end up studying.

SOLUTIONS TO CHAPTER 10 APPENDIX

Review Questions

10A.1 Transitive preferences are characterized by the following: if a consumer prefers A to B and B to C, then the consumer will prefer A to C. This is important for the consumer’s preferences to be consistent.

10A.2 An indifference curve shows the combinations of consumption bundles that give the consumer the same utility. They can never cross because the point of intersection would represent a point where the same bundle is associated with two levels of utility.

10A.3 The marginal rate of substitution is the rate at which a consumer would be willing to trade off one good for another, or the slope of the indifference curve. An optimal decision requires the consumer to equate the MRS with the slope of the budget constraint, or the relative price of the two goods.
Problems and Applications

10A.4 a.

b. The indifference curve must be drawn so that it is tangent to the budget constraint at point A, as in the graph above.

c. The budget constraint rotates inward (that is, counter-clockwise from the point where it intersects the Lemon Fizz axis at five Lemon Fizzes). The new optimum consumption point will be at a higher level of Lemon Fizz and a lower level of ice cream, such as point B, so draw an indifference curve that is tangent at such a point, as in the graph above. Make sure that the indifference curves do not cross.

10A.5 a.
b. The income increase causes a parallel outward shift in the budget constraint. Because both goods are normal, higher income leads to greater consumption of both goods, shown by the move from the initial point of consumption, $A$, to a point like $B$ in the graph above.

c. If ice cream is inferior, then consumption of it will fall as income rises, moving Jacob from point $A$ to a point like $C$ in the graph above. (Indifference curves $I_2$ and $I_3$ may cross because they represent situations where Jacob’s tastes are different.)

10A.6  a. Calvin’s indifference curves won’t be curved like the indifference curves in the appendix. The curves will be straight lines with a slope of negative one—showing that Calvin is always willing to trade off one can of Coke for one can of Pepsi.

b. Because Pepsi and Coke taste exactly the same to Calvin, he’ll buy whichever drink has the lower price.

10A.7  a. The prices of the goods can be found by dividing Nikki’s budget by the maximum amount that she can buy of each good. The price of blouses = $200/5 = $40. The price of skirts = $200/10 = $20.

b. Four blouses and two skirts cannot be the optimal point because the indifference curve going through this point isn’t tangent to Nikki’s budget constraint. She can reach higher indifference curves at points between the two intersections of her budget constraint and the indifference curve that is shown.
If Marilou and Hunter are both choosing optimally, at their consumption point their marginal rate of substitution between milk and doughnuts will be the same because they pay the same prices for the two goods. We know the prices are the same because they buy the goods in the same store. The marginal rate of substitution is the slope of the indifference curve. Each of them selects a point where his or her highest attainable indifference curve is tangent to his or her budget constraint, but these budget constraints must have the same slope because the prices they pay are identical. In the figure, Marilou has a higher income than Hunter. The slope of $I_H$ at point $H$ is the same as the slope of $I_M$ at point $M$.

Because prices and incomes are unchanged for the typical consumer, the budget constraint doesn’t change. Instead, tastes change so the indifference curves change. The initial point of tangency was at a very low level of prune juice consumption, point $A$. But the new point of tangency is at a much higher level of prune juice consumption, point $B$.

First, draw the budget constraint, indifference curve, and point of optimal consumption for the original prices (the budget constraint runs from 30 DVDs to 30 CDs, the indifference curve is $I_1$, and the point of optimal consumption is $A$). At the new prices, Dave
can buy a maximum of 25 DVDs or 50 CDs (this is his new budget constraint). Both his old and his new budget constraints pass through the consumption bundle at point $A$. This consumption bundle is no longer optimal, however, because with the new prices, it is possible for him to reach an indifference curve that is higher than $I_1$. Draw in the new highest indifference curve he can reach, $I_2$, and show the new optimal consumption bundle, point $B$. As the figure shows, because Dave can now reach a higher indifference curve, $I_2$ at point $B$, he is better off than he was before the price change.
2. If 1366 Technologies is successful, it will benefit from economies of scale and lower its average total cost of production as it sells more solar panels. It will then be difficult for a smaller firm to enter the market and sell enough solar panels to reach minimum efficient scale. But being the first firm to use a new technology can lead to economic losses if the technology does not allow 1366 Technologies to lower its average total costs enough to earn an economic profit.
Problems and Applications

1.3 You should disagree with the statement because firms can experience technological change in the production of existing products, not just in the introduction of new products. Examples include the firm’s managers rearranging the flow of work on a factory floor or the layout of a retail store, thereby increasing production and sales, retraining workers, or installing faster or more reliable machinery or equipment.

1.4 a. Positive technological change  
b. Positive technological change  
c. Positive technological change  
d. A negative shock  
e. Positive technological change

1.5 You should disagree because the statement is incorrect. The firms could now produce more output (greater sales) with fewer inputs (fewer trucks). Therefore, this is indeed an example of technological change.

11.2 The Short Run and the Long Run in Economics

Learning Objective: Distinguish between the economic short run and the economic long run.

Review Questions

2.1 In the short run, at least one of the firm’s inputs is fixed, but in the long run the firm can vary all of its inputs, adopt new technology, and change the size of its physical plant. The amount of time that it takes to move from the short run to the long run varies from firm to firm.

2.2 For a firm, fixed costs are the costs that remain constant as output changes. Variable costs are those that change as output changes. The average total cost is the cost of all the inputs a firm uses in production per unit output.

2.3 Accounting costs are explicit costs which are actually paid out while economic costs are the sum of explicit and implicit costs that measure the opportunity cost of a particular economic activity.

2.4 The production function shows the relationship between the inputs employed by a firm and the maximum output it can produce with those inputs. The short-run production function
holds constant fixed inputs (such as the number of ovens in Jill’s pizza restaurant in the example in the chapter).

Problems and Applications

2.5 The article states that the cost of the shuffle’s components, headphones, and packaging is $21.77. Not included in this figure are other costs Apple incurred, including those for research and development, advertising, and a return on the investment made by Apple’s owners in the firm. To calculate economic profit, all implicit and explicit costs relating to the production of the shuffle must be subtracted from total revenue.

2.6 The number of factor floor workers can be varied depending on how much output firms want to produce; however, a manager will always be necessary to run a firm of any size. The cost of utilities may be either variable or fixed or a combination of both. Basic utilities required to run any plant include electricity and water. However, the greater the level of output, the more the consumption of electricity. Therefore, some utilities have a fixed cost and a variable cost component.

2.7
a. Fixed cost
b. Variable cost
c. Variable cost
d. Fixed cost
e. Variable cost

2.8 The private firms that print and sell the Statistical Abstract of the United States only pay the cost of printing the book, advertising it, and delivering it to customers. They do not pay the fixed (and huge) costs of collecting the data in the first place or the cost of assembling the data from a variety of government reports and other sources. Because the U.S. Census Bureau does have to cover these fixed costs, it sells copies of the Statistical Abstract at a higher price.

2.9

<table>
<thead>
<tr>
<th>Quantity of workers</th>
<th>Quantity of cars per month</th>
<th>Fixed cost</th>
<th>Variable cost</th>
<th>Total cost</th>
<th>Average total cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>$5,000</td>
<td>0</td>
<td>$5,000</td>
<td>NA</td>
</tr>
<tr>
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<td>$2,500</td>
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<td>$5,000</td>
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<td>$15,000</td>
<td>$300</td>
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</tbody>
</table>
2.10 The opportunity cost is the highest-valued alternative that must be given up to engage in an activity. By keeping the Supersonics in Seattle instead of moving them to Oklahoma City, Bennett would give up $82 million dollars, the difference between losing $63 million by staying in Seattle and gaining $19 million by moving to Oklahoma City. (The team did move to Oklahoma City in 2008.)

2.11 Jill’s reasoning is faulty. If she could rent out her current building for $4,000 per month, then she would incur an opportunity cost of that amount by using the building herself. Therefore, by moving to the suburbs, Jill’s costs would actually drop by $1,000 per month, which is the difference between the implicit rent of $4,000 she is paying now and the cash rent of $3,000 she would pay if she moved.

2.12 The report included DuPont chemical company’s expected earnings as a loss because the return on the investment represents the opportunity cost of the funds the company had invested. Expected earnings are an implicit cost that must be subtracted from revenue when calculating a firm’s economic profit or loss.

### Review Questions

3.1
Marginal product normally increases at first due to specialization and division of labor, but it eventually decreases because of the law of diminishing returns. The amount of capital per worker declines as more labor is hired to work with a fixed amount of capital. Therefore, the marginal product of labor falls. When the marginal product of labor is greater than the average product of labor, the average product of labor increases. When the marginal product of labor is less than the average product of labor, the average product of labor decreases. The marginal product of labor is equal to the average product of labor when the average product of labor is at its maximum value.

3.2 The average product of labor is the average of the marginal products of labor. Whenever the marginal product of labor is greater than the average product of labor, the average product of labor is increasing. Whenever the marginal product of labor is less than the average product of labor, the average product of labor is decreasing. The marginal product of labor equals the average product of labor for the quantity of workers where the average product of labor is at its maximum.

3.3 Marginal product rises initially as additional workers are able to make better use of available capital and specialize in different aspects of the production process to increase total output. Eventually, however, the gains from division and specialization of labour are exhausted and production is subject to diminishing returns – where increased use of labour leads to declining productivity of every additional unit of labour.

Problems and Applications

3.4

<table>
<thead>
<tr>
<th>Quantity of Workers</th>
<th>Total Output</th>
<th>Marginal Product of Labor</th>
<th>Average Product of Labor</th>
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</thead>
<tbody>
<tr>
<td>0</td>
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<tr>
<td>7</td>
<td>2,300</td>
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<td>329</td>
</tr>
</tbody>
</table>

104
3.6 The student’s analysis is incorrect. The data in Table 11.3 represent the effects of specialization and division of labor and the law of diminishing returns, not the varying quality of the workers.

3.7 Gains from specialization are not limited to the production of physical goods. In retail stores, for example, there is a division of labor between those who stock the shelves, help customers in the aisles, and operate cash registers.

3.8 As long as Sally’s GPA for a semester is below her cumulative GPA, her cumulative GPA will fall, because this semester’s GPA is the marginal GPA, while her cumulative GPA is the average GPA. Even if her marginal GPA goes up, her average GPA will go down as long as her marginal GPA is below her average GPA.

3.9 No, because anything that increases the marginal product of labor must also change the average product of labor.
Learning Objective: Explain and illustrate the relationship between marginal cost and average total cost.

Review Questions

4.1 Average total cost is total cost divided by the quantity of output produced; marginal cost is the change in a firm’s total cost from producing one more unit of a good or service.

4.2 If the marginal product of labor is rising, it means that each additional worker is contributing more additional output than the previous worker. As a result, the additional, or marginal, cost of output must be falling because the additional output takes fewer additional workers to produce. Marginal product and marginal cost are mirror images of each other: When marginal product increases, marginal cost falls, and vice versa.

4.3 When marginal cost is below average total cost, marginal cost pulls average total cost down, so we are on the downward-sloping section of the U-shaped average total cost curve. When output expands enough, marginal cost rises to equal and then exceed average total cost. When marginal cost is above average total cost, marginal cost pulls average total cost up, so we are on the upward-sloping section of the U-shaped average total cost curve. Therefore, at the point where marginal cost equals average total cost, the average total cost curve stops sloping downward but hasn’t begun sloping upward—that is, the average total cost curve is at its lowest point when the marginal cost curve equals (or intersects) it.

Problems and Applications

4.4 Yes. As long as the marginal cost is below the average total cost, average total cost will be decreasing even if marginal cost is increasing.

4.5 a. No. In this case, the average total cost is also always increasing.

   b. As each unit costs an additional (marginal) cost of $5 to produce, average total cost will also be $5 for each unit and the average cost curve will also be a straight line parallel to the quantity axis at $5.

4.6 a.

<table>
<thead>
<tr>
<th>Quantity of Workers</th>
<th>Quantity of Copies per Day</th>
<th>Fixed Cost</th>
<th>Variable Cost</th>
<th>Total Cost</th>
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</tbody>
</table>

106
b. The average total cost curve is U shaped; it falls initially and then rises. (Note that in this example, we only get the U shape for the average total cost curve if we compute average total cost to three decimal places. At two decimal places, the average total cost of producing 1,100, 1,500, and 1,800 copies is $0.11, so the average total cost curve will have a flat section.) The marginal cost curve, on the other hand, rises continuously, rather than being U shaped.
4.7 Average total cost is total cost divided by total output. In this case, average total cost is $50,011/10,001 = $5.00. Marginal cost is the change in total cost divided by the change in output. In this case, marginal cost is $11/1 = $11. As the graph shows, when average total cost is rising, marginal cost must be above average total cost. Therefore, Jill is correct to say that her marginal cost must be increasing.

4.8 Average total cost is total cost divided by total output. In this case, average total cost is $75,002/20,001 = $3.75. Marginal cost is the change in total cost divided by the change in output. In this case, marginal cost is $2/1 = $2. As the graphs show, when average total cost is greater than marginal cost, marginal cost may be either increasing (graph (a) shown below) or decreasing (graph (b) shown below). Therefore, Jill is wrong to say that her marginal cost must be increasing.

a. In this case, Jill’s average total cost is above her marginal cost, and her marginal cost is increasing.
b. In this case, Jill’s average total cost is above her marginal cost, and her marginal cost is decreasing.

4.9

a. \( \Delta VC = \Delta (wL) = w\Delta L \)

b. \( \frac{\Delta TC}{\Delta Q} = \frac{\Delta VC}{\Delta Q} = w\frac{\Delta L}{\Delta Q} = w/\text{Marginal product of labour} \)

c. Marginal cost at 100 pizzas = \( w/\text{Marginal product of labour} = \frac{1,000}{100} = \$10 \)

If wage falls, then marginal cost at 100 pizzas falls as well to \( \frac{800}{100} = \$8 \)

If marginal product of labour rises, then marginal cost at 100 pizzas falls to \( \frac{1,000}{150} = \$6.67 \)

11.5 Graphing Cost Curves

Learning Objective: Graph average total cost, average variable cost, average fixed cost, and marginal cost.

Review Questions

5.1 Average fixed cost is the value of total fixed costs per unit output. Since fixed costs remain unchanged, as output increases average fixed costs will always fall.

5.2 The marginal cost curve intersects both the average total cost and variable costs curves through the points where both are at their minimum.

Problems and Applications

5.3

a. Variable cost = Total cost – fixed cost = $20,000

b. Average variable cost = $20,000/20,000 = $1

Average fixed cost = $20,000/20,000 = $1
c. The difference will be greater at 10,000 balls than at 30,000 balls because average fixed costs fall as quantity produced rises. In this example, average fixed cost would fall from $2 at 10,000 balls to $0.67 at 30,000 balls.

5.4 Fixed costs are like a lump-sum tax because both are fixed amounts that do not change as output changes. Because \( AFC = \frac{FC}{Q} \), a tax becomes smaller per unit of output as output increases.

5.5

a. Cost of 6 scrolls = \((11.33+16.5)*6 = 166.98\) drachmas
Cost of 6 codices = \((11.33+9.25)*6 + 72 = 195.48\) drachmas
The publisher should publish 6 copies as scrolls.
Cost of 12 scrolls = \((11.33+16.5)*12 = 333.96\) drachmas
Cost of 12 codices = \((11.33+9.25)*12 + 72 = 318.96\) drachmas
The publisher should publish 12 copies as codices.

b. The number of units published probably increased substantially between the first and the third centuries AD. Since average fixed costs decline with the quantity produced, the additional fixed cost of producing codices were outweighed by the benefits of lower marginal costs associated with them.

5.6

a. $15

b. Total cost = \( ATC \times Q = 30 \times 1,000 = 30,000 \).

c. Variable cost = \( AVC \times Q = 20 \times 1,000 = 20,000 \).

d. Fixed cost = Total cost − Variable cost = $30,000 − $20,000 = $10,000.

5.7 The \( AFC \) curve should be downward sloping, not U shaped. Because \( AFC = \frac{TC}{Quantity} \), and because total fixed cost does not change, \( AFC \) will decrease as quantity increases. \( ATC \) should be above \( AVC \). Because \( ATC = AFC + AVC \), the \( ATC \) curve will always be above the \( AFC \) and \( AVC \) curves.

5.8

a. MC, AVC remain unchanged. AFC and ATC fall since the annual maintenance fee is a fixed cost.

b. MC, AVC and ATC rise. AFC remains unchanged since the carbon tax is a variable cost.

c. MC, AVC, ATC fall. AFC remains unchanged since the number of stewards employed is a variable cost.
d. MC, AVC remain unchanged. AFC and ATC falls. Here the television budget is assumed to be fixed over a particular period of time.

11.6 Costs in the Long Run

Learning Objective: Understand how firms use the long-run average cost curve in their planning.

Review Questions

6.1 A long-run average cost curve shows the lowest cost at which a firm is able to produce a given quantity of output in the long run, when no inputs are fixed. Its shape will depend on the nature of the firm or industry – whether it experiences economies of scale (falling curve) or diseconomies of scale (rising curve) or even constant returns to scale (horizontal line).

6.2 Minimum efficient scale is the lowest level of output at which all economies of scale have been exhausted. In other words, minimum efficient scale is where the long-run average cost curve stops sloping downward. In the long run, firms that don’t reach minimum efficient scale will have higher average costs than competitors that do reach minimum efficient scale, so they will probably be driven out of business. However, firms that justify selling at premium prices due to product differentiation can survive. The textbook discusses this last point in Chapter 13.

6.3 Economies of scale exist when a firm’s long-run average costs fall as the firm increases output. Firms may experience economics of scale because: (1) a firm’s technology may allow it to increase production with a smaller proportional increase in at least one input; (2) both workers and managers can become more specialized as output expands; (3) large firms may be able to purchase inputs at lower costs than smaller firms; and (4) as a firm expands, it may be able to borrow money at a lower interest rate, thereby lowering its costs.

6.4 Diseconomies of scale exist when a firm’s long-run average costs rise as the firm increases output. Diseconomies of scale eventually arise because managing a store or factory above a certain size is simply too complicated.

6.5 Because short-run average cost includes at least one input that is fixed in amount, it can never be less than long-run average cost (where there are no fixed inputs or fixed costs).

Problems and Applications

6.6 Economies of scale occur when a firm’s long-run average costs fall as the firm increases output. By building bigger factories, computer chipmakers will be able to increase the output of computer chips. The more chips these firms are able to produce in each factory, the lower the cost per chip.
6.7  

a. Jill’s average total cost will be lower with a smaller restaurant.

b. Jill’s average total cost will be lower with a larger restaurant.

c. As we can see in Figure 11.6 in the text, economies of scale often take the form of a larger store or restaurant allowing for lower average cost for a large quantity, but actually higher average cost for a small quantity. The larger restaurant may use larger ovens, more tables, or other capital that isn’t efficiently used if Jill is only able to sell a smaller quantity of pizzas.

6.8  

a. The minimum point on the oil refinery’s long-run average cost curve came at a level that was a much higher fraction of industry output than in the shoe industry.

b. There were more shoe factories than oil refineries in the late nineteenth century because the economies of scale in oil refining meant that large oil refineries had a significant cost advantage over small oil refineries. Economies of scale in shoe manufacturing were much more limited.

c. Because these very large shoe factories would have suffered from significant diseconomies of scale resulting in higher average costs and higher prices to cover those costs.

6.9  

If the price of Japanese mobile phones is high because they are being produced in low volume, this indicates that the Japanese firms were not yet at minimum efficient scale in the mobile phone business. Minimum efficient scale is represented on the graph by quantity $Q_{M}$, with an average total cost of $ATC_{M}$. The current volume of mobile phones being produced by the Japanese manufacturers is represented by $Q_{A}$, with an average total cost of $ATC_{A}$.
6.10 CNN and ABC News were on $ATC_1$. If the companies had merged, they would move to $ATC_2$ and be on the section of the long-run average cost curve that exhibits diseconomies of scale.

6.11 Ford would have ended up as the only automobile producer. Other producers would have had higher average costs and, therefore, would not have been able to match his price cuts.

6.12 DuPont had expected to be on $ATC_1$, in which case as production of paint increased from $Q_1$ to $Q_2$, average cost would have decreased from $AC_1$ to $AC_2$. In fact, they were on $ATC_2$, so average cost actually increased from $AC_3$ to $AC_4$, as production expanded.
6.13 The independent bookstores most likely have higher average costs than the large, online sellers. If the smaller, independent sellers’ average costs are higher, they cannot make a profit selling books at market prices that are the same as those of the larger, more efficient online sellers.

6.14 The statement is incorrect. The River Rouge plant exhibited diseconomies of scale, a long-run concept, not diminishing returns, which is a short-run concept.

6.15 Morita’s short-run cost curve is described in the chapter opener. Its lowest point is at outputs between 10,000 and 30,000. If Morita wanted to produce more than 75,000, he would have built an additional factory, or if there were economies of scale in manufacturing transistor radios, he would have built a larger factory.

6.16 Companies with greater economies of scale have lower average costs than competitors, so they can charge a lower price and still make a profit.

**Solutions to Chapter 11 Appendix**

**Review Questions**

11A.1 The isoquant is a curve that shows all the combinations of two inputs, such as capital and labor that will produce the same level of output. The isocost line shows all the combinations of two inputs, such as capital and labor that have the same total cost. The expansion path is a curve that shows a firm’s cost-minimizing combination of inputs for every level of output.
11A.2  The marginal rate of technical substitution (MRTS) is the rate at which a firm is able to substitute one input for another while keeping the level of output constant. It is given by the slope of the isoquant.

11A.3  The firm wants to minimize the cost of producing any level of output. This occurs where the isoquant and isocost lines are tangent or the MRTS equals the ratio of the input prices.

Problems and Applications

11A.4

![Diagram of isoquant and isocost lines]

11A.5  a. If total cost is $2,000 and the wage rate and rental price of machines both equal $100, the isocost line’s endpoints are at 20 and 20. Along this isocost curve, the cost-minimizing point for producing 5,000 units is at point A.

b. If the wage rate is one-fourth the rental price of machines, then we must be on the isocost line whose endpoints are where capital = 10 and labor = 40, because we can buy four times as much labor with a total cost of $1,000. Along this isocost curve the cost-minimizing point for producing 5,000 units is at point B.

c. In this case, the isocost line’s endpoints are at 40 and 40, so the cost-minimizing point for producing 12,000 units is at point C.

11A.6  For Jill to minimize costs, the following condition must hold $\frac{MPK}{\text{rental price}} = \frac{MPL}{\text{wage rate}}$

Currently, the ratio of marginal product of labour to wage is $12$, which is higher than the ratio of marginal product of capital to rental prices at $10$. Jill should hire more workers or use fewer pizza ovens till the marginal product of labour per unit wage rate drops to the same level as the ratio of marginal product of capital to rental price.
11A.7 At point $A$ the slope of the isocost $= \frac{-w}{r} = -1/2$ ovens per worker, while the slope of the isoquant $= MRTS = -1$ oven per worker ($w$ = wage rate; $r$ is unit capital rate). Since the slope of the isoquant is greater than the slope of the isocost in absolute value, Jill should employ more workers and fewer ovens (represented by point $B$) to minimize cost for $Q = 20,000$ pizzas per week.

11A.8

In the colonies, with land cheap and labor expensive, the cost-minimizing input combination was point $A$. In Europe, where land was expensive and labor was cheap, the cost-minimizing input combination was point $B$, with more labor and less land.

11A.9
After the positive technological change, Jill can produce 20,000 pizzas per week at a cost less than $20,000 per week.

11A.10 a. Combinations A and B yield the same output because they are on the same isoquant curve.

b. The ratio of the wage rate to the rental price of capital will determine which point along this isoquant Jill chooses.

c. The marginal rate of technical substitution is the slope of the isoquant, which is greater in magnitude at point A.

11A.11

Jill Johnson’s pizza restaurant exhibits economies of scale between 20,000 and 45,000 pizzas per week and diseconomies of scale between 45,000 and 60,000 pizzas per week.
The isoquant curve shows that there are innumerable combinations of workers and machines that can pick the same quantity of oranges per day. In the United States, firms select a point like \( A \)—using a lot of capital and very little labor—because the isocost curves they face are very steep, due to the fact that in the United States labor is relatively expensive in comparison to capital. In Brazil, firms select a point like \( B \)—using lots of labor and very little capital—because the isocost curves they face are very flat, due to the relatively low price of labor in comparison to capital in Brazil.

For optimization, Jill must meet the following condition:

\[
\frac{MPL}{wage} = \frac{MPK}{rental\ price}
\]

Or

\[
MPL = MPK \times \frac{wage}{rental\ price} = 5,000 \times \frac{300}{1,000} = 1,500
\]

If Massey and Thaler are correct, the team that has the first pick in the draft should trade it to another team for a lower draft pick. The players chosen with the first few picks of the first round of the draft tend to be paid salaries that are much higher relative to their marginal products than is true for players taken later in the first round. A typical team with a high draft pick would increase its ability to win football games at the constant cost represented by the salary cap if it traded for lower draft picks. The 2011 agreement that limits the salaries that drafted players can receive will mean lower overall salaries, so a team with the first pick should still trade it to another team for a lower pick.
1. As some farmers exit the market, the market supply curve will shift to the left. The exit will continue until the supply curve has shifted from $S_1$ to $S_2$ and the market price has risen back up to $P_1$, as shown in Figure 1. With the price back at $P_1$, the farmer represented by Figure 2 will now break even.

2. Government grants and subsidies reduced the cost for farmers to convert to and produce organic products, making the market more profitable for farmers and therefore increasing the number of farmers in the market. With the elimination of this government assistance, farmers must bear the entire cost of conversion and production, decreasing their profits. If the government had never initiated these assistance programs, fewer farmers would have entered the market, prices would have most likely been higher, and the quantity of organic products being produced would have been smaller.
12.1 Perfectly Competitive Markets
Learning Objective: Explain what a perfectly competitive market is and why a perfect competitor faces a horizontal demand curve.

Review Questions

1.1 A perfectly competitive market is characterized by the existence of a large number of firms, all of which are small compared to the size of the market. All firms sell identical products and there are no barriers to entry for new firms into the market. These conditions are not very realistic, particularly the requirement that all products be identical.

1.2 A price taker is a buyer or seller that is unable to affect the market price. Because a firm in a perfectly competitive market is very small relative to the market, and because it is selling exactly the same product as every other firm, it can sell as much as it wants without having to lower its price. If the firm raises its price, the firm will sell nothing.

1.3 The graph will look like Figure 12.2 on page 455. The graph on the left shows the market supply and demand curve for corn. The graph on the right shows the demand for corn produced by one corn farmer.

Problems and Applications

1.4 a. May be perfectly competitive in a given area if there are a large number of growers and easy availability of land, preventing barriers to entry.

b. Not perfectly competitive since different brands try to produce different types of products. Also, there are relatively few companies in the industry.
c. Not perfectly competitive because products are all different and number of firms is small.

d. Not perfectly competitive because there are typically only one or two producers.

1.5 Most consumers are too small relative to the market to affect the price. Most firms, on the other hand, are large enough relative to their markets that they are able to affect the price.

1.6 The remark confuses the market demand for wheat with the demand facing one farmer selling wheat. Remember that the units used in drawing the market demand curve are much greater than the units used in drawing the individual farmer’s demand curve.

1.7 The company is a price taker because it is in a very competitive industry. The company should charge the market price.

### 12.2 How a Firm Maximizes Profit in a Perfectly Competitive Market

Learning Objective: Explain how a firm maximizes profits in a perfectly competitive market.

#### Review Questions

2.1 The demand curve for a perfectly competitive firm is a horizontal line passing through the market price for the firm’s product, which cannot be influenced by the firm. It is the same as the marginal revenue of the firm.

2.2 As long as $MR > MC$, a firm should continue to expand production because doing so adds more to its total revenue than to its total cost, thereby increasing total profit. When a firm reaches the level of output at which marginal revenue equals marginal cost, it has reached the point where producing that unit of output will add as much to its total revenue as it does to its total cost, which means that total profit cannot get be increased and therefore must be at a maximum.

2.3 In a perfectly competitive market, $MR = P$, making these two conditions equivalent.

#### Problems and Applications

2.4 A firm maximizes profits by selling where marginal revenue is equal to marginal cost. If a firm stops producing where marginal revenue is greater than marginal cost, then it could increase its profits by producing more. Firms are not interested in maximizing their profits per unit sold. Firms are interested in maximizing their total profits.
2.5 Revenue is just the total dollar amount of a firm’s sales. Firms are interested in what they have left over from their revenues after they have paid all of the costs of producing the goods they sell. Profit is what’s left over when you subtract total cost from total revenue. That is why firms maximize profit, rather than revenue. A revenue-maximizing firm is likely to produce more output than if it were maximizing profit because revenues tend to increase past the point where profits start to decline.

2.6 The marginal revenue has now risen to $6.00, so the profit-maximising output is 7 bushels of wheat. Above this, marginal cost will be greater than marginal revenue and profits will decline. At this level of production, total revenue will be $42, total costs will still be $21.50 and profits will be equal to the difference, or $20.50.

2.7 With marginal revenue still at $4.00, the profit-maximising output will fall to 5 bushels of wheat. At six bushels of wheat, marginal cost will be higher than marginal revenue and profit will decline. Total revenues are $20 for 5 bushels while total costs rise to $18. Profits at 5 bushels of wheat will be $2.

2.8 Farmer Parker's fixed costs are $2, the minimum costs to be paid even when no wheat is being produced. If fixed costs rise, then total cost will increase but the marginal cost for every bushel of wheat will be unchanged; as a result, the profit maximising output will remain unchanged at 6 bushels of wheat. Total costs rise to $18.50 but revenue remains unchanged at $24, causing profits to fall to $5.50.

12.3 Illustrating Profit or Loss on the Cost Curve Graph
Learning Objective: Use graphs to show a firm’s profit or loss.

Review Questions

3.1 The graph should look like the graph in Step 4 of Solved Problem 12.3 (which is reproduced here).
3.2 The graph should look like the graph in Step 6 of Solved Problem 12.3 (which is reproduced here).

Problems and Applications

3.3 a. To maximize profits, Frances will produce the level of output where marginal revenue is equal to marginal cost. Frances will charge the market price of $1.80. Her profit maximizing output level is 6 earrings. She should expand output up to the point where $MR = MC$, but remember that in a competitive market $MR = P$. The sixth earring’s marginal cost is $1.60 (see the table that follows listing values for marginal cost at each level of output), which is less than the marginal revenue it generates, but the seventh earring’s marginal cost is $1.90, which is slightly more than the marginal revenue from selling it. Making the sixth earring increases profits, but making the seventh earring would reduce profits. Her profit $= \text{total revenue} - \text{total cost} = (\text{price} \times \text{quantity}) - \text{total cost} = ($1.80 \times 6) - $6.80 = $4$. 
### Output per Day Costs

<table>
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<th>ATC</th>
<th>MC</th>
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<td>0.30</td>
</tr>
<tr>
<td>5</td>
<td>5.20</td>
<td>0.84</td>
<td>1.04</td>
<td>0.70</td>
</tr>
<tr>
<td>6</td>
<td>6.80</td>
<td>0.967</td>
<td>1.133</td>
<td>1.60</td>
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<tr>
<td>7</td>
<td>8.70</td>
<td>1.10</td>
<td>1.243</td>
<td>1.90</td>
</tr>
<tr>
<td>8</td>
<td>10.70</td>
<td>1.213</td>
<td>1.338</td>
<td>2.00</td>
</tr>
<tr>
<td>9</td>
<td>13.00</td>
<td>1.333</td>
<td>1.444</td>
<td>2.30</td>
</tr>
</tbody>
</table>
b. Frances will charge $1 and produce 5 earrings. Her loss will be $(5 \times 1) - 5.20 = 0.20$, which is smaller than the loss of $1$ if she shuts down.

c. If the price falls to $0.25, she will shut down, because this price is less than the minimum point on her AVG curve. Her loss will be equal to her fixed cost of $1$.

3.4 At a price or marginal revenue of $6.00, Andy will produce 4 basketballs, since 4 basketballs results in a marginal cost of exactly $6.00. Total revenues will be $24 while total costs are $34. Andy will be making a loss of $10.

3.5 This argument is incorrect. To maximize profit, the firm should produce up to the point where marginal revenue equals marginal cost. By producing only $Q_1$, the firm will miss out on all the profits to be made on units between $Q_1$ and $Q_2$.

3.6 Total profit can fall, even if profit per used car rises, if the total number of used cars sold falls. The graph below is drawn so that prices stay the same, while the firm decreases the scale of its operations, as shown by the move from $ATC_2$ to $ATC_1$. The average total cost per used car is now slightly lower, raising profit per used car—but the quantity has fallen significantly, so total profits have fallen, from $(P - ATC_2) \times Q_2$ to $(P - ATC_1) \times Q_1$. (Carmax’s prices may have fallen also, which would have decreased its total profits, but the graph is illustrating the case where prices remain constant.)
3.7 Demand in the industry will shift to the right, which will cause the demand and marginal revenue curves faced by the representative firm in the industry to shift up. The graph that follows illustrates this as the price increases from $250 per scan to $495 per scan and demand shifts up from Demand\(_1\) to Demand\(_2\), causing the representative firm to move from making losses to breaking even.

12.4 **Deciding Whether to Produce or to Shut Down in the Short Run**

Learning Objective: Explain why firms may shut down temporarily.

Review Questions

4.1 A firm’s sunk cost is the fixed cost spent by a firm, which cannot be recovered by it. The shutdown point is the minimum level of average variable cost for the firm. If the price
falls below this level, the firm decides to stop producing. The shutdown point does not depend on the firm’s sunk cost.

4.2 The perfectly competitive firm’s supply curve can be directly derived from its marginal cost curve. The firm will produce where \( P = MC \) if price is at or above the shutdown point at the minimum of \( AVC \).

4.3 The market supply curve is determined by adding up the quantity supplied (using the marginal cost curves) by each firm in the market at each price.

Problems and Applications

4.4 a. Fill in the missing values in the following table:

<table>
<thead>
<tr>
<th>Output per week</th>
<th>Total costs</th>
<th>AFC</th>
<th>AVC</th>
<th>ATC</th>
<th>MC</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>$100</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>1</td>
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<tr>
<td>2</td>
<td>175</td>
<td>50</td>
<td>37.5</td>
<td>87.5</td>
<td>25</td>
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<tr>
<td>3</td>
<td>190</td>
<td>33.3</td>
<td>30</td>
<td>63.3</td>
<td>15</td>
</tr>
<tr>
<td>4</td>
<td>210</td>
<td>25</td>
<td>27.5</td>
<td>52.5</td>
<td>20</td>
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<td>5</td>
<td>240</td>
<td>20</td>
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<td>48</td>
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<tr>
<td>6</td>
<td>280</td>
<td>16.7</td>
<td>30</td>
<td>46.7</td>
<td>40</td>
</tr>
<tr>
<td>7</td>
<td>330</td>
<td>1.4</td>
<td>32.9</td>
<td>47.1</td>
<td>50</td>
</tr>
<tr>
<td>8</td>
<td>390</td>
<td>12.5</td>
<td>36.3</td>
<td>48.8</td>
<td>60</td>
</tr>
<tr>
<td>9</td>
<td>460</td>
<td>11.1</td>
<td>40</td>
<td>51.1</td>
<td>70</td>
</tr>
<tr>
<td>10</td>
<td>540</td>
<td>10</td>
<td>44</td>
<td>54</td>
<td>80</td>
</tr>
</tbody>
</table>

b. If marginal revenue is $60, then Scahill should produce 8 lamps per week, where marginal cost is also $60. His revenues will be $480 while his total cost will be $390, yielding profits of $90.

c. If the price drops to $40, Scahill should produce 6 lamps, earning a total revenue of $240 against costs of $280. His loss will be $40. Since the price is higher than his AVC at this level of production ($30), he will not shut down.
4.5 a.

<table>
<thead>
<tr>
<th>Output per week</th>
<th>Total costs</th>
<th>AFC</th>
<th>AVC</th>
<th>ATC</th>
<th>MC</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>100</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
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<td>155.7</td>
<td>100</td>
<td>55.7</td>
<td>155.7</td>
<td>55.7</td>
</tr>
<tr>
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<td>205.6</td>
<td>50</td>
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<td>102.8</td>
<td>49.9</td>
</tr>
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<td>253.9</td>
<td>33.3</td>
<td>51.3</td>
<td>84.6</td>
<td>48.3</td>
</tr>
<tr>
<td>4</td>
<td>304.8</td>
<td>25</td>
<td>51.2</td>
<td>76.2</td>
<td>50.9</td>
</tr>
<tr>
<td>5</td>
<td>362.5</td>
<td>20</td>
<td>52.5</td>
<td>72.5</td>
<td>57.7</td>
</tr>
<tr>
<td>6</td>
<td>431.2</td>
<td>16.7</td>
<td>55.2</td>
<td>71.9</td>
<td>68.7</td>
</tr>
<tr>
<td>7</td>
<td>511.1</td>
<td>14.2</td>
<td>59.4</td>
<td>73.6</td>
<td>83.9</td>
</tr>
<tr>
<td>8</td>
<td>618.4</td>
<td>12.5</td>
<td>75.8</td>
<td>88.3</td>
<td>103.3</td>
</tr>
<tr>
<td>9</td>
<td>745.3</td>
<td>11.1</td>
<td>71.7</td>
<td>82.8</td>
<td>126.9</td>
</tr>
<tr>
<td>10</td>
<td>900</td>
<td>10</td>
<td>80</td>
<td>90</td>
<td>154.7</td>
</tr>
</tbody>
</table>

b. In a competitive market, Rafferty will charge the equilibrium market price of $90, producing 7 units per week, where marginal cost is just under $90. His total revenues will be $630, his total costs $515.1, yielding profits of $114.9.

c. If the price falls to $75, Rafferty will produce 6 units per week. Total revenues will be $450, total costs $431.2, yielding profits of $18.8.

d. If the price falls to $45, Rafferty will not be able to produce at all since his AVC will always be above $45 at any level of output.

4.6 a. Total cost = A + B + C
b. Total revenue = A + B
c. Variable cost = A
d. Loss = C
The firm will continue to produce in the short run because it has revenue greater than its variable costs.

4.7 The graph on the left below shows the price of soybeans above the average total cost curve, and therefore represents the farm earning a profit. The graph on the right below shows that the cost curves have shifted up so that the price of soybeans is now below the minimum point on the average variable cost curve. This represents a shut down situation.

4.8 You should continue running the copy store as long as the revenue you earn covers your variable costs. The rent, and interest and repayment on the loan are fixed costs that you cannot avoid paying even if you shut down. Therefore, you should ignore those costs in the short run (until the year’s lease is over).

4.9 Because the store owner would be responsible for the remainder of the lease even if he shut down the store, he must have decided that the loss from shutting down would be larger than the loss from continuing to operate. This indicates that the revenues from operating were sufficient to cover the store’s variable costs.
Learning Objective: Explain how entry and exit ensure that perfectly competitive firms earn zero economic profit in the long run.

Review Questions

5.1 Economic profits lead firms to enter an industry. Economic losses lead firms to exit an industry.

5.2 Industries are divided on the basis of which how costs change as the scale of operation or output increases over the long run. Firms with economies of scale face decreasing costs over time, firms with constant returns face constant costs while firms with diseconomies of scale face increasing costs.

5.3 The long-run supply curve in a perfectly competitive market will be a horizontal line if it is a constant-cost industry—that is, if the typical firm’s average cost curves are unchanged as the industry expands or contracts. If the firm is an increasing-cost industry, the long-run supply curve will slope upward; if the firm is a decreasing-cost industry, the long-run supply curve will slope downward. Figure 12.10 (b), which is reproduced on the next page, shows how a perfectly competitive constant cost industry adjusts to a permanent decrease in demand.

![Diagram of supply and demand curves](image-url)
Problems and Applications

5.4 Her accounting profit will be reduced by the salary she has given up, of $85,000, as well as the annual return on her original investment of $12,100 to obtain her economic profit. Therefore, her economic profit will be $2,900 ($100,000-$85,000-$12,100).

5.5 As more farmers enter the industry, the market supply curve shifts to the right. This shift leads to a lower market price received by firms already in the industry, causing economic profit to be driven to zero in the long run. As more firms exit the industry, the market supply curve shifts to the left. This shift leads to a higher price received by firms remaining in the industry, resulting in these firms breaking even in the long run.

5.6 Disagree. No matter how great demand may be, if there are no barriers to firms entering the industry, profits will be competed away in the long run.

5.7 When the market price falls to $7, Sacha must match it or her sales will fall to zero.

5.8 With a fixed amount of output, more firms will enter an increasing cost industry than a decreasing cost industry. With many firms producing a fixed share of total output, the more the firms, the less the output produced by each. When the industry has decreasing costs, it is inefficient for many firms to produce small quantities since costs fall with scale. However, it is efficient for many firms to produce small quantities in an industry where producing more output leads to increasing costs. See chapter 14 for more details.

5.9 Nicholas must consider the opportunity cost of quitting Sun and going to work for himself. In addition to the monetary costs he incurs in developing the games, his opportunity costs will also include what he has given up by leaving Sun, including his salary and all benefits he received from the firm when he was a full-time employee.

5.10 The remark is incorrect because the student has confused accounting profit and economic profit. Zero economic profit includes a normal rate of return on the investment of the owners of the firm.

5.11 a. The increase in the international price of gold has led gold mining to become more profitable. As a result of increased profits, more firms have decided to enter the market for gold mining.

b. As more firms enter the market for gold mining, the market supply of gold will increase, causing the price of gold to decrease. As price falls, economic profits are reduced.
5.12 In the graph on the left, the increase in the demand for laptop computers causes the demand curve to shift from $D_1$ to $D_2$, temporarily driving the price up to $P_3$. As the production of laptops increases, more orders are placed for laptop displays. As production of laptop displays increases, their cost and price fall because of economies of scale. As shown in the graph on the right, with increased demand and lower costs, the firms that assemble laptops can make economic profits at $P_3$. The result is that new firms enter the industry, the industry supply curve shifts from $S_1$ to $S_2$, driving down the price to $P_2$ and eliminating economic profits. Because the price of laptop computers declines as output increases, the long-run supply curve is downward sloping. This is a decreasing-cost industry.

5.13 Vegetable growers switched from selling to supermarkets to selling in farmers’ markets because they could make economic profits for a few years.

12.6 Perfect Competition and Efficiency

Learning Objective: Explain how perfect competition leads to economic efficiency.

Review Questions

6.1 If consumers want more of a product, the market will supply it. This increase in production stems from the increase in demand, which results in higher prices and firms earning economic profits. If consumers want less of a product, the market will reduce its supply of the product. A decline in demand leads to lower prices and firms suffering economics losses. As some firms exit the industry, the quantity of the good supplied decreases. In this way, consumers are able to dictate to firms the quantities of each good or service the firms produce.
6.2 Allocative efficiency is the state of the economy in which production reflects consumer preferences; in particular, every good or service is produced up to the point where the last unit provides a marginal benefit to consumers equal to the marginal cost of producing it. Productive efficiency is the situation in which a good or service is produced at the lowest possible average cost. Productive efficiency deals with how a good or service is produced, while allocative efficiency deals with producing the goods and services that consumers value most.

6.3 Consumers purchase output up to the point where price equals marginal benefit. Under perfect competition, firms produce up to the point where price equals marginal cost. Under perfect competition, therefore, we get an equilibrium output where marginal benefit equals marginal cost, which represents allocative efficiency. In a perfectly competitive industry, free entry and exit ensures that in the long run firms are producing where average costs are minimized, thereby ensuring that productive efficiency is also achieved.

Problems and Applications

6.4 The student is correct to note that a firm’s goal is to maximize profits and not consumer welfare. However, consumers will never purchase past the point where marginal benefit equals price, and given that firms produce up to the point where price equals marginal cost, we get the efficient outcome the text states. Efficiency is achieved despite consumers and producers acting in their own self-interest.

6.5 In perfectly competitive markets, firms may temporarily earn greater profits from a reduction in costs. However, in the long run, these profits will lead to new firms entering the market. New firms entering the market will shift the supply curve to the right, resulting in lower prices. Lower prices benefit consumers, but leave the typical firm just breaking even in the long run.

6.6 As long as it is possible for firms to enter the industry, when firms earn a profit in the long run new firms will enter the industry. New firms entering the industry will cause the supply curve to shift to the right, which will lower prices and eliminate economic profits. In the long run, even without a law being passed, prices will be exactly equal to the average total cost of production, which means that firms will be breaking even.

6.7 In the long run, firms only break even on their investment in producing high technology goods. Competition between the key players in the LCD, LED, and plasma TV market pushed prices down, and Sony would risk losing all its customers to its competitors if it raised its prices. This analysis implies that Sony and its competitors in the TV manufacturing industry are unlikely to earn an economic profit in the long run.
6.8 If the apple diet becomes wildly popular, the demand for apples will increase. An increase in demand will increase the price of apples and increase the demand for land needed to grow apples. As the land outside of New York City again becomes desirable for apple production, the number of apple orchards around New York City will likely increase. An increase in land used for apple growing will decrease the supply of land used for housing developments, which will increase the price of housing in New York City.
Ch13 SOLUTIONS TO END-OF-CHAPTER EXERCISES

Answers to Thinking Critically Questions

1. The license would be a barrier to entry into the coffeehouse market because entry would no longer be free. This barrier would increase the costs of firms that paid the license fee (the ATC curves for these firms would shift upward compared with the curves of existing firms). The new barrier to entry would mean that competition from new firms would no longer compete away the profits earned by existing firms, even in the long run. The license fee exemption would benefit the incumbent firms but would limit competition and harm consumers. Incumbent firms would have an incentive to lobby the federal government in order to maintain the license fee for new firms and maintain the exemption for themselves.

2. The other retailers would probably consider expanding their offerings to include health and wellness products similar to those offered by the new Starbucks chain.

13.1 Demand and Marginal Revenue for a Firm in a Monopolistically Competitive Market

Learning Objective: Explain why a monopolistically competitive firm has downward-sloping demand and marginal revenue curves.

Review Questions

1.1 In both perfectly competitive and monopolistically competitive industries, there are many firms and low barriers to entry. However, while products are identical in perfectly competitive markets, products are similar—but not identical—in monopolistically competitive markets. Wheat and many raw materials are sold in perfectly competitive markets; haircuts and restaurant meals are sold in monopolistically competitive markets.

1.2 Monopolistic firms do not sell identical products as in perfectly competitive markets but distinguish their products from one another. In doing so, they are able to influence the price of a commodity. By increasing the price of a good, a monopolistic firm’s revenue will change by a price effect—causing revenue to rise due to higher prices—and an output effect—causing revenues to fall due to less output being demanded. A perfectly competitive firm can only increase revenue by producing more output since it cannot influence the output.

1.3 The demand curve faced by a monopolistic firm is equal to its average revenue curve, which is not the same as its marginal revenue. Perfectly competitive firms have a demand curve, which is given by the identical marginal revenue and average revenue curves.
Problems and Applications

1.4 If Domino’s advertising campaign is successful, the demand curve for its pizza would become steeper. If consumers believe Domino’s pizza is superior to that of its competitors, Domino’s would increase brand loyalty among its consumers; therefore, if Domino’s were to increase the price of its pizzas, more of its customers would continue to buy them.

1.5

<table>
<thead>
<tr>
<th>Horse riding lessons per day (Q)</th>
<th>Price (P)</th>
<th>Total Revenue (TR = P x Q)</th>
<th>Average Revenue (AR = TR/Q)</th>
<th>Marginal Revenue (MR = ΔTR/Q)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>$100.00</td>
<td>$0</td>
<td>-</td>
<td>-</td>
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<td>2</td>
<td>80.00</td>
<td>160.0</td>
<td>80.0</td>
<td>70.0</td>
</tr>
<tr>
<td>3</td>
<td>70.00</td>
<td>210.0</td>
<td>70.0</td>
<td>50.0</td>
</tr>
<tr>
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<td>240.0</td>
<td>60.0</td>
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<td>210.0</td>
<td>30.0</td>
<td>−30.0</td>
</tr>
<tr>
<td>8</td>
<td>20.00</td>
<td>160.0</td>
<td>20.0</td>
<td>−50.0</td>
</tr>
</tbody>
</table>

1.6 The argument is incorrect. The student is forgetting that if the firm is facing a downward-sloping demand curve, it must lower the price to all consumers in order to sell another unit. Because the firm receives a lower price on all but the last unit, the marginal revenue received from the last unit is less than the price.

1.7 All wheat farms are selling identical goods. But coffeehouses do not sell identical goods. If a wheat farmer raises his price above the market price, he will lose all of his buyers. A Starbucks coffeehouse can raise its price without losing all of its buyers because it is selling a product that is not identical to the products sold by other coffeehouses.

1.8 In a perfectly competitive market, marginal revenue is equal to price so marginal revenue cannot be negative. Because marginal revenue is downward sloping for a monopolistically competitive firm, at a high enough level of output marginal revenue will become negative. However, a monopolistically competitive firm produces where marginal
revenue equals marginal cost. Because marginal cost is never negative, a monopolistically competitive firm will never produce where marginal revenue is negative.

1.9 The output effect is represented by the dark shaded area in the graph below; this area is equal to $4.75. The price effect is represented below by the lighter shaded area; this area is equal to $2.50. The marginal revenue of the eleventh unit is $4.75 – $2.50 = $2.25.

![Graph showing price and output effects]

1.10 Five additional pounds of tomatoes are sold at $3.50 for revenues of $17.50. The loss in revenue on the first 50 pounds will be $25. Therefore, the marginal revenue of the five additional pounds (the fifty-first to the fifty-fifth) will be -$7.5. If we assume that each additional pound of the five sold has an equal impact, the 55th pound will have marginal revenue of -$1.5.

13.2 **How a Monopolistically Competitive Firm Maximizes Profits in the Short Run**

Learning Objective: Explain how a monopolistically competitive firm maximizes profits in the short run.

**Review Questions**

2.1 Because $P > MR$ for a monopolistically competitive firm, a profit-maximizing monopolistically competitive firm producing where $MR = MC$ will necessarily produce where $P > MC$.

2.2 Grooming the additional dog will reduce Stephen’s profits by $5.

2.3 Daniel’s profits will be average revenue less average cost, or $0.75 per unit, or $150 in all.
2.4 Monopolistically competitive firms produce the level of output where marginal revenue equals marginal cost. Because fixed costs have no effect on marginal costs, monopolistically competitive firms can ignore them when deciding how much to produce.

Problems and Applications

2.5 Maria will produce at the point at which marginal revenue is equal to marginal cost. To determine this, we draw up the following table:

<table>
<thead>
<tr>
<th>Ciabatta Bread Sold per Hour (Q)</th>
<th>Price (P)</th>
<th>Total revenue (P*Q)</th>
<th>Marginal revenue (∆TR/∆Q)</th>
<th>Total Cost (TC)</th>
<th>Marginal cost (∆TC/∆Q)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
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<td>9.00</td>
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<td>9</td>
<td>12.00</td>
<td>$5</td>
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<td>16</td>
<td>7</td>
<td>16.00</td>
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<td>25</td>
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<td>8</td>
<td>2.00</td>
<td>16</td>
<td>-5</td>
<td>27.00</td>
<td>2</td>
</tr>
</tbody>
</table>

a. Maria will produce 4 loaves of ciabatta since, beyond this level, marginal cost will exceed marginal revenue. Her price will be set at $6 and her profits will be $3.

b. The marginal revenue at this level is equal to $3 while marginal cost is equal to $2.

2.6 Jerry is correct. We cannot determine the profit-maximizing number of lamps with knowing the revenue that would be earned from selling lamps. Remember that minimizing average costs is not the same as maximizing profits. The profit-maximizing rate of output is typically not the same output that would minimize average costs.

2.7 a. Profit = Total revenue − Total cost. Because profit fell, total cost must have increased more than total revenue increased.

b. On the graph on the left, Total revenue = $100 \times 100$ units = $10,000. Total cost = $80 \times 100$ units = $8,000. Profit = $10,000 − $8,000 = $2,000.

On the graph on the right, Total revenue = $120 \times 100$ units = $12,000. Total cost = $130 \times 100$ units = $13,000. Profit = $12,000 − $13,000 = −$1,000 (loss of
$1,000). The company goes from a $2,000 profit to a $1,000 loss, while the total revenue increases from $10,000 to $12,000.

2.8 The drop in profits per item of clothing doesn’t necessarily indicate that cutting prices was a bad idea. If J. Crew is maximizing profits, the company will set its output where $MC = MR$ and charge the highest price that people are willing to pay for this quantity. J. Crew may have been forced to cut its prices (and profits per item) because demand fell. (In fact, according to the article, this was the case.) Keeping its prices at the old level may have caused an even greater loss.

2.9 a. The graph shows that when the marginal and average total cost curves shift up, the profit-maximizing price rises from $P_1$ to $P_2$. 
b. Germano seems to be assuming that demand is perfectly elastic, which is unlikely. If a publisher does not raise the price of a book following an increase in its production cost, its marginal revenue from the last few copies will be less than the marginal cost—so it will earn a smaller profit than it would at a higher price.

c. If demand is relatively inelastic, a higher price should result in a small decrease in the quantity demanded. Raising price to cover higher costs will result in a smaller decrease in profit when demand is relatively inelastic than when demand is relatively elastic.

2.10  

a. Initial revenue = $440 × 500,000 = $220,000,000. Revenue after price cut: $360 × 800,000 = $288,000,000. So, he expected total revenue to rise.

b. Recall that the midpoint formula uses the average of the initial and final quantity and the initial and final price. The average of the initial and final prices of Model Ts is

$$\frac{\$440 + \$360}{2} = \$400,$$

and the average of the initial and final quantities is:

$$\frac{500,000 + 800,000}{2} = 650,000.$$

So, the percentage change in the quantity demanded is:

$$\frac{800,000 - 500,000}{650,000} \times 100 = 46.2\%,$$

and the percentage change in the price is:

$$\frac{\$360 - \$440}{\$400} \times 100 = -20.0\%.$$

So, the price elasticity of demand for Model Ts is:

$$\frac{46.2\%}{-20.0\%} = -2.3.$$
c. Profit = Revenue – Cost. $60,000,000 = $288,000,000 – (ATC × 800,000); therefore, to earn a profit of $60,000,000, the ATC for making 800,000 cars must be $285. ATC for 500,000 Model Ts: Total Cost = Revenue – Profit = $220,000,000 – $60,000,000 = $160,000,000. Therefore, ATC = $160,000,000/500,000 = $320. So, the ATC of producing 800,000 Model Ts was lower than the ATC of producing 500,000 Model Ts.

d. Yes. If the profit is the same and he is selling more cars, he must be making a smaller profit per car. We can check this by calculating the profit per car (price minus ATC): For 500,000 cars, profit per car = $440 – $320 = $120 per car; for 800,000 cars, profit per car = $360 – $285 = $75 per car.

### 13.3 What Happens to Profits in the Long Run?

Learning Objective: Analyze the situation of a monopolistically competitive firm in the long run.

**Review Questions**

3.1 In the long run, price will be equal to average total cost and entry and exit of firms will eliminate supernormal profits.

3.2 As more firms enter the industry, the existing firm’s demand curve shifts to the left because the firm will sell fewer units of output when there are additional firms in the area selling similar products. And the demand curve becomes more elastic because consumers have additional firms from which to buy their products.

3.3 Economic profits take into account opportunity costs. Accounting profits do not. So, economic profits will typically be smaller than accounting profits. If a firm has zero accounting profits, it will be making an economic loss, while a firm with zero economic profits will have positive accounting profits.

3.4 Firms can continually innovate to design new products or to differentiate existing products from others available in the market. They can also develop new ways of reducing the cost of production.

**Problems and Applications**

3.5 a. Angelica should sell 55 beef brisket sandwiches at a price of $4.50 each. At a quantity of 55, \( MC = MR \).

b. Her loss is equal to the difference between price and average total cost, multiplied by quantity = \((4.50 – 5.50) \times 55 = –55.00\). Because the price is greater than her
average variable cost, she should continue to operate and not shut down in the short run.

c. No, because she is taking a loss. If such losses persist, she should shut down her store and exit the industry.

3.6 The analysis is incorrect. The student has forgotten that economic costs include a normal rate of return on the owners’ investment in the firm. Therefore, firms will not leave the industry when earning zero economic profit. Also, in the long run, the price will be equal to average cost, not above-average cost as the student mentioned.

3.7 Higher competition in an industry generally means lower prices for consumers. As more firms enter an industry, the demand for each individual firm’s product decreases. The decrease in demand shifts the individual firm’s demand curve to the left, which lowers the selling price, which is good for consumers. If the industry is monopolistically competitive, the firm’s demand curve will eventually shift to the point where it is tangent to the average total cost curve. This is where price is equal to average total cost, which means the firm is breaking even, which compared to earning a profit, is bad for shareholders.

3.8 If consumers believe that all coffee is equal, then consumers have no reason to choose Starbucks coffee over any other coffee, and Starbucks would not be able to charge a higher price than any of its competitors. To convince consumers that all coffee is not equal, Starbucks could use marketing to differentiate its product. This could include advertising, store design, and store location.

3.9 Saks may have difficulty becoming a low-priced, luxury clothing retailer. If Saks lowers prices on luxury clothing, other luxury clothing retailers are likely to follow suit. This will give Saks no price advantage over competing retailers. It may help Saks to provide better customer service than its competition. With hhgregg, customer service is very important because the company sells electronics and appliances, products for which consumers need reliable information in terms of features, quality, and operation. However, this is generally not the case with respect to clothing. Therefore, the strategy is more likely to be successful for hhgregg than for Saks in the long run.

3.10 It will be very difficult to become rich by following the advice found in a book because if the book really has a good idea, then a lot of people will follow its advice. In the process, they will compete away the profits from following the advice. Only those who pounce on the profit opportunity quickly will earn great profits before imitators enter the market and eliminate the profits. (In addition, if the author’s advice is really that valuable, he or she will
probably want to keep it secret, using it in his or her own business rather than telling rivals about it.)

3.11 Many other firms sell coffee, so if selling coffee is the only part of the Starbucks experience, Starbucks would face a lot of competition. And with nothing to differentiate it from its competitors, Starbucks would not be as unusual—or as profitable.

3.12 Some Starbucks locations might decide not to cover up the outlets if they do not have many customers, allowing everyone to enjoy the Starbucks “experience” more casually. On the other hand, if a Starbucks location is extremely busy with lots of customers, it might decide to cover up the outlets so that it can serve more customers. Covered or uncovered outlets is yet another way that the stores can differentiate themselves.

3.13 a. Apparently there are not many competitors in the nonalcoholic beer market, so these big brewers believe they can supply this product to more health-conscious consumers and make larger profits than they can by selling conventional beer.

b. Brewers are responding to consumer desires for a tastier and healthier nonalcoholic beer, but brewers are also trying to increase their sales and profits by offering a different product to the market.

c. If the brewing advances are successful in improving the taste of nonalcoholic beer, the demand for it should increase. This increase in demand, in turn, will lead more firms to enter this market.

### 13.4 Comparing Monopolistic Competition and Perfect Competition

**Learning Objective:** Compare the efficiency of monopolistic competition and perfect competition.

**Review Questions**

4.1 In the long run, a perfectly competitive firm charges a price equal to marginal cost and it produces the quantity that minimizes average total cost. A perfectly competitive firm is allocatively and productively efficient. A monopolistically competitive firm charges a price that is above marginal cost (so it is not allocatively efficient), and it produces a quantity that is less than the amount that minimizes average total cost (so it is not productively efficient). Despite these differences, perfectly competitive and monopolistically competitive firms both earn zero economic profits in the long run.

4.2 A monopolistically competitive firm is not productively efficient because it does not produce at minimum average total cost. Excess capacity stems from the fact that when a
monopolistically competitive firm produces where $MR = MC$, it produces a level of output that is below the quantity for which average total cost is minimized.

4.3 A monopolistically competitive firm is not allocatively efficient because it charges a price that is greater than marginal cost.

4.4 Monopolistic competition probably doesn’t cause a significant loss in economic well-being to society. The loss or gain can be measured by total economic surplus. Although monopolistically competitive firms reduce total economic surplus by producing less than the efficient amount (creating a deadweight loss), they also increase consumer surplus because people are willing to pay more for variety and for products that are more closely suited to their tastes.

Problems and Applications

4.5 There is no contradiction between producing where price is greater than marginal cost and zero profits. Zero profits occur when price equals average cost, which holds in the long run for both perfectly competitive and monopolistically competitive firms.

4.6 a. This graph shows a monopolistically competitive firm. We know this because the firm faces a downward-sloping demand curve. A perfectly competitive firm’s demand curve would be horizontal.

b. We know the graph shows a short-run equilibrium because the demand curve is above the $ATC$. This means that price is greater than average total cost, so the firm is earning economic profits. Monopolistically competitive firms only earn economic profits in the short run.

c. If the firm were perfectly competitive, it would produce the quantity where the $ATC$ is at its minimum. On the graph, this quantity is 7.

4.7 Few will agree with this argument. Firms differentiate their products to appeal to consumers’ varied tastes. The success of product differentiation strategies indicates that many consumers find differentiated products preferable to the alternatives. Consumers are, therefore, better off than they would be if companies did not differentiate their products—consumers are willing to pay for the higher costs (“waste”) caused by differentiation.

4.8 As more firms enter the business of streaming movies, Netflix will likely become less profitable due to the increased competition. If the increased competition results in Netflix incurring losses over time, Netflix will be forced out of business. To survive, Netflix must
find ways to contain costs and to successfully differentiate itself from its competitors so that consumers will continue to buy its services.

### 13.5 How Marketing Differentiates Products

**Learning Objective:** Define marketing and explain how firms use marketing to differentiate their products.

#### Review Questions

**5.1** Marketing is used by monopolistic firms to differentiate their products from one another giving them increased control over prices and the ability to earn long-run profits. Marketing is also necessary to defend an existing brand name to ensure the continued earning of profits.

**5.2** A trademark grants legal protection to a firm against other firms using its product’s name. This is important to allow a firm to defend its brand and to ensure its continued profitability.

#### Problems and Applications

**5.3** Advertising is a fixed cost, so it will shift up the *ATC* curve, but not the *MC* curve.

5.4 Looking at what consumers are already buying is a good way to find out what customers want, but it probably isn’t a good way to make a profit because other firms already know this same information and are selling products to these customers. Entering the market with products exactly like the competition will only work if your firm somehow has lower costs than the other firms. On the other hand, firms who discover new information about what customers want can temporarily make a profit supplying a new product until new firms enter the market and competition drives profits back to zero.
5.5  
a. The government allows firms to trademark their products to encourage firms to invest in product improvements and innovation. Firms will only make such investments if they expect to get the benefits of these investments in the form of higher profits from new or differentiated products that cannot be immediately copied by competitors.

b. If retailers would choose to pay a fee to the NFL and continue using the phrase “the big game” after the NFL was issued a trademark, then consumers would be likely to lose as the investment in the product (the Super Bowl) will probably not increase due to this new trademark. Forcing retailers to pay for using the phrase in their advertisements will raise the retailer’s costs and the prices they charge. More than likely, most retailers would avoid using the phrase once it was trademarked to avoid having to pay the NFL for its use.

5.6  
Thermos was originally a brand name for a particular type of vacuum flask, but by the 1960s other firms had begun selling “thermos” containers. Although the Thermos company sued, a court decision declared that “thermos” had become a generic term that any firm could use, provided the word was spelled with a lower case “t” to avoid confusion with the Thermos company. Once the courts have declared a company’s brand name generic, there is not much the company can do. Rebranding the product would lose the name recognition the firm had built up over time. Another famous example of a product image mishap is Reebok’s Incubus running shoes for women. Reebok was surprised to learn that in medieval legend an incubus was a male demon who preyed on sleeping women. After a big frenzy in the press, Reebok changed the shoe’s name.

13.6  
What Makes a Firm Successful?

Learning Objective: Identify the key factors that determine a firm’s success.

Review Questions

6.1  A monopolistically competitive firm’s profitability depends on its ability to differentiate its products (especially to make them seem more desirable than competitors’ products) and to produce its product at a lower average cost than competing firms.

6.2  A monopolistically competitive firm can continually earn economic profits greater than zero only if it always stays one step ahead of the on-rushing competition.
Problems and Applications

6.3 A firm may change market niches because it fears its traditional market is being reduced by competition and hopes the new niche will be more profitable. Starbucks is currently expanding from the coffee-only niche to the breakfast/light food niche to combat increasing competition in coffee sales.

6.4 Competition is a risk because it can reduce a firm’s profits. The barriers to entry are low in retailing, so the competition is intense.

6.5 Wal-Mart may have been more successful buying big chains as this reduces competition in the new market. Bigger chains may also allow Wal-Mart to reduce the average costs of advertising and operating in the new market. Larger chains may also have a larger and more loyal base of customers and a greater ability to negotiate lower prices from suppliers.

6.6 Design flaws can indeed reduce profits for “first movers” and leave room for competitors who can enter the new market with a better product. Firms that enter a market later often have had enough time to improve the products they offer and can better gauge product characteristics that are important to consumers. Apple took this approach when entering the markets for digital music players and cellphones.

6.7 According to the text, it is a little of both. There are certain factors that skilled managers can control in order to increase the value of their products, such as successful product differentiation and having lower costs than competing firms. Other factors that result in profits are not so easily controlled and can be the result of sheer luck. For example, sales of an energy drink may increase if a popular athlete or celebrity is seen drinking it, or a restaurant’s profits may increase because celebrities are spotted eating there.
Ch14 SOLUTIONS TO END-OF-CHAPTER EXERCISES

Answers to Thinking Critically Questions

1. A sluggish economy could reduce the demand for computers in general. The popularity of tablet computers could reduce consumer demand for the more expensive laptop-tablet hybrid that Intel is offering. Rival firms, such as Toshiba and Apple, may market their own versions of this hybrid computer, and these firms may be able to offer computers that have superior technology or sell for lower prices.

2. Competition from existing firms—the article mentions that Apple, with its iPhone, iPad, and MacBook Air, is in competition with Intel.

The threat from potential entrants—other computer firms, such as Apple or Toshiba, may decide to sell laptop-tablet hybrid models if Intel is successful.

Competition from substitute goods or services—consumers can choose to buy traditional laptops, netbooks, or tablets that have lower prices.

The bargaining power of buyers—although Intel is targeting individual consumers with its Ultrabook, companies or institutions that adopt the computer may wish to purchase multiple units, and would hope to use their buying power to negotiate purchases at lower prices.

The bargaining power of suppliers—although suppliers are not mentioned in the article, suppliers of the screens and other components used to make the Intel Ultrabook may have bargaining power if these inputs are specialized.

14.1 Oligopoly and Barriers to Entry

Learning Objective: Show how barriers to entry explain the existence of oligopolies.

Review Questions

1.1 On oligopoly is a market structure in which a small number of interdependent firms compete against one another to supply a market. The four-firm concentration ratio states the fraction of total sales in the industry that are accounted for by the top four firms in the industry. Generally, concentration ratios of over 40% indicate an oligopolistic industry.

1.2 The presence of economies of scale tends to reduce the competition in that industry. With decreasing costs, larger firm size becomes more efficient and with a fixed demand, this
results in a fewer number of large firms. Industries with decreasing costs will have fewer firms than those with increasing costs.

1.3 The concentrated ownership of inputs such as gold mines in South Africa or oil fields in Saudi Arabia creates a barrier to entry to firms that are not from the area and that cannot control the use of the input. This raises the costs of entry and ensures that the industry is served by a few firms.

1.4 Government sometimes issue patents and licenses to encourage firms to make large investments in research and development of new products and technologies. On some occasions, key figures in government and the legislature are aggressively lobbied by oligopolistic firms to protect their interests and profits.

Problems and Applications

1.5 Economic structure would include whether there are economies of scale in the industry, whether one or more firms owns a key input or raw material, whether there are government-imposed barriers to entry or competition, the threat of substitute goods or services, the bargaining power of buyers, and the bargaining power of suppliers. Most economists agree that economic structure is the main determinant of the intensity of competition in an industry, but other factors, such as the personalities of the managers and members of the boards of directors of different companies, might occasionally play a role.

1.6 By offering different iPhones with “very different specs,” Apple’s long-run average costs would increase because economies of scale would decrease. The increase in average costs would likely increase the prices Apple charges for its iPhones. The increase in average costs would make it easier for other firms to compete with the iPhone.

1.7 Some entrepreneurs hope to increase profitability by creating “big businesses” that might face less competition and be able to charge higher prices. However, unless there are significant economies of scale, they will not be successful. In the figure, firms producing $Q_1$ have the lowest average costs. If a firm tries to grow to a larger size in order to produce $Q_2$, its average costs will rise—from $C_1$ to $C_2$ in this case. An entrepreneur in this industry will be most competitive if it chooses to produce $Q_1$ with a relatively small-scale company.
1.8 The position of the market demand curve plays a critical role in this market because market demand determines the total number of cars that buyers are willing to buy at various prices. That, in turn, limits the available strategies for the firm, as well as limiting the extent to which it can take advantage of economies of scale. It may help to think of the market demand curve as a constraint on the firm.

a. There would be one or more firms like Little Auto. Because the demand curve slopes downward we know the firm(s) will achieve the lowest \( ATC \) by building assembly lines the size of Little Auto. At output below 1,000 units, the \( ATC \) of Big Auto is greater than the \( ATC \) of Little Auto.

b. A single firm like Big Auto will probably dominate the market. In this range, the \( ATC \) of Big Auto is less than the \( ATC \) of Little Auto.

c. There will probably be two or more firms like Big Auto, depending on the position of the demand curve (the quantity at which it intersects the horizontal axis). Note that no firm will build an assembly line with a capacity greater than 10,000 autos because for quantities above 10,000, the \( ATC \) is increasing.

1.9 \( LRAC_1 \) would most likely be associated with a perfectly competitive industry and \( LRAC_2 \) with an oligopoly. The position of \( LRAC_2 \) implies that there are economies of scale that would characterize an oligopoly industry. There are no significant economies of scale associated with \( LRAC_1 \), which means that many relatively small, competitive firms would be able to survive in this industry.

1.10 As Chandler suggests, there are many firms in these industries because smaller firms can produce at a lower long-run average cost than larger firms. Diseconomies of scale occur when long-run average cost increases as firm size increases.
1.11 Low barriers to entry means that it was easy for new firms to enter the cotton textile industry at low cost. Frequent technological innovation means that firms’ average costs would fall over time and firms would have an incentive to cut prices. Frequent firm bankruptcies means that exit from the industry was also common. Competition is more likely when the cast of players in the industry changes rapidly and when new technology reduces the advantages of existing firms.

Using Game Theory to Analyze Oligopoly

Learning Objective: Use game theory to analyze the strategies of oligopolistic firms.

Review Questions

2.1 a. Game theory is the study of how people make decisions in situations in which attaining their goals depends on their interactions with others.

b. A cooperative equilibrium is one in which players in a game cooperate to increase their mutual payoff.

c. A noncooperative equilibrium is one in which players don’t cooperate but pursue their own self-interest.

d. A dominant strategy is one that is best for a player, no matter what strategies other players use.

e. A Nash equilibrium is a situation in which each player chooses the best strategy, given the strategies chosen by the other player or players.

2.2 Such games have rules, which are determined by a given production function in the short run, business strategies aimed at maximizing profits, and payoffs in the form of profits.

2.3 The prisoner’s dilemma is a game in which pursuing dominant strategies results in noncooperation that leaves everyone worse off. The typical example is of two persons who are in prison and unable to cooperate with one another. Each is offered a deal whereby they get a reduced prison sentence if they testify against the other person, a maximum term if they remain silent and get convicted and get let off if there is no evidence against them. The dominant strategy is for each to testify against the other resulting in both getting reduced prison sentences. However, both would have been better off if they remained silent.

2.4 A repeated game is one which is played over and over again. A game which is repeated may have a very different dominant strategy than one which is played just once. The
dominant strategy is adapted to incorporate the possibility of retaliation strategies by one player to retaliate against the moves of another players in a previous game.

2.5 Price leadership is a form of implicit collusion in which one firm in an oligopoly announces a price change and the other firms in the industry match the change. It is a form of price collusion but is difficult to prove. It is also difficult for the price leader to enforce collusion by the other firms.

Problems and Applications

2.6 a. Confessing is a dominant strategy for Bob.

b. Confessing is a dominant strategy for Tom.

c. They will both confess, so they will both serve 10-year sentences. This outcome is difficult to avoid because both Bob and Tom have a strong incentive to confess, but if they had both refused to confess, they would both have served only 3-year sentences. For many years, organized crime practiced a “code of silence” under which any member of the organization knew that if he testified against another member, he was likely to be killed. In game theory terms, the code of silence helped organize crime avoid the prisoners’ dilemma when their members were arrested.

2.7 Collusion makes firms better off because if they act as a single entity, like a monopoly, they can reduce output, increase prices, and increase their profits. Among the reasons that every industry doesn’t become a cartel are that the high profits caused by collusion will induce new firms to enter the industry; because each member of the cartel has an incentive to “cheat” on the collusive agreement, earning the highest profit by producing more than its share when everyone else sticks with the collusive agreement; and because collusion is illegal in the United States and many other countries.
2.8 You should agree with the conclusion that early decision plans may have put “big-name”
colleges in a prisoners’ dilemma. As game theory shows, if one school has an early admission
plan and another school does not, the school without the early admission plan stands to lose
out on enrolling talented students. Students may be better off if these schools did not offer
early admission because students would have more time to make the best decision regarding
which college best fits their education goals and needs. But the dominant strategy for the
colleges is to offer early admission plans to be able to attract the most talented students. In
game theory terms, the colleges appear to be facing a prisoners’ dilemma.

2.9  
a. Each player would benefit if all players avoided steroids, as this would eliminate
health risks. But each player improves his relative standing if he continues taking
steroids, whether or not other players do. As a result, the Nash equilibrium is for
all players to take steroids, and we get an outcome that is worse for all. This is
indeed a case of a prisoners’ dilemma.

b. Testing has made players as a group better off. Testing has enforced the
cooperative equilibrium.

2.10 The practice of decimation will change the payoff matrix, increasing the payoff from
staying relative to the payoff from running away for individual soldiers. If the increase in the
relative payoff from staying is high enough, the practice will induce some soldiers to stay
who might otherwise have run away. There is a positive feedback effect. As fewer run away,
the incentive for any single individual to run away goes down as well. However, if the odds of
getting killed in battle are too high, decimation won’t change the decision to run away. A 10
percent chance of death after the battle won’t dissuade many soldiers from running away if
they face nearly certain death on the battlefield. The policy of decimation also had the
drawback that if any soldiers in a unit ran away, then every soldier in the unit was subject to
the same penalty whether he had run away or not. Thus, soldiers with greater skills were
killed as often as soldiers with lower skill levels.

2.11 If advertising is a prisoners’ dilemma, as in Solved Problem 14.2, then a ban on
advertising beer on television is likely to increase the profits of beer companies.

2.12  
a. The Nash equilibrium occurs when both companies bid $4 billion and each earns
profits of $0.75 billion.

b. If they expect to be bidding on many similar projects in the future, they are more
likely to avoid the prisoners’ dilemma outcome by both bidding $5 billion.
2.13  

**a.** Wal-Mart doesn’t have a dominant strategy. If Target uses bar codes, Wal-Mart earns more profit when it also uses bar codes, but if Target uses RFID tags, Wal-Mart’s best strategy is to use RFID tags.

**b.** Target doesn’t have a dominant strategy. If Wal-Mart uses bar codes, Target earns more profit when it uses bar codes, but if Wal-Mart uses RFID tags, Target earns more by using RFID tags.

**c.** Recall the definition of a Nash equilibrium: A situation in which each firm chooses the best strategy, given the strategies chosen by other firms. In this problem there are two Nash equilibria: Both firms choosing bar codes or both firms choosing RFID tags. In either of these situations, neither firm can increase its profits by changing its strategy, given the strategy chosen by the other firm. An important point to note is that it is possible to have a Nash equilibrium even when neither firm has a dominant strategy.

2.14 The argument is incorrect. The best strategy for each player is to not cooperate, no matter what the other player does.

2.15  

**a.** The analysis in the text assumes that the auction is a private value auction, which means that each person’s value of the good is independent of other bidders’ values. But this may be wrong: you may learn about the value of a good through other people’s bids. This would be the case if, for example, you are thinking of buying U2 concert tickets in order to resell them. In that case you want to find out the market value of the tickets and the other bids may disclose some of this information. Or, if you were interested in a collectible, the fact that a well-known collector or dealer was bidding more than your highest bid might lead you to reevaluate how valuable the collectible was.

**b.** Sniping can allow you to learn the market value of a good without disclosing your private information. Many dealers looking for undervalued collectibles use automated sniping programs so that collectors and other dealers are not able to use their private information about the true value of the collectible.

2.16 The airline industry is an oligopoly, and as game theory demonstrates, the other airlines were “forced” into lowering their fares in order to compete with Southwest. By matching Southwest’s lower fares, the other airlines were choosing the best strategy for maximizing profits given Southwest’s strategy. Your answer would not change if the fare decrease took place during a recession, because the airlines would still be choosing the best strategy given Southwest’s strategy.
2.17  

a. A dominant strategy is a strategy in which a player is better off playing regardless of which strategy the other player chooses. To analyze Delta’s strategy: Suppose Delta knew that United was going to charge a high price. In that case, Delta could also charge a high price and receive a payoff of $20,000, or it could charge a low price and receive a payoff of $30,000. Clearly, Delta would be better off charging a low price if it knew United was going to charge a high price. Now suppose that Delta knew that United was going to charge a low price. In that case, Delta could charge a high price and receive a payoff of −$10,000, or it could charge a low price and receive a payoff of $0. Clearly, Delta would be better off charging a low price if it knew United was going to charge a low price. Because Delta’s best strategy is to charge a low price regardless of what United does, charging a low price is a dominant strategy for Delta.

To analyze United’s strategy: Suppose United knew that Delta was going to charge a high price. In that case, United could also charge a high price and receive a payoff of $20,000 or it could choose a low price and receive a payoff of $30,000. Clearly, United would be better off charging a low price if it knew Delta was going to charge a high price. Now suppose United knew that Delta was going to charge a low price. In that case, United could charge a high price and receive a payoff of −$10,000, or it could charge a low price and receive a payoff of $0. Clearly, United is better off charging a low price if it knew Delta was going to charge a low price. Because United’s best strategy is to charge a low price regardless of what Delta does, charging a low price is a dominant strategy for United.

Both players have a dominant strategy of charging a low price, so the equilibrium of the game is the outcome in the southeast quadrant.

b. A prisoner’s dilemma exists when there is a possible outcome that makes both players better off, but the players end up at a different outcome. In this game there is a prisoner’s dilemma because the outcome in the northwest quadrant (both firms charging a high price) results in a higher payoff for both firms. However, this outcome will not occur because each firm has an incentive to change strategies. Delta has an incentive to switch from charging a high price to charging a low price to increase its payoff from $20,000 to $30,000. United has the same incentive to charge a low price rather than a high price, so the equilibrium is one in which both firms charge a low price so that each has a payoff of $0. Charging a low price leads to a worse outcome for both airlines. So, this game is a prisoner’s dilemma.

c. Repeated playing would add a possibility of punishing the other firm for charging a low price and increase the prospects of cooperation and high prices (and profits) for both firms.
2.18 By posting prices before they went into effect, an airline could see what the reaction of its competitors to the price change would be. If firms matched a price cut or failed to match a price increase, the airline could cancel the price change before it had actually taken effect, which might be to the disadvantage of consumers.

2.19 a. A dominant strategy is a strategy where a player is better off playing regardless of which strategy the other player chooses. To analyze Microsoft’s strategy: Suppose Microsoft knew that Apple was going to charge a high price. In that case, Microsoft could also charge a high price and receive a payoff of $1 billion, or it could choose to charge a low price, and receive a payoff of $8 billion. Clearly Microsoft would be better off charging a low price if it knew Apple was going to charge a high price. Now suppose that Microsoft knew that Apple was going to charge a low price. In that case, Microsoft could charge a high price and receive a payoff of $10 billion, or it could charge a low price and receive a payoff of $4 billion. Clearly, Microsoft would be better off charging a high price if it knew Apple was going to charge a low price. Because Microsoft’s best strategy depends upon the strategy Apple chooses, Microsoft doesn’t have a dominant strategy.

To analyze Apple’s strategy: Suppose Apple knew that Microsoft was going to charge a high price. In that case, Apple could also charge a high price and receive a payoff of $6 billion, or it could charge a low price and also receive a payoff of $6 billion. Clearly, Apple is indifferent between charging a high price or charging a low price if it knew Microsoft was going to charge a high price. Now suppose Apple knew that Microsoft was going to charge a low price. In that case, Apple could charge a high price and receive a payoff of $2 billion, or it could charge a low price and receive a payoff of $3 billion. Clearly, Apple is better off charging a low price if it knew Microsoft was going to charge a low price.

Because Apple is indifferent between strategies if Microsoft charges a high price and better off charging a low price if Microsoft charges a low price, a dominant strategy for Apple is to charge a low price.

b. A Nash equilibrium occurs when neither player has an incentive to change strategies given the strategy the other player is using. In this game, Apple always chooses to charge a low price because that is its dominant strategy. If Apple chooses to charge a low price, then Microsoft is better off charging a high price, so the Nash equilibrium for this game is the outcome in the northeast quadrant. Apple has no incentive to change its behavior given Microsoft is charging a high price. If Apple switched to charging a high price, then its outcome would not improve. Microsoft has no incentive to change its behavior given Apple is charging a low price.
price. If Microsoft switched to charging a low price, then its payoff would fall from $10 billion to $4 billion, which clearly makes it worse off.

2.20 Less price cutting would not be good for consumers, who benefit more when prices are lower. Firms, on the other, would benefit from less price cutting because prices would be higher and more stable, which should result in greater revenues and profits.

2.21 The article is referring to the cartel known as OPEC. Saudi Arabia, the largest producer within OPEC, can cut back production to enforce higher oil prices agreed on by the cartel. Similarly, if world oil prices begin to rise above the cartel price, Saudi Arabia can increase production to bring prices back down.

2.22 a. The Nash Equilibrium to this game is for both countries to produce a low output. (The Nash equilibrium exists because Nigeria knows Saudi Arabia has low price as a dominant strategy. Therefore, Nigeria will never choose high price, despite the larger payoff for that strategy if Saudi Arabia charges a high price.)
b. The Nash equilibrium for this game is for both countries to produce a low output.

c. There are no differences in this case between a. and b.

14.3 **Sequential Games and Business Strategy**

**Learning Objective:** Use sequential games to analyze business strategies.

**Review Questions**

3.1 By creating barriers to entry, existing firms are able to earn supernormal economic profits in the long run. There is a clear incentive for them to ensure these barriers remain in place. This can be analysed through sequential games where firms act in turn, responding to one another.

3.2 A subgame-perfect equilibrium is a Nash equilibrium in which no player can make himself or herself better off by changing his decision at any decision node in a sequential game.

**Problems and Applications**

3.3 Your answer does depend on the minimum rate of return owners of fast-food restaurants require on their investment. For example, suppose the minimum required return is 15 percent. Then Burger King will enter whether McDonald’s builds a large store or a small store. So, McDonald’s should build a small store, because it will receive a return of 20 percent, rather than 16 percent. But suppose the minimum required return is 20 percent. Then Burger King will not enter if McDonald’s builds a large store. So, McDonald’s should build the large store, in which case it will earn a return of 25 percent. (Note that this answer depends critically on
the assumption that McDonald’s moves first. If Burger King’s management is aware of this situation, they may want to try to make a preemptive first move themselves.)

3.4 By being the first to offer a tablet, Apple was able to capitalize on the huge demand for its iPad and keep price high. As more competitors enter the market, Apple’s profit will fall if consumers switch to lower-priced tablets. However, if Apple is successful in convincing consumers that there are no good substitutes for its iPad, then Apple will continue to remain profitable as consumers continue to pay high prices for iPads.

3.5 In this case TruImage’s threat that it will reject an offer of $20 per copy is credible because it is better off rejecting such a low offer. Under this scenario, Dell would be better off offering $30. This offer will be accepted by TruImage and this will be the outcome.

The Five Competitive Forces Model
Learning Objective: Use the five competitive forces model to analyze competition in an industry.

Review Questions

4.1 Five competitive forces are believed to determine the level of competition in a market. 1) Competition from existing firms on price or other factors will increase the level of competition in the market. (2) Increased threat from potential entrants will increase competition. (3) Competition from substitute goods or services will increase competition. (4) High bargaining power of buyers will increase competition and (5) high bargaining power of suppliers tends to increase competition.

4.2 The strength of these forces changes over time. For example, a small supplier might grow into a virtual monopolist—as happened to IBM in its dealings with Microsoft.

Problems and Applications

4.3 Firms in these industries will not earn an economic profit. To earn an economic profit, they need to offer a product or service that competitors have difficulty copying, or they need one of the additional barriers to entry discussed in this chapter.

4.4 a. Competitive pressure means that other firms are providing close substitutes and similar improvements in their products. The author is referring to competition from existing firms in the industry.

b. Browser companies will benefit only temporarily from incorporating new innovations because competing firms are likely to copy these innovations quickly. The benefit of the innovation is, therefore, likely to go to the consumers who gain from being able to obtain better service from their web browsers.
4.5 The analogy is not necessarily good. As athletes age, they lose the physical ability to compete with younger athletes. Firms may need to adjust previously successful strategies or even adopt new strategies to continue to remain successful, but unlike aging athletes, this would not be a physical impossibility. With businesses, competition can quickly erode profits and even turn a successful firm into an unsuccessful one. Adjusting strategies will almost certainly be necessary for firms to remain profitable in ever-changing markets. In the long run, most firms that at one time dominated their industries, such as U.S. Steel, General Motors, or Kodak, have seen their profitability sharply reduced by competition.

4.6 “Look like, taste like, act like the competition” means copying the business model of another firm. “Look like, taste like, act like the competition” sometimes makes sense. One example would be when there is no other option available in the industry—such as in a perfectly competitive industry. Another case in which this approach makes sense is when their business model fits your firm better than it does their firm.

4.7 In an oligopoly, firms set prices based on how other firms in the industry set prices. Because there is interdependence on pricing strategy among all the firms in an oligopolistic market, the market is, in effect, setting prices.
**Ch15 SOLUTIONS TO END-OF-CHAPTER EXERCISES**

**Answers to Thinking Critically Questions**

1. In addition to the cost of producing $Q_M$ in the figure, a firm would be willing to spend an amount equal to the area in the figure that equals economic profit ($B + C$).

2. No. The fixed costs needed to supply customers in one or more of the communities or counties in Upstate New York (for example, Kings County, which has a population of more than 2.5 million) would prevent many firms from entering. Verizon had to invest considerable amounts of money and time to install its FiOS network and negotiate with community officials before it could begin offering its services and earn revenue.

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**15.1 Is Any Firm Ever Really a Monopoly?**

**Learning Objective:** Define *monopoly*.

**Review Questions**

1.1 A monopoly is a firm that is the only seller of a good or service that does not have a close substitute. The firm can’t have a monopoly if a close substitute for its product exists.

1.2 Because consumers in your town could buy hardware on the Internet or by driving to another town that has a hardware store, you would not have a monopoly under the narrow definition of the term. However, because competition from on-line sellers and stores in other towns may not be sufficient to eliminate your economic profits in the long run, you may have a monopoly in the broader sense of the term.

1.3 Monopoly is a pretty good name for the game Monopoly. The object of the game is to become the only owner of property, and, like a real market, once you have ownership of a set of properties you are able to increase the price. Consider what happens when someone rolls a 10 and lands on your hotel on Boardwalk. He is required to rent your property; there is no substitute, he cannot go anywhere else, so you have a monopoly. Another way to play the game Monopoly would be to roll the dice and then have the choice of going either forward or backward. Now the player who rolls the 10 can go forward to your hotel on Boardwalk or backward to a cheaper property. This ability to rent a substitute property would substantially reduce the quantity of visits to your high-priced property, wiping out much of your monopoly profits. (In this version of the game, no one ends up gaining all the property and no one is driven into bankruptcy.)
Problems and Applications

1.4 A monopoly is defined as a firm that is the only seller of a good or service that does not have a close substitute. Ty Cobb considered candlelight a substitute for electric lights, so from his point of view, the local electric company was not a monopoly.

1.5 Even though local cable TV companies have a monopoly in providing cable service in a city, they face growing competition from satellite TV companies like DIRECTV and Dish Network. If consumers view satellite TV as a close substitute for cable TV, then the cable companies no longer have a monopoly.

1.6 Yes, certain prescription drugs, for example, have no close substitutes. Economists generally define a monopoly as a firm that is the only seller of a good or service that does not have a close substitute. So, it is possible to have a monopoly on a product that has substitutes, as long as they are not close substitutes.

1.7 Google is concerned with its image, in some people’s eyes, of being a monopolist. If it can broaden the definition of the market in which it operates, Google will appear to be a smaller firm in that market and less likely to be accused of violating antitrust laws. Because highway billboards are used by companies to advertise their products, these billboards could compete with some of the products promoted on Google’s search engine. But a billboard is not really providing competition to an Internet search engine.

1.8 Because a monopolist is defined as a firm that is the only seller of a good or service for which there are no close substitutes, Google would not seem to fit that definition if other search engines like Yahoo and Bing can also be used to access YouTube. If other search engines cannot be used to access popular sites such as YouTube, then the case for considering Google to be a monopoly is strengthened.

15.2 Where Do Monopolies Come From?
Learning Objective: Explain the four main reasons monopolies arise.

Review Questions

2.1 All firms would like to exist as a monopoly since they do not face any competition and are able to earn large profits. Firms that face large economies of scale will find it particularly efficient to be a monopoly. The government sometimes supports the existence of a monopoly by supporting barriers to entry through the issue of patents or licences. This is usually either when the firm faces large economies of scale or to support continued investment in research and development in a particular field.
2.2 Network externalities are externalities generated when more and more people use a product. The more the number of people use a product, such as cell phones, the more the positive externalities associated with owning one. This process generates ever higher usage and externalities by setting up a virtuous cycle of increasing consumption.

2.3 A public franchise is the right given by a government to a firm to be the single producer of a commodity such as electricity. Patents and copyrights are legal protection against other firms producing a particular product or using a particular technique of production.

2.4 Natural monopolies face large economies of scale. As output increases, their costs decline substantially, to form a decreasing-cost industry.

Problems and Applications

2.5 The USPS is probably not a natural monopoly. If it were, it wouldn’t need a law banning competition. It would be able to provide mail delivery at a lower cost and charge a lower price than potential competitors, so no one would want to enter the industry. If the current law banning competitors were removed, firms would likely enter this market. Competitors have already entered portions of the market (such as delivering packages and overnight letters) where competition isn’t banned and seem eager to expand into additional sectors in the mail delivery business.

2.6 Extending the life of patents for pharmaceutical companies would allow them to charge the monopoly price for their drugs for a longer period and earn higher profits. This potential for higher profits would encourage them to develop more new products. Consumers would gain from having a wider range of medicines, but they would lose because the prices of the medicines would stay high longer.

2.7 Book prices are higher than they would be without copyrights. If any publisher could print copies of John Grisham’s latest novel, competition would drive down the price. In this sense, a copyright is a tax on readers. Because publishers cannot print copies of an author’s book without the author’s permission, publishers pay authors much more than they would if there were no copyrights. In effect, a copyright gives an author a monopoly on any books the author writes. If copyrights were abolished, very few authors would be able to earn a living by writing. As a result, many fewer books would be written, which would make readers worse off.

2.8 Patents are granted to encourage firms to spend more money on research and development to create new products. If somehow firms did not incur any costs in developing new products, the issuance of patents would still be a motivator for firms because they would have the exclusive right to the products they develop.
2.9 There are only a limited number of countries in the world, which limits the number of customers in this market. Also, printing currency that is difficult to counterfeit requires specialized printing methods.

2.10 If the process of grafting poinsettias were patented, the Ecke family might have continued their monopoly of the market, earned higher profits, and perhaps been better off. But they were afraid that the information they would have had to divulge in order to obtain a patent might have given competitors enough information to discover ways of grafting poinsettias that were similar to the Ecke method but that did not violate the patent. This approach might have resulted in the Ecke family losing its monopoly even earlier than they did.

2.11 De Beers was concerned that used diamonds would be a close substitute for newly mined diamonds and reduce their monopoly power in the market. De Beers used advertising to convince people not to sell their diamonds. In particular, the advertising slogan “A diamond is forever” was designed to emphasize the sentimental value of diamonds so people and their heirs would not sell the diamonds. Because the advertising campaign was successful, it greatly reduced the number of used diamonds that were available as substitutes for new diamonds. The reduction in the availability of a substitute shifted out the demand curve for new diamonds, increased prices, and increased profits for De Beers.

2.12 The average total costs of this firm are given in the table below.

<table>
<thead>
<tr>
<th>Quantity (Per Day)</th>
<th>Total Cost</th>
<th>ATC (TC/Q)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>$1,200</td>
<td>$40</td>
</tr>
<tr>
<td>40</td>
<td>1,400</td>
<td>35</td>
</tr>
<tr>
<td>50</td>
<td>2,250</td>
<td>45</td>
</tr>
<tr>
<td>60</td>
<td>3,000</td>
<td>50</td>
</tr>
</tbody>
</table>

The average costs for this firm initially decline but start to increase at some point between 40 and 50 units per day. Since the demand is set at 55 units at a price of $48, the demand curve will intersect the cost curve at some point after the 50th unit, when costs are already increasing. As such, the firm supplying this demand will not have a natural monopoly.
How Does a Monopoly Choose Price and Output?
Learning Objective: Explain how a monopoly chooses price and output.

Problems and Applications

3.1 The monopolist’s demand curve is the market demand curve. The marginal revenue curve is derived from the demand curve. For a linear demand curve, the marginal revenue will be below the demand curve (and it is also twice as steep as the demand curve, because in absolute value, the slope of the marginal revenue curve will be twice the slope of the demand curve).

3.2 A monopolist is a price maker in the sense that if a monopolist raises price, it will lose some, but not all, of its customers. In other words, it does not take the price as given.

3.3. Assume the graph below represents the market for Time Warner Cable’s basic cable package as an example of a monopolist earning a profit.

```
3.4 a.

<table>
<thead>
<tr>
<th></th>
<th>Quantity (per week)</th>
<th>Total Revenue</th>
<th>Marginal Revenue</th>
<th>Total Cost</th>
<th>Marginal Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$20</td>
<td>15,000</td>
<td>$300,000</td>
<td>---</td>
<td>$330,000</td>
<td>---</td>
</tr>
<tr>
<td>19</td>
<td>20,000</td>
<td>380,000</td>
<td>$16</td>
<td>365,000</td>
<td>$7</td>
</tr>
<tr>
<td>18</td>
<td>25,000</td>
<td>450,000</td>
<td>14</td>
<td>405,000</td>
<td>8</td>
</tr>
<tr>
<td>17</td>
<td>30,000</td>
<td>510,000</td>
<td>12</td>
<td>450,000</td>
<td>9</td>
</tr>
</tbody>
</table>
```
b. To maximize profits, Ed should produce where marginal revenue equals marginal cost. So, he should charge $16 per baseball and produce 35,000 baseballs per week. His weekly profits will be $560,000 – $500,000 = $60,000. Note: In the graph, we have rounded the average total cost to $14.28. So, the calculation of total profit would be: ($16.00 – $14.28) x 35,000 = $60,200. It is preferable to direct students to the more accurate value in the table.

c. Because the tax does not affect his marginal revenue or marginal cost, Ed should not change the price he charges or the quantity he produces. His profits will fall by the amount of the tax, from $60,000 to $10,000.

d. Because the tax does not affect his marginal revenue or marginal cost, Ed should not change the price he charges or the quantity he produces. His profits will fall by the amount of the tax, from a profit of $10,000 (when the tax is $50,000) to a loss of $10,000 (when the tax is $70,000). If these losses continue, however, Ed will need to exit the market in the long run unless he changes his price and output strategy.

3.5 a. The higher fixed costs will not affect the profit maximizing output for Comcast, which will remain at 6 subscriptions. Its profits will fall from $34 to $30. Since it is still making profits, the firm should stay open in both the short run and the long run.
b. With a flat tax of $0.60, marginal costs will increase by 0.60 at every level of output.

Now, Comcast will sell five subscriptions at a price of $25 each. Its revenues will be $125 while costs will rise to $94 yielding profits of $31.

3.6 You are likely to make a loss because demand for slide rules is so low. If a profit was likely in this market, someone would probably have already entered it. The graph below shows the situation you are likely to be in.

3.7 With economies of scale, a monopolist will face decreasing costs. It will continue to earn profits as it does with increasing costs; the existence of economies of scale adds another barrier to entry for outside competition.

3.8 The student’s argument is incorrect. As the graph shows, a reduction in marginal cost will cause a monopolist to reduce his price, produce more, and increase profits.
3.9 When a monopoly exists, it doesn’t set the price whimsically; it sets the price so that consumers will buy the quantity at which marginal cost equals marginal revenue, thereby maximizing the firm’s profit. It is doubtful that a company in this situation would charge a price as high as $500 per month, because doing so would greatly reduce the quantity demanded, and profit would be less than if a lower price were set.

3.10 Profit maximization is not the same thing as revenue maximization. To maximize revenue, the firm would produce up to the point where marginal revenue is zero. Unless marginal cost is zero, this is a larger quantity than the quantity where marginal revenue equals marginal cost. Maximizing production could mean producing the physical maximum possible. This is likely to be far beyond the profit-maximizing level of output.

15.4 Does Monopoly Reduce Economic Efficiency?

Learning Objective: Use a graph to illustrate how a monopoly affects economic efficiency.

Review Questions

4.1 Market power is the ability of a firm to charge a price above marginal cost. With market power, producers are able to increase their producer surplus, but consumer surplus declines. Increasing market power leads to a deadweight loss, compared to the efficient market equilibrium in the case of competitive markets.

4.2 The “creative gale of destruction” refers to the process by which products can be continually reinvented and innovated by firms that can invest in research and development. Since monopolies earn large profits, they are able to finance these investments. The benefits of innovation by firms with market power could be used to justify the very existence of
market power in the first place, even though it tends to reduce consumer surplus in the absence of innovation.

Problems and Applications

4.3 The less elastic is the demand curve, the greater market power the firm has, the bigger is the difference between the marginal benefit (which equals the price) and marginal cost of the last unit produced and greater is the deadweight loss due to the monopoly.

4.4 If the monopoly were more efficient, its marginal costs would fall—from $MC_1$ to $MC_2$ in the figure. As the figure shows, if a monopoly has higher costs ($MC_1$) because it does not face competition, then the true deadweight loss is increased. The darker shaded area shows the original deadweight loss as it was in Figure 15.5 on page 557 of the main text. The lighter shaded area shows the additional deadweight loss from taking into account x-inefficiency—that is, from the firm not producing more efficiently, at quantity $Q_{CX}$.

4.5 Charging by the gallon is more likely to achieve allocative efficiency – as long as the price equals the marginal cost. To charge by the gallon, the city has to install a water meter in each firm or home and employ meter readers to gather information on how many gallons have been used. Some cities might want to avoid this expense.

4.6 If a market is a monopoly, a negative externality in production will not always lead to production beyond the level of economic efficiency. In the following graph, the competitive output is at $Q_1$, where price, $P_1$, equals marginal private cost, $MC_1$. If this market is a
monopoly, the profit-maximizing output is at \( Q_2 \), where marginal revenue is equal to marginal private cost. With a negative externality in production, the marginal social cost curve is \( MC_2 \). The point where price, \( P_2 \), is equal to marginal social cost is economically efficient. In this example, the economically efficient quantity, \( Q_2 \), is the same as the profit-maximizing quantity. Although the economically efficient quantity and the profit maximizing quantity are the same on this graph, this will not always be the case.

**Government Policy toward Monopoly**

*Learning Objective:* Discuss government policies toward monopoly.

**Review Questions**

5.1 Antitrust law is legislation aimed at preventing collusion and increasing the competition in a market. Mergers often lead to firms having greater market power but certain mergers also increase the efficiency of production, leading to lower costs for consumers. Such mergers, particularly vertical mergers, could even increase efficiency and consumer surplus.

5.2 Government will examine whether the mergers lead to increased efficiency and lower costs. In general, it will be willing to allow a merger which leads to higher efficiency. For this reason, governments tend to prefer vertical mergers between firms at different stages of the production process, rather than horizontal mergers between firms that are producing the same product. Governments will also consider the concentration of the industry after the merger. Mergers which lead to highly concentrated markets will also be less likely to be approved.

5.3 Charging a price equal to marginal cost means that output will equal the level at which marginal cost equals marginal benefit, which is the efficient level of output. However, charging this price would mean that the typical regulated natural monopoly would suffer an
economic loss, as this price will be below average cost. If the regulator sets price to equal average cost instead, some efficiency will be lost, but the natural monopoly will stay in business and earn a normal profit.

Problems and Applications

5.4  
a. To maximize profits, the monopoly will produce the quantity where marginal revenue equals marginal cost. So, the monopoly will produce 50 units and charge a price of $10.

b. To achieve economic efficiency, the regulatory agency should require the monopoly to charge a price equal to marginal cost, which in this case would be a price of $7. The regulated monopoly will produce 90 units. It will make a profit, because price is above average total cost.

5.5  
a. To maximize profits, the monopoly will produce the quantity where marginal revenue equals marginal cost. So, the monopoly will produce 20 units and charge a price of $30.

b. The monopoly’s marginal revenue curve is now a flat line at $18, running from the vertical axis to the demand curve, so the monopoly will produce 33 units and charge a price of $18. The quantity demanded at a price of $18 is 40, but the quantity supplied is only 33, so there will be a shortage of 7 units, and some consumers will not be able to buy the product.

5.6  
If the price is set equal to average total cost, the firm will earn a normal profit. If a firm knows that it will always be able to charge a price equal to average total cost, it will have no incentive to reduce average costs since it will not be able to earn more than a normal profit.
Before the merger, the price was \( P_c \) and the quantity was \( Q_c \), so consumer surplus equaled \( A + B + C + D + E \), and producer surplus was area \( F + G + H + K + L + M \). After the merger, price fell to \( P_{\text{merge}} \) and quantity rose to \( Q_{\text{merge}} \), so consumer surplus equaled \( A + B + C + D + E + F + G + H + I + J \) and producer surplus became area \( K + L + M + N + O + P + Q + R \).

5.8 Howard Putnam understood that the antitrust laws do not allow firms in the same industry to agree on what prices they will charge.

5.9 Defining the size of a market is important to the Justice Department when deciding whether to oppose a merger because the more narrowly a market is defined, the more concentrated the market. The more concentrated a market, the more likely the Justice Department is to oppose a merger in that market. By including the “other sources of audio entertainment” in the same market as the two satellite radio firms, the Justice Department considers the market less concentrated than it would if it excluded the other sources.

5.10 a. We need to calculate the Herfindahl-Hirschman Index (HHI). Before the merger: 
\[ 20 \times 5^2 = 500. \]  
After the merger:  
\[ (16 \times 5^2) + 20^2 = 400 + 400 = 800. \]  
Because the post-merger HHI is below 1,000 the merger will not be opposed.

b. HHI before the merger: \( 5 \times 20^2 = 2,000. \)  
After the merger: \( (3 \times 20^2) + 40^2 = 1200 + 1600 = 2,800. \)  
Both before and after the merger, the HHI is above 1,800 and the
merger will increase the HHI by more than 100 points, so the merger will likely be opposed.

5.11 The Department of Justice press release describes the efficiencies as follows: “the merger likely will result in efficiencies such as cost savings in airport operations, information technology, supply chain economics, and fleet optimization that will benefit consumers. Consumers are also likely to benefit from improved service made possible by combining under single ownership the complementary aspects of the airlines' networks.” The merger would not substantially lessen competition if the newly merged airline concentrates on cost cutting efforts such as the elimination of duplicate or unprofitable routes and more efficient flight connections. These efforts would make the airline more successful without significantly threatening other airlines in the industry.

5.12 HHI before any merger, assuming 6 firms in the “other” category, each with a 3 percent share of the market: $29^2 + 22^2 + 11^2 + 10^2 + 10^2 + 6(3^2) = 1,700$, which is considered highly concentrated. So, even if no company other than HP, Dell, Acer, Apple and Toshiba has a market share greater than 3 percent, the Department of Justice and the Federal Trade Commission would be likely to challenge a merger between any of the 5 largest firms. If the merger was between Toshiba and Apple, the HHI would increase by 300 points, so that merger may be challenged. Any other merger of the 5 largest firms would increase the HHI by more than 100 points and would be challenged.

5.13 HHI before the merger, assuming 12 firms in the “other” category, each with a 1 percent share of the market: $42^2 + 30^2 + 16^2 + 12(1^2) = 2,932$. So, even if no company other than Coca-Cola, PepsiCo, and Dr. Pepper Snapple has a market share greater than 1 percent, the Department of Justice and the Federal Trade Commission would be likely to oppose a merger between two of the leading three firms.

5.14 a. If the software codes for iTunes were publicly available, other firms could easily copy any improvement Apple would make in the program and Apple would lose the benefits of the greater sales it expects due to these improvements. In this case, an investment in a better product would not yield a sufficient return.

b. The French government wishes to reduce monopoly power in the market and bring about lower prices and less deadweight loss. Doing so, though, might reduce the incentive for firms to undertake the investments necessary for further technological progress in the on-line distribution of music.

5.15 The proposed merger could result in high-speed wireless services being developed more quickly nationally, and it could also allow for data to move more quickly and more cheaply.
On the other hand, the proposed merger may result in fewer pricing plans, higher prices (due to less competition), and the loss of some jobs.
Ch16 SOLUTIONS TO END-OF-CHAPTER EXERCISES

Answers to Thinking Critically Questions

1. Although this is a normative question, charging high prices for tickets and equity seat rights shifts the burden for financing the stadiums and arenas to (a) those with the highest willingness to pay and the highest demand for tickets meaning (b) relatively high-income fans and business firms.

2. Reducing prices and eliminating equity seat rights would have no effect on the quantity supplied for tickets once the stadium has been constructed. The quantity demanded would increase as the price of tickets fell. This could benefit middle and low-income fans who want tickets but could not or would not pay high prices for them. There would be (a) a shortage of tickets (assuming that the demand for tickets would not decrease dramatically because, for example, the team did not win many games) and (b) means other than price would be used to ration the tickets. Some local residents would be harmed because they would bear a greater burden to finance the stadium. The burden would be heaviest on those people with the lowest incomes and the least interest in professional football.


Learning Objective: Define the law of one price and explain the role of arbitrage.

Review Questions

1.1 According to the law of one price, identical products usually sell for the same price everywhere. Arbitrage is the practice of buying a product in one market at a low price and reselling it in another market at a high price.

1.2 When transactions costs are non-zero, firms are able to practice price discrimination, which violates the law of arbitrage or the law of one price. For example, if transactions costs increase with distance (due to the costs of transportation, for example), the firm may charge distant geographic markets a higher price than closer markets.

Problems and Applications

1.3 The New York residents are buying goods at a low price in New Jersey, but they are not re-selling them at a higher price in New York. So they are not, strictly speaking, engaged in arbitrage.
1.4 Unless there are big differences in the quality of the retailers in terms of shipping, delivery, or ease of use of their Web sites, these data would seem to contradict the law of one price. In particular, Amazon and Walmart are well-known Web sites with good reputations for rapid and dependable delivery. So, we might expect the other two sites, which are less well-known, to charge less rather than more for this DVD. However, in some cases a store or a Web site will specialize in one type of product and carry other products only as a convenience to their customers. In this case, the store may not attempt to be competitive on the prices of the convenience products.

1.5 Abner is not exploiting the consumers in Nevada by engaging in arbitrage. Because of his activities, consumers in Nevada can buy apples at a lower price than they would otherwise pay. Because others besides Abner would see the profit potential of engaging in arbitrage, they are likely to begin competing with Abner. This competition will keep Abner from earning economic profits in the long run.

1.6 Valerian might be suspicious of eBay because many of its users buy at a low price to resell at a high price. However, if he were to find an item that had great value to him on eBay, he might temper his judgment. Valerian’s worry seems to be that arbitragers are making unfairly high profits, but eBay actually helps increase competition, thus eliminating the middleman’s economic profits, while increasing consumer surplus.

16.2 Price Discrimination: Charging Different Prices for the Same Product

Learning Objective: Explain how a firm can increase its profits through price discrimination.

Review Questions

2.1 Price discrimination is the setting of different prices for the same product for different sub-groups of the market for that product. For successful price discrimination, it must be possible for the firm to easily segment the market and to identify individuals from different market segments so that the product cannot be bought at the lower price and resold at a higher price.

2.2 U.S. Airways and other airlines use the strategy of yield management as a way of segmenting the market. Those travelers who can plan to buy tickets in advance are generally leisure travelers who aren’t willing to pay as much for their flights. Those travelers who cannot plan as far in advance are generally business travelers who are willing to pay more.

2.3 Yield management is the practice of adjusting prices to account for differences in demand. Daytime shows of movies tend to have lower demand than evening or late night
shows. Since students have more flexible schedules, they are more likely to attend daytime shows, particularly if they are offered lower prices, since they are often quite price-sensitive.

2.4 First degree price discrimination or perfect price discrimination is the practice of charging every consumer their willingness to pay. In such a scenario, consumer surplus will fall to zero since every consumer will be paying the maximum amount they are willing to pay for a product.

2.5 Early adopters of products tend to be less price-sensitive because they have a preference for acquiring a product early, irrespective of the price. This allows firms to charge a higher price to early adopters and reduce the price some time after introduction to attract more price sensitive consumers.

Problems and Applications

2.6 A “road warrior” is a person who travels extensively on business. These are people who are not likely to be in any one location for more than one or two days at a time. A company may put restrictions on a service that make that service less desirable to some of its customers if those customers do not have any viable alternative to using the service, and if the restrictions increase the profitability of the company.

2.7 AMC is attempting to price discriminate between those willing to pay a high price and attend a movie during the normal afternoon and evening hours and those not willing to pay high prices. The second group, whose price elasticity of demand for seeing movies will be relatively high, are charged a lower price during less convenient morning shows. Audiences that AMC may reach in this way include senior citizens and families with small children who may not have otherwise attended the movies at all.

2.8 Truth serum would be very useful for one of the requirements to price discriminate: determining different customers’ willingness to pay. However, the airlines would still need to keep the people who buy at the low price from reselling at the high price.

2.9 The New York Times is charging consumers who are willing—or claim to be willing—to cancel their subscriptions lower prices than consumers are who don’t make this claim (or who don’t realize that making the claim might result in a 50 percent reduction in their subscription price). Assuming that the elasticity of demand of consumers who call up threatening to cancel is greater than the elasticity of those who don’t call up, the Times is engaging in price discrimination.
2.10  a. This is not pure price discrimination because there are differences in costs. However, the differences in prices may have been greater than the differences in costs, so there might have been some price discrimination involved.

b. Most economists would argue that in a competitive industry like dry cleaning, in the long run price will equal the average cost of providing a service, and government intervention will not be necessary. However, it is still possible to support this law on normative grounds, especially if you are likely to benefit from it personally.

2.11  a. The graph shows that in Market 1, marginal revenue equals marginal cost at a quantity of 25. Therefore, a price of $7 should be charged to maximize profits.

b. The graph shows that in Market 2, marginal revenue equals marginal cost at a quantity of 45. Therefore, a price of $11 should be charged to maximize profits.

2.12 Price discrimination can be effective for firms when the price elasticity of demand for their product varies from one group of customers to another. Apple cuts prices more to students for its laptop because students have a more elastic demand than businesspeople do.

2.13 Apple is not engaging in price discrimination because it is offering a different iMac, a lower-end model with presumably a different cost of production, for a lower price to certain schools and universities. Apple may not offer these computers to the general public because they are likely less price-sensitive and will pay more for a slightly different model.

2.14 Initially we are assuming that universities charge a different price to each student, which is an example of perfect price discrimination. As the chapter explains, the demand curve is the marginal revenue curve for a perfect price discriminator. A university acting as a perfect discriminator would look like the following graph:

![Graph of perfect price discrimination](image-url)
In this scenario, the marginal revenue curve is the demand curve, so the profit maximizing quantity is $Q_1$. You should also notice that this quantity achieves allocative efficiency because marginal benefit equals marginal cost at this quantity.

The figure below shows the consequences of forcing the universities to charge the same price ($P_2$) to each consumer. In this scenario, the number of people admitted into college declines to $Q_2$ from $Q_1$. Students who were paying more than $P_2$ before the change in policy gain because they now pay less to attend college. However, fewer students will be attending college, and some of those who do will be paying a higher price. Because the new equilibrium quantity is below the allocatively efficient quantity, there is now a deadweight loss. The areas representing profit, consumer surplus, and deadweight loss are represented in Figure 16.3 on page 584 in the textbook.

![Diagram showing price and cost with consumer surplus, profit, deadweight loss, marginal cost, average cost, demand, and quantity axes.]

2.15 In each case, Disney is attempting to set price so as to maximize profits given differing price elasticities of demand.

2.16 Yes, coupons are a form of price discrimination. People who are willing to take the time to clip coupons have a higher price elasticity of demand than people who are not willing to clip coupons. Coupons are a way for firms to cut the price paid by consumers with a higher price elasticity without having to cut the price for everyone else.

2.17 Although Netflix incurs higher costs to send out more movies in any month, it is likely that the differences in prices are greater than these differences in costs. Netflix’s subscription plans attempt to segment the market on the basis of different tastes in movie watching and, therefore, different price elasticities. So, Netflix is practicing price discrimination by offering these different subscription plans.

2.18 The perfect price discriminator sells $Q_3$ units and charges a range of prices along the demand curve—$P_1$ to the person who is willing to pay $P_1$ for unit $Q_1$, $P_2$ to the person who is willing to pay $P_2$ for unit $Q_2$, and $P_3$ to the person buying unit $Q_3$, for example. Producer
surplus is the entire area of triangle $A$ between the demand and marginal cost curves. There is no deadweight loss, and there is no consumer surplus. The marginal revenue curve equals the demand curve.

16.3 **Other Pricing Strategies**

Learning Objective: Explain how some firms increase their profits through the use of odd pricing, cost-plus pricing, and two-part tariffs.

**Review Questions**

3.1 Odd pricing is the practice of charging prices that are just less than round figures (such as $0.99 instead of $1 or $9.95 instead of $10). Consumers are believed to be under the illusion that the odd-priced good is significantly cheaper than a good that costs a round figure. If true, such a pricing strategy could yield higher revenues and profits for firms.

3.2 Cost-plus pricing is the strategy by which firms charge a price, which is a mark-up of the costs of producing the product. This is sometimes considered a sensible way to approximate the profit-maximising price when either marginal price or marginal revenue are difficult to calculate.

3.3 In a two-part tariff, consumers pay one price (or tariff) for the right to buy as much of a related good as they want at a second price. Firms set two-part tariffs in order to capture as much consumer surplus as possible. By setting the second price at marginal cost, firms reach an efficient outcome, and then by setting a suitable first tariff, firms can capture as much consumer surplus as possible in the form of increased profits.
3.4 Disney switched because they thought the two-part tariff pricing strategy would increase revenues and profits, as shown in Figure 16.5 on page 591. The switch probably reduced their costs as well because tickets did not have to be collected at the entrance to each ride.

Problems and Applications

3.5 If this explanation of odd pricing is correct, you would expect to see it used more often among people who are gullible, not comfortable with math, or less well educated. Banning the practice probably wouldn’t make much difference. Consumers might make slightly wiser choices, but they would have to pay slightly more and a few would lose the feeling of having made a great deal. In competitive markets, firms do not make economic profits in the long run.

3.6 It is likely that McDonald’s and Burger King believe that the elasticity of demand for French fries and for sodas is less elastic than the elasticity of demand for hamburgers. The less elastic the demand for a product, the less substitution there will be away from the product in response to an increase in price.

3.7 The firm was using the cost-plus method of pricing. As the firm produced so many products, it may have been profitable to use this pricing method instead of investing the resources needed to estimate demand and marginal cost in each separate market. In general, though, the cost-plus price will not be the same as the profit-maximizing price.

3.8 We should not expect a publishing company to use cost-plus pricing for all its books. We can see evidence that cost-plus pricing is not always used by looking at prices of the same book in different markets (for example, the U.S. and European markets), or by noting that best sellers usually sell for lower prices, or that the relative prices of some books change over time.

3.9 a. This is a variation of the Disney World, two-part tariff problem. The team will make more profit by keeping the season ticket prices low.

b. After the first year, the team no longer collects revenue from seat licenses, so it would have an incentive to raise the price of season tickets.

c. If it still has some seat licenses unsold, then it will not raise season tickets as much as it would if it sold them all the first year.

3.10 This is a variation of the Disney World, two-part tariff problem. The railroad companies would maximize their combined profit from selling land and shipping freight by keeping freight prices lower than they would if they did not also have land to sell. This was true
because farmers would be able to make greater profits—and, therefore, would be willing to pay more for land—if freight charges were low.

3.11 When Disney charged a low price for admission while requiring people to purchase tickets to go on the rides, its overall profit was lower because of the deadweight loss created by the monopoly price. By acting as it would in a perfectly competitive market and charging a price equal to marginal cost ($0) for the rides, Disney is able to increase its overall consumer surplus and charge a higher price for admission tickets, thereby increasing its overall profit.

3.12 The town could charge a fixed fee for any garbage collection plus an additional fee per garbage can.
Answers to Thinking Critically Questions

1. The marginal revenue product of college coaches is greater than the marginal revenue product of their faculty colleagues. Division 1-A games between two successful basketball teams generate revenue from ticket sales and television networks. Lectures on demand and supply and John Milton’s poem *Paradise Lost* do not.

2. Both the demand and the supply of college coaches (those who coached at the non-Division 1-A level) would increase. It is difficult to predict what would happen to salaries because an increase in demand, *ceteris paribus*, would increase salaries, while an increase in supply, *ceteris paribus*, would decrease salaries. However, it is likely that the salaries of the best coaches will increase because the increase in demand for coaches of Division 1-A programs would exceed the increase in the supply of successful coaches such as Mike Anderson and John Calipari.

The Demand for Labor

**Learning Objective:** Explain how firms choose the profit-maximizing quantity of labor to employ.

**Review Questions**

1.1 The derived demand for labor depends on the demand for the good labor produces.

1.2 The marginal product of labor is the additional output a firm produces as a result of hiring one more worker. The marginal revenue product of labor is the change in the firm’s revenue as a result of hiring one more worker.

1.3 The demand curve for labor is the marginal revenue product of labor, which equals the marginal product of labor multiplied by the marginal revenue from selling another unit. In the case of a firm that is a perfect competitor in the output market, the marginal revenue product of labor equals the marginal product of labor multiplied by price because price equals marginal revenue for a perfect competitor. The *MRPL* slopes downward because the marginal product of labor eventually diminishes due to the law of diminishing returns.

1.4 Human capital is the accumulated skills and knowledge embodied in the labour force. Increases in human capital lead to a rise in the productivity of the labour force, leading to an increase in the demand for labour and causing the demand curve to shift out.
Problems and Applications

1.5 Frank must ensure that the marginal revenue product of labour is equal to the wage rate he pays his workers. Therefore, the final worker must have a marginal revenue product of $2.50. The marginal revenue of that last worker will be $12/2.5 or 4.8 apple boxes an hour.

1.6

<table>
<thead>
<tr>
<th>Number of Workers</th>
<th>Output of Televisions per Week</th>
<th>Marginal Product of Labor (television sets per week)</th>
<th>Product Price</th>
<th>Marginal Revenue Product of Labor (dollars per week)</th>
<th>Wage (dollars per week)</th>
<th>Additional Profit from Hiring One More Worker (dollars per week)</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Q</td>
<td>MP</td>
<td>P</td>
<td>MRP = P x MP</td>
<td>W</td>
<td>MRP − W</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>−</td>
<td>−</td>
<td>$300</td>
<td>$1,800</td>
<td>−</td>
</tr>
<tr>
<td>1</td>
<td>8</td>
<td>8</td>
<td>300</td>
<td>$2,400</td>
<td>1,800</td>
<td>$600</td>
</tr>
<tr>
<td>2</td>
<td>15</td>
<td>7</td>
<td>300</td>
<td>2,100</td>
<td>1,800</td>
<td>300</td>
</tr>
<tr>
<td>3</td>
<td>21</td>
<td>6</td>
<td>300</td>
<td>1,800</td>
<td>1,800</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>26</td>
<td>5</td>
<td>300</td>
<td>1,500</td>
<td>1,800</td>
<td>−300</td>
</tr>
<tr>
<td>5</td>
<td>30</td>
<td>4</td>
<td>300</td>
<td>1,200</td>
<td>1,800</td>
<td>−600</td>
</tr>
<tr>
<td>6</td>
<td>33</td>
<td>3</td>
<td>300</td>
<td>900</td>
<td>1,800</td>
<td>−900</td>
</tr>
</tbody>
</table>

a. The firm is a price taker. We know this because the product price given in the table is constant and does not depend on the quantity being sold.

b.
1.7  

a. This will be a movement along the demand curve for labor.

b. The demand curve for labor will shift to the left from $D_1$ to $D_2$.

c. If several firms exit the television market, production of televisions will decrease. This will decrease the demand for labor, causing the demand curve for labor to shift to the left from $D_1$ to $D_2$. 

d. If this new training increases productivity, the demand will shift to the right from $D_1$ to $D_2$.

![Graph showing demand shift from $D_1$ to $D_2$]

1.8 A baseball player’s contract could cause that player to have a negative value to the team if his marginal revenue product of labor ($MRP$), or his contribution to the revenue of the team, is less than his wage, or salary. In this case, the player is contributing less to the team’s revenue than he is to its costs.

### The Supply of Labor

**Learning Objective:** Explain how people choose the quantity of labor to supply.

**Review Questions**

2.1 A backward bending supply curve can be explained by the relative sizes of the substitution effect and income effect from a rise in wages. When the wage level is low, further increases in wages yield a negative substitution effect on the demand for leisure (consumers want to work more) and a positive but small income effect on the demand for leisure (consumers want to work less). The aggregate effect is for workers to increase their supply of labour. At high enough wages, however, the income effect is large enough to dominate the substitution effect such that a further increase in wages leads consumers to consume more leisure and supply less labour. In aggregate, however, the market supply curve for labour is typically upward sloping.

2.2 This depends on the original age of the population. If an ageing population becomes younger, then there may be more members in the working age population leading to an increase or outward shift of the labour supply curve. If a population dominated by working age members becomes much younger, there may be more members who are below working age, leading to a decrease or inward shift in the labour supply curve.
Problems and Applications

2.3 With the fall in Daniel’s wage, the substitution effect would cause him to consume more leisure, and work less, since the opportunity cost of leisure, in terms of the wage rate, has fallen. The income effect would have him consume less leisure, and work more, due to the fall in his income. Since Daniel has only marginally reduced the hours of work per week in response to a large cut in his income, we conclude that the substitution effect and income effect are working in opposite directions with the substitution effect being marginally stronger.

2.4 The price of time is the value individuals put on a certain amount of time—for instance, how much you value one hour of time. If real hourly wages have risen, then time becomes more valuable in terms of earning power, so the price of time will have also risen. One way to look at this is if you decide not to work one hour instead of working that same hour. The higher the real wage, the more that hour will cost you. That one hour of time has gone up in value due the increase in the real wage.

2.5 Most labor economists assume that many adult males will work the same number of hours despite changes in their current wage rates. If, for example, an adult male worked forty hours per week, an increase in his wage would result in him working the same forty hours. In other words, the substitution effect of the wage increase (which would lead him to substitute work for leisure and work more hours) is equal to the income effect (which would lead him to work fewer hours).

2.6 Eliminating the income tax on wages increases the opportunity cost of leisure because the after-tax wage is now higher than it was. Workers will also earn more income for any given number of hours worked. Whether workers will end up supplying more hours at each wage rate depends on whether the substitution effect of this increase in the after-tax wage is greater than the income effect.

2.7 As the U.S. population ages, the supply curve for labor will shift to the left.

2.8 a. A movement along the supply curve.

b. The opportunity cost of working in agriculture has increased. So, the supply curve of labor in agriculture will shift to the left from $S_1$ to $S_2$. 
c. Unlimited immigration will shift the supply curve for agricultural workers to the right from $S_1$ to $S_2$.

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**17.3 Equilibrium in the Labor Market**

Learning Objective: Explain how equilibrium wages are determined in labor markets.

**Review Questions**

3.1 In this case, the equilibrium wage will fall, as will the equilibrium quantity of labor employed.
3.2 If the labor supply curve shifts to the left, the equilibrium wage will rise, and the equilibrium quantity of labor employed will fall.

Problems and Applications

3.3 If skilled workers earn more than unskilled workers, workers have an economic incentive to acquire skills. We would expect to see unskilled workers going to college to acquire skills that will increase their salaries. In the extreme case, we would expect people to leave the unskilled market, go to college, and enter the skilled market until the skilled wage was exactly the same as the unskilled wage. However, going to college is costly and time consuming, and one of the reasons that firms have to pay skilled workers more is to compensate these workers for taking the time to go to college to become a skilled worker. As a result, the skilled wage is likely always to be higher than the unskilled wage. Consider this: Would you go to college for four years (giving up the possibility of earning income) to get a
degree if after graduation your salary would be the same as if you worked behind the counter at McDonald’s?

3.4

3.5 Salaries are not determined by the importance of the work being done. Salaries are determined by the intersection of the demand curve for labor and the supply curve for labor in a specific market.

3.6 Even though in some school systems outstanding teachers are paid more than less productive teachers, outstanding teachers earn salaries closer to their marginal revenue product, which is below $320,000. Salaries are determined by demand and supply in labor markets, not by the importance of the work being done.

3.7 The shift from Labor supply$_1$ to Labor supply$_2$ shows the effect of the plague on the quantity of sailors available at each wage. In the absence of government intervention, the wage would have risen from $W_1$ to $W_2$, and the quantity of sailors employed would have fallen from $L_1$ to $L_2$. The wage ceiling keeps the wage at $W_1$, but causes the quantity of sailors employed to fall all the way to $L_3$. There is a shortage of labor equal to $L_1 - L_3$. 

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17.4 Explaining Differences in Wages

Learning Objective: Use demand and supply analysis to explain how compensating differentials, discrimination, and labor unions cause wages to differ.

Review Questions

4.1 A compensating differential exists when a higher wage compensates workers for unpleasant aspects of a job. An example would be when workers need to be paid an extra $2 an hour to work in a job with a higher risk of injury.

4.2 Economic discrimination is the phenomenon where workers are paid lower wages or excluded from employment on the basis of a characteristic that has nothing to do with productivity, such as race or gender. Factors that could explain wage differences between men and women include differences in the average level of schooling between men and women (due to social or other reasons) or differences in the average level of work experience between men and women. Finally, women may display a preference for certain types of jobs that are lower-paying, on average, than men.

4.3 Employers who discriminate will experience a decrease in their supply of labor, which in turn puts upward pressure on wages. The employers who do not discriminate, on the other hand, will experience lower costs and, subsequently, will be able to charge lower prices for their output and be more profitable than their discriminating competitors. Although this penalty should reduce discrimination, many economists doubt that the penalty is sufficient to eliminate discrimination.
4.4 The existence of a labour union that can collectively lobby in an organized fashion on behalf of all workers for an increase in wages leads to higher average worker wages and better working conditions, in general.

Problems and Applications

4.5 The economy will operate efficiently if workers are paid wages equal to their marginal revenue products. Workers with large marginal revenue products will receive more than workers with small marginal revenue products. Kinsley considers this outcome to be good for almost everyone, but others who care more about equality and less about efficiency may be more critical.

4.6 You should agree with this statement. A player’s marginal product—which we can think of as the extra games a team will win by employing him—should be about the same for any team. But the marginal revenue product will be higher in some markets than in others. In larger markets, winning more games will result in a greater increase in attendance in those markets. It will also result in a greater increase in viewers for games on television in those markets. Therefore, teams in larger markets are able to sell the extra wins that a player produces for more than teams in smaller markets can. This difference explains why some teams are willing to pay certain players more than other teams are willing to pay.

4.7 You should not agree with the student’s reasoning. The marginal revenue product of major league baseball players is much higher than the marginal revenue product of college professors, even though the price of a college education is much greater than the price of a ticket to a baseball game.

4.8 Alex Rodriguez’s marginal revenue product—how much extra revenue he earns for his employer—is obviously much higher than the marginal revenue product of this fan’s boss. Rodriguez’s high pay is justified in an economic sense by the willingness of fans to pay so much to see a winning Major League Baseball team. Complaints about high salaries for professional athletes amount to complaints that fans are willing to pay too much to view games. If A-Rod were paid less, the big winner would be his employer, the New York Yankees.

4.9 Baseball managers and general managers are generally paid less than baseball players because their marginal revenue product is lower. There marginal revenue product is lower because they have a smaller effect on the outcome of games and because they are less important in attracting high attendance at stadiums or high numbers of TV viewers.

4.10 Nick Saban may have the same marginal product as a coach being paid “only” $500,000 in that he may have the same effect on outcomes, but he may have a higher marginal revenue
product if his name attracts more viewers to the game or more donations by alumni to the school. Saban’s marginal revenue product may also be higher than that of other coaches if attendance at football games at the University of Alabama is higher than at some other schools.

4.11 This is an example of the economics of “superstars” as described in the Making the Connection. As relatively few entertainers are able to become extremely well-known through television, videos, and the Internet, lesser-known entertainers come to seem poorer substitutes in the eyes of consumers. Increasingly, consumers are willing to pay high ticket prices to see the very top entertainers and much lower prices to see less highly regarded acts.

4.12 The increase in the relative incomes of superstars is mainly due to technological advances. For instance, the spread of cable television has greatly increased the number of potential viewers of basketball games. But many of those viewers will watch only if their team is winning. This increases the value to the owners of basketball teams of winning games and, therefore, increases the marginal revenue product of the best basketball players and the salaries they can earn. The difference between the marginal revenue products of the best plumbers and the marginal revenue products of average plumbers is much smaller. A superstar plumber can only service one household at a time, but a superstar athlete can perform for millions of fans simultaneously.

4.13  
   a. Goldwyn probably meant that the star was getting paid more than other actors who could have played the role.
   
   b. The star was worth his high salary if he raises the probability the movie will be a hit and bring in a great deal of revenue. In other words, as long as the star’s wage does not exceed his marginal revenue product, the movie studio will increase its profit by employing him.

4.14 Before the passage of workers’ compensation laws, workers in hazardous industries such as coal and lumber had been receiving compensating differentials. After the passage of the laws, these compensating differentials declined, reducing the workers’ wages.

4.15 If employers always discriminated against racial minorities, it would be unlikely that Asian males would earn more than white males. However, it is important not to use average wages to assess whether or not discrimination occurs. Differences in productivity are probably the main factor determining differences in wages. Economic discrimination occurs when someone is paid less due to an irrelevant characteristic that isn’t related to productivity. Comparing average wages across ethnic groups cannot definitively decide the question of whether and to what extent economic discrimination occurs.
4.16 It is likely that these women ended up with less education than they would have if they had known they would be in the labor force. As a result, their earnings were lower than they would have been if they had correctly predicted the probability of their being in the labor force later in life.

4.17 The wages received by employees of firms that currently do not make contributions to their employees’ retirement plans are likely to fall. Employees’ compensation includes not only wages, but also the value of any fringe benefits received, including employer contributions to retirement plans. So, the intersection of the labor demand and labor supply curves really determines equilibrium compensation. If employers are now required to contribute to employee retirement plans, this increase in employee compensation would most likely be offset by a decrease in the compensation employees receive from their wages.

4.18 a. 7,000 trash collectors at a wage of $600 per week.
    b. 9,000 receptionists at a wage of $400 per week.
    c. The marginal revenue products of the two types of workers may differ. There may also be a compensating differential because the work of trash collectors is dirty and unpleasant.
    d. 6,000 trash collectors and 8,000 receptionists.

4.19 This law would be a version of comparable worth legislation. Assume, hypothetically, that before the legislation is passed, the equilibrium wage for economics professors is $70,000 per year and the equilibrium number of economics professors hired is \( L_1 \). Setting the wage at $60,000, which is below equilibrium, reduces the number of professors who are willing to work in this occupation from \( L_1 \) to \( L_2 \), but increases the number of professors demanded by employers from \( L_1 \) to \( L_3 \). The result is a shortage of economics professors equal to \( L_3 - L_2 \), as shown in the graph that follows. Without the legislation, the equilibrium wage for English professors is $50,000 and the equilibrium number hired is \( L_1 \). Setting the wage for English professors at $60,000, which is above equilibrium, increases the number of professors who want to work in this occupation from \( L_1 \) to \( L_3 \), but reduces the number of professors demanded by employers from \( L_1 \) to \( L_2 \). The result is a surplus of English professors equal to \( L_3 - L_2 \), as shown in the graph.
Employers might believe that applicants with white-sounding names are more productive, so they will be more inclined to interview those individuals. These employers, however, will likely incur an economic penalty. Employers who discriminate will experience a decrease in their supply of labor, which in turn puts upward pressure on wages. The employers who do not discriminate, on the other hand, will experience lower costs and, subsequently, will be able to charge lower prices for their output and be more profitable than their discriminating competitors.

17.5 Personnel Economics
Learning Objective: Discuss the role personnel economics can play in helping firms deal with human resources issues.

Review Questions

5.1 Personnel economics is the application of economic analysis to human resource issues, such as compensation packages, promotions, training, and pensions.

5.2 A piece-rate compensation system pays workers on a per-output basis. Firms are able to ensure higher effort by their workers and can also retain the most-productive workers, since they are paid much more than less-productive workers. This could, however, create incentives for workers to increase output at the cost of quality because they are being paid on the basis of how many units of output they produce.

5.3 Risk-averse workers would prefer straight-time pay because they are guaranteed a fixed periodic payment, irrespective of how successful they are in creating output.

Problems and Applications

5.4 Tying pay to productivity gives workers an incentive to put in a greater effort. These schemes may be increasingly used over time as jobs that require measurable effort are
becoming more common. Pay systems of this type may be more popular with higher-paid jobs because effort is more important in such jobs, because direct measurement of work (such as hours on the job) is not a good proxy for effort in such jobs, or because high paid workers are less risk averse and therefore more willing to accept such pay schemes.

5.5 It isn’t likely because workers who found the job acceptable with the previous minimum now have an economic incentive to produce more. If they had wanted to produce less, it is likely they already would have found a job that required less work for a lower wage.

5.6 It will be higher under a piece-rate system, because the workers are willing to put in a greater effort to earn more.

5.7 Previously, salespeople had an incentive to sell more inexpensive tires, which were probably less profitable for Goodyear. In addition, because they were compensated on the basis of the quantity of tires sold, they had an incentive to reduce the price to sell more tires, even if this reduced Goodyear’s profits.

5.8 The marginal cost to the company per window installed fell from $44.43 under the hourly wage system to $35.24 under the piece-rate system. If all firms adopted a system of incentive pay, the marginal cost of all window replacements would fall, and so would the price. Ultimately, it is the worker replacing the windows and the consumers who would gain from this increased productivity: the workers would be paid more, and the consumers would pay less. This is possible because the new pay scheme increased productivity.

17.6 The Markets for Capital and Natural Resources
Learning Objective: Show how equilibrium prices are determined in the markets for capital and natural resources.

Review Questions

6.1 In equilibrium, the price of capital is determined by the intersection of the supply of capital curve and the demand for capital curve. Similarly, the equilibrium price of natural resources is determined by the intersection of the supply of natural resources curve and the demand for natural resources curve. The marginal productivity theory of income distribution concludes that each individual’s income is determined by the marginal productivity of the factors of production (such as labor, capital and natural resources) that the individual owns.

6.2 Economic rent is the price paid for a factor of production (for example land) that is in fixed supply. A monopsony is a market with only one buyer of a factor of production.
Problems and Applications

6.3  

<table>
<thead>
<tr>
<th>Number of Machines</th>
<th>Output of Pins (Boxes per Week)</th>
<th>Marginal Product of Capital (Boxes per Box)</th>
<th>Marginal Product Price (Dollars per Box)</th>
<th>Total Revenue of Pins (Boxes per Week)</th>
<th>Marginal Revenue Product of Capital</th>
<th>Rental Cost per Machine</th>
<th>Additional Profit from Renting One Machine</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Q</td>
<td>MP</td>
<td>P</td>
<td>TR</td>
<td>MP</td>
<td>R</td>
<td>MRP − R</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>−</td>
<td>$100</td>
<td>$</td>
<td>0</td>
<td>$550</td>
<td>−</td>
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<td>12</td>
<td>100</td>
<td>1,200</td>
<td>$1,200</td>
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<td>650</td>
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<td>100</td>
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<td>900</td>
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<td>350</td>
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</tr>
<tr>
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<td>3,900</td>
<td>500</td>
<td>550</td>
<td>−50</td>
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<td>4</td>
<td>100</td>
<td>4,300</td>
<td>400</td>
<td>550</td>
<td>−150</td>
</tr>
</tbody>
</table>

Adam should rent 4 machines to maximize his profit, because this is where the additional profit from renting one additional machine is closest to zero without being negative.

b. The demand for capital curve equals the marginal revenue product of capital.

![Graph showing the relationship between rental price of capital and quantity of capital](image)

6.4  

As the graph shows, the only way that the prices of natural resources won’t rise is if their supply has shifted to the right at least as much as the demand for natural resources has
shifted to the right. Paradoxically, even though we continue to use up natural resources, the supplies of most of them have continued to rise. The supply of natural resources has as much to do with the cost of finding, extracting, and processing the natural resources as with how much of them actually exist. Natural resources are a gift of nature, but it often takes a lot of effort to unwrap the gift, and we’ve gotten better and better at doing so over time.

6.5 If the supply of land is perfectly inelastic, the whole burden of the tax will fall on the seller. Note that in this case there is no deadweight loss and this tax is efficient.
6.6 The supply of oil is the quantity firms are willing to sell at each price. As price increases, firms are willing to extract harder to reach oil, so the quantity supplied will increase as the price of oil rises, even though the total amount of oil in the ground is not increasing. Therefore, the supply curve for oil is not perfectly inelastic.

6.7 In the case of a monopsony, imposing a minimum wage removes market power from the single firm and encourages the firm to hire more workers than it would otherwise.