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Chapter 2

THE ECONOMIC PROBLEM

Answers to the Review Quizzes

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1. How does the production possibilities frontier illustrate scarcity?

The unattainable combinations of production that lie *beyond* the *PPF* illustrate the concept of *scarcity*. There are not enough resources to produce any of these combinations. And moving along the *PPF* to increase the production of one good requires that the production of another good be reduced, which also illustrates scarcity.

2. How does the production possibilities frontier illustrate production efficiency?

The production points that lie on the *PPF* illustrate the concept of production efficiency. These points are attained only by producing the goods and services at the lowest possible cost. At any point inside the frontier, production of one good can be increased without decreasing production of the other good. Such points cannot be production efficient.

3. How does the production possibilities frontier show that every choice involves a tradeoff?

Movements along the *PPF* illustrate that producing more of one good requires producing less of the other good. This observation reflects the result that a *tradeoff* must be made when producing efficiently.

4. How does the production possibilities frontier illustrate opportunity cost?

The negative slope of the production possibility curve illustrates the concept of *opportunity cost*. Moving along the production possibilities frontier, producing additional units of a good requires that the output of the other good must fall. This tradeoff is the opportunity cost of producing more of the first good.

5. Why is opportunity cost a ratio?

The slope of the *PPF* is a *ratio* that expresses the quantity of lost production of the good on the *y*-axis to the increase in the production of the good on the *x*-axis moving downward along the *PPF*. The steeper the slope, the greater is the ratio, and the greater is the opportunity cost of increasing the output of the good measured on the horizontal axis.

6. Why does the *PPF* bow outward and what does that imply about the relationship between opportunity cost and the quantity produced?

Some resources are better suited to produce one type of good or service, like pizza. Other resources are better suited to produce other goods or services, like DVDs. If society allocates resources wisely, it will use each resource to produce the kind of output for which it is best suited. Consider a *PPF* with pizza measured on the *x*-axis and DVDs measured on the *y*-axis. A small increase in pizza output when pizza production is relatively *low* requires only a small increase in the use of those resources still good at making pizza and not good at making DVDs. This yields a small decrease in DVD production for a large increase in pizza production, creating a relatively *low opportunity cost* reflected in the gentle slope of the *PPF* over this range of output. However, the same small increase in pizza output when pizza production is relatively *large* will require society to devote to pizza production those

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resources that are less suited to making pizza and more suited to making DVDs. This reallocation of resources yields a relatively small increase in pizza output for a large decrease in DVD output, creating a relatively *high opportunity cost* reflected in the steep slope of the *PPF* over this range of output. The opportunity cost of pizza production increases with the quantity of pizza produced as the slope of the *PPF* becomes ever steeper. This effect creates the *bowed-out* effect (the concavity of the *PPF* function) and means that as more of a good is produced, the opportunity cost of producing additional units increases.

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1. What is marginal cost? How is it measured?

Marginal cost is the opportunity cost of producing *one more unit* of a good or service. Along a *PPF* marginal cost is reflected in the absolute value of the slope of the *PPF*. In particular, the magnitude of the slope of the *PPF* is the marginal cost of a unit of the good measured along the *x*-axis. As the magnitude of the slope changes moving along the *PPF*, the marginal cost changes.

2. What is marginal benefit? How is it measured?

The *marginal benefit* from a good or service is the benefit received from consuming one more unit of it. It is measured by what an individual is willing to give up (or pay) for an additional unit.

3. How does the marginal benefit from a good change as the quantity produced of that good increases?

As more of a good is consumed, the marginal benefit received from each unit is smaller than the marginal benefit received from the unit consumed immediately before it, and is larger than the marginal benefit from the unit consumed immediately after it. This set of results is known as the principle of *decreasing marginal benefit* and is often assumed by economists to be a common characteristic of an individual's preferences over most goods and services in the economy.

4. What is allocative efficiency and how does it relate to the production possibilities frontier?

Allocative efficiency is a situation in which goods and services are produced at the lowest possible cost and in the quantities that provide the greatest possible benefit. We cannot produce more of any good without giving up some of another good that we value more highly. The allocative efficient level of output is the point on the *PPF* (and hence is a production efficient point) for which the marginal benefit equals the marginal cost.

5. What conditions must be satisfied if resources are used efficiently?

Resources are used efficiently when more of one good or service cannot be produced without producing less of some other good or service that is *valued more highly*. This is known as *allocative efficiency* and it occurs when: 1) production efficiency is achieved, and 2) the marginal benefit received from the last unit produced is equal to the marginal cost of producing the last unit.

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1. What generates economic growth?

The two key factors that generate economic growth are *technological change* and *capital accumulation*. Technological change is the development of new goods and of better ways of producing goods and services. Capital accumulation is the growth of capital resources, including human capital.

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2. **How does economic growth influence the production possibilities frontier?**
   Economic growth shifts the *PPF* outward.
3. **What is the opportunity cost of economic growth?**
   When a society devotes more of its scarce resources to research and development of new technologies, or devotes additional resources to produce more capital equipment, both decisions lead to increased consumption opportunities in future periods at the cost of less consumption today. The loss of consumption today is the opportunity cost borne by society for creating economic growth.
4. **Explain why Hong Kong has experienced faster economic growth than Canada.**
   Hong Kong devotes a greater proportion of its available resources to the production of capital than Canada. Canada devotes one-fifth of its resources to accumulating capital. Hong Kong devotes one-third of its resources to accumulating capital. This allows Hong Kong to grow at a faster rate than Canada.
5. **Does economic growth overcome scarcity?**
   Scarcity reflects the inability to satisfy all our wants. Regardless of the amount of economic growth, scarcity will remain present because it will never be possible to satisfy all our wants. Economic growth allows more wants to be satisfied but it does not eliminate scarcity.

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1. **What gives a person a comparative advantage?**
   A person has a comparative advantage in an activity if that person can perform the activity at a lower opportunity cost than anyone else. If the person gives up the least amount of other goods and services to produce a particular good or service, the person has the lowest opportunity cost of producing that good or service.
2. **Distinguish between comparative advantage and absolute advantage.**
   A person has a *comparative advantage* in producing a good when he or she has the lowest opportunity cost of producing it. Comparative advantage is based on the output forgone. A person has an *absolute advantage* in production when he or she uses the least amount of *time or resources* to produce one unit of that particular good or service. Absolute advantage is a measure of productivity in using inputs.
3. **Why do people specialize and trade?**
   People can compare consumption possibilities from producing all goods and services through *self-sufficiency* against specializing in producing only those goods and services that reflect their comparative advantage and trading their output with others who do the same. People can then see that the consumption possibilities from specialization and trade are greater than under self-sufficiency. So it is in people's own *self-interest* to specialize.
4. **What are the gains from specialization and trade?**
   From society's standpoint, the total output of goods and services available for consumption is greater with specialization and trade. From an individual's perspective, each person who specializes enjoys being able to consume a larger bundle of goods and services after trading with others who have also specialized, than would otherwise be possible under self-sufficiency. These increases are the gains from specialization and trade for society and for individuals.
5. **What is the source of the gains from trade?**
   As long as people have different opportunity costs of producing goods or services, total output is higher with specialization and trade than if each individual produced goods and

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services under self-sufficiency. This increase in output that arises from divergent opportunity costs is the gains from trade.

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1. Why are social institutions such as firms, markets, property rights, and money necessary?

These social institutions are necessary for a decentralized economy to coordinate production. *Firms* are necessary to allow people to specialize. Without firms, specialization would be limited because a person would need to specialize in the *entire* production of a good or service. With firms people are able to specialize in producing particular bits of a good or service. For a society to enjoy the fruits of specialization and trade, the individuals who comprise that society must voluntarily desire to specialize in the first place. Discovering trade opportunities after a person has specialized in his or her comparative advantage in production is what allows that person to gain from his own specialization efforts. Trading opportunities can only take place if a *market* exists where people observe prices to discover available trade opportunities. *Money* is necessary to allow low-cost trading in markets. Without money, goods would need to be directly exchanged for other goods, a difficult and unwieldy situation. Finally people must enjoy social recognition of and government protection of *property rights* to have confidence that their commitments to trade arrangements will be respected by everyone in the market.

2. What are the main functions of markets?

The main function of a market is to enable buyers and sellers to get information and to do business with each other. Markets have evolved because they facilitate trade, that is, they facilitate the ability of buyers and sellers to trade with each other.

3. What are the flows in the market economy that go from firms to households and the flows from households to firms?

On the real side of the economy, goods and services flow from firms to households. On the money side of the economy, payments for factors of production, wages, rent, interest, and profits, flow from firms to households. Flowing from households to firms on the money side of the economy are the expenditures on goods and services and on the real side are the factors of production, labour, land, capital, and entrepreneurship.

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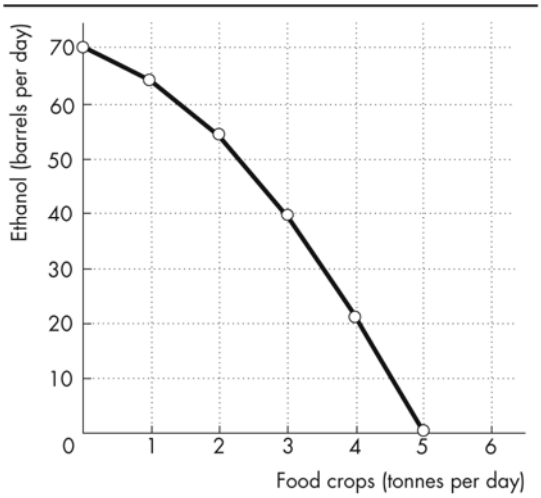
Answers to the Study Plan Problems and Applications

Use the following information to work Problems 1 to 3. Brazil produces ethanol from sugar, and the land used to grow sugar can be used to grow food crops. The table sets out Brazil's production possibilities for ethanol and food crops.

Ethanol (barrels per day)		Food crops (tonnes per day)
70	and	0
64	and	1
54	and	2
40	and	3
22	and	4
0	and	5

FIGURE **2.1**
Problem 1



1. a. **Draw a graph of Brazil's *PPF* and explain how your graph illustrates scarcity.**
   Figure 2.1 shows Brazil's *PPF*. The production possibilities frontier indicates scarcity because it shows the limits to what can be produced. In particular, production combinations of ethanol and food crops that lie outside the production possibilities frontier are not attainable.

   b. **If Brazil produces 40 barrels of ethanol a day, how much food must it produce to achieve production efficiency?**
   If Brazil produces 40 barrels of ethanol per day, it achieves production efficiency if it also produces 3 tonnes of food per day.

   c. **Why does Brazil face a tradeoff on its *PPF*?**
   Brazil faces a tradeoff on its *PPF* because Brazil's resources and technology are limited. For Brazil to produce more of one good, it must shift factors of production away from the other good. To increase production of one good requires decreasing production of the other—a tradeoff.

2. a. **If Brazil increases ethanol production from 40 barrels a day to 54 barrels a day, what is the opportunity cost of the additional ethanol?**
   When Brazil is production efficient and increases its production of ethanol from 40 barrels a day to 54 barrels a day, it must decrease its production of food crops from 3 tonnes a day to 2 tonnes a day. The opportunity cost of the additional ethanol is 1 tonne of food a day for the entire 14 barrels of ethanol or 1/14 of a tonne of food per barrel of ethanol.

   b. **If Brazil increases its production of food crops from 2 tonnes per day to 3 tonnes per day, what is the opportunity cost of the additional food?**
   When Brazil is production efficient and increases its production of food crops from 2 tonnes per day to 3 tonnes per day, it must decrease its production of ethanol from 54 barrels per day to 40 barrels per day. The opportunity cost of the additional 1 tonne of food crops is 14 barrels of ethanol.

   c. **What is the relationship between your answers to parts (a) and (b)?**
   The opportunity cost of an additional barrel of ethanol and the opportunity cost of an additional tonne of food crops are reciprocals of each other. That is, the opportunity cost of 1 tonne of food crops is 14 barrels of ethanol and the opportunity cost of 1 barrel of ethanol is 1/14 of a tonne of food crops.

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3. Does Brazil face an increasing opportunity cost of ethanol? What feature of Brazil's *PPF* illustrates increasing opportunity cost?

Brazil faces an increasing opportunity cost of ethanol production. For example, when increasing ethanol production from 0 barrels per day to 22 barrels the opportunity cost of a barrel of ethanol is 1/22 of a tonne of food crops. Increasing ethanol production by another 18 barrels per day (to a total of 40 barrels per day) has an opportunity cost of 1/18 of a tonne of food crops per barrel of ethanol. The *PPF*'s bowed-out shape reflects increasing opportunity cost.

Use the above table (for Problems 1 to 3) to work Problems 4 and 5.

4. Define marginal cost and calculate Brazil's marginal cost of producing a tonne of food when the quantity produced is 2.5 tonnes per day.

The marginal cost of a good is the opportunity cost of producing one more unit of the good. When the quantity of food produced is 2.5 tonnes, the marginal cost of a tonne of food is the opportunity cost of increasing the production of food from 2 tonnes per day to 3 tonnes per day. The production of ethanol falls from 54 barrels per day to 40 barrels per day, a decrease of 14 barrels per day. The opportunity cost of increasing food production is the decrease in ethanol production, so the opportunity cost of producing a tonne of food when 2.5 tonnes of food per day are produced is 14 barrels of ethanol per day.

5. Define marginal benefit. Explain how it is measured and why the data in the table does not enable you to calculate Brazil's marginal benefit from food.

The marginal benefit from a good is the benefit received from consuming one more unit of the good. The marginal benefit from a good or service is measured by the most people are willing to pay for one more unit of it. The data in the table do not provide information on how much people are willing to pay for an additional unit of food. The table has no information on the marginal benefit from food.

6. Distinguish between *production efficiency* and *allocative efficiency.* Explain why many production possibilities achieve production efficiency but only one achieves allocative efficiency.

Production efficiency occurs when goods and services are produced at the lowest possible cost. This definition means that production efficiency occurs at any point *on* the *PPF*. Therefore *all* of the production points on the *PPF* are production efficient. Allocative efficiency occurs when goods and services are produced at the lowest cost *and* in the quantities that provide the greatest possible benefit. The allocatively efficient production point is the *single* point on the *PPF* that has the greatest possible benefit.

7. A farm grows wheat and produces pork. The marginal cost of producing each of these products increases as more of it is produced.

a. Make a graph that illustrates the farm's *PPF*.

Measure the quantity of pork produced on the *x*-axis and measure the quantity of wheat produced on the *y*-axis. *Because* the marginal cost of both wheat and pork increase as more of the good is produced, the *PPF* has a bowed-out shape.

b. The farm adopts a new technology that allows it to use fewer resources to fatten pigs. Use your graph to illustrate the impact of the new technology on the farm's *PPF*.

The new technology rotates the *PPF* outward. If the farm puts all of its resources into pork production, it can produce more pork. But if the farm puts all of its resources into wheat production, it still produces the same quantity of wheat.

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c. With the farm using the new technology described in part (b), has the opportunity cost of producing a tonne of wheat increased, decreased, or remained the same? Explain and illustrate your answer.

With the new technology, the opportunity cost of producing pork decreases. To increase pork production, the production of wheat decreases by less than prior to the implementation of the new technology. The opportunity cost of producing wheat is the inverse of the opportunity cost of producing pork. So the opportunity cost of producing wheat increases.

d. Is the farm more efficient with the new technology than it was with the old one? Why?

The farm is able to produce more with the new technology than with the old, but it is not necessarily more efficient. If the farm was producing on its *PPF* before the new technology and after, the farm was production efficient both before the new technology and after.

8. In one hour, Sue can produce 40 caps or 4 jackets and Tessa can produce 80 caps or 4 jackets.

a. Calculate Sue's opportunity cost of producing a cap.

Sue forgoes 4 jackets to produce 40 caps, so Sue's opportunity cost of producing one cap is (4 jackets)/(40 caps) or 0.1 jackets per cap.

b. Calculate Tessa's opportunity cost of producing a cap.

Tessa forgoes 4 jackets to produce 80 caps, so Tessa's opportunity cost of producing one cap is (4 jackets)/(80 caps) or 0.05 jackets per cap.

c. Who has a comparative advantage in producing caps?

Tessa's opportunity cost of a cap is lower than Sue's opportunity cost, so Tessa has a comparative advantage in producing caps.

d. If Sue and Tessa specialize in producing the good in which each of them has a comparative advantage, and they trade 1 jacket for 15 caps, who gains from the specialization and trade?

Tessa specializes in caps and Sue specializes in jackets. Both Sue and Tessa gain from trade. Sue gains because she can obtain caps from Tessa at a cost of (1 jacket)/(15 caps), which is 0.067 jackets per cap, a cost that is lower than what it would cost her to produce caps herself. Tessa also gains from trade because she trades caps for jackets for 0.067 jackets per cap, which is higher than her cost of producing a cap.

9. Suppose that Tessa buys a new machine for making jackets that enables her to make 20 jackets an hour. (She can still make only 80 caps per hour.)

a. Who now has a comparative advantage in producing jackets?

Sue forgoes 40 caps to produce 4 jackets, so Sue's opportunity cost of producing one jacket is (40 caps)/(4 jackets) or 10 caps per jacket. Tessa forgoes 80 caps to produce 20 jackets, so Tessa's opportunity cost of producing one jacket is (80 caps)/(20 jackets) or 4 caps per jacket. Tessa has the comparative advantage in producing jackets because her opportunity cost of a jacket is lower than Sue's opportunity cost.

b. Can Sue and Tessa still gain from trade?

Tessa and Sue can still gain from trade because Tessa (now) has a comparative advantage in producing jackets and Sue (now) has a comparative advantage in producing caps. Tessa will produce jackets and Sue will produce caps.

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c. Would Sue and Tessa still be willing to trade 1 jacket for 15 caps? Explain your answer.

Sue and Tessa will not be willing to trade 1 jacket for 15 caps. In particular, Sue, whose comparative advantage lies in producing caps, can produce 1 jacket at an opportunity cost of only 10 caps. So Sue will be unwilling to pay any more than 10 caps per jacket.

10. For 50 years, Cuba has had a centrally planned economy in which the government makes the big decisions on how resources will be allocated.

a. Why would you expect Cuba's production possibilities (per person) to be smaller than those of the United States?

Cuba's economy is almost surely less efficient than the U.S. economy. The Cuban central planners do not know people's production possibilities or their preferences. Because firms in Cuba are owned by the government rather than individuals, no one in Cuba has the self-interested incentive to operate the firm efficiently and produce goods and services that consumers desire. Additionally Cuba does not actively trade so Cuba produces most of its consumption goods rather than buying them from nations with a comparative advantage. Because Cuba uses its resources to produce consumption goods, it cannot produce many capital goods so its economic growth rate has been low.

b. What are the social institutions that Cuba might lack that help the United States to achieve allocative efficiency?

Of the four social institutions, firms, money, markets, and property rights, Cuba's economy has firms and money. Markets, however, are less free of government intervention in Cuba. But the major difference is the property rights in the Cuban economy. In Cuba the government owns most of the firms; that is, the government has the property right to run the producers. Because the firms are not motivated to make a profit, the managers of these firms have little incentive to operate the firm efficiently or to produce the goods and services that consumers desire. In the United States, firms are owned by individuals; that is, people have the property right that allows them to run firms. These owners have the self-interested incentive to operate the firm efficiently and to produce the goods and services people want, an incentive sorely lacking in the Cuban economy.

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Answers to Additional Problems and Applications

Use the table to work Problems 11 and 12. Suppose that Yucatan's production possibilities are given in the table.

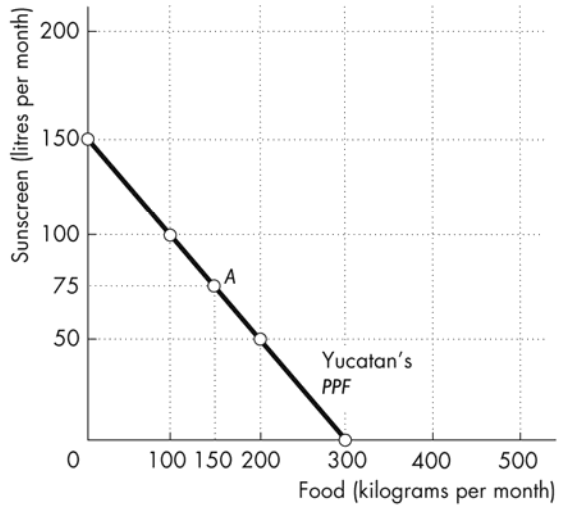
Food (kilograms per month)		Sunscreen (litres per month)
300	and	0
200	and	50
100	and	100
0	and	150

11. a. Draw a graph of Yucatan's *PPF* and explain how your graph illustrates a tradeoff.

Yucatan's *PPF* is illustrated in Figure 2.2. The figure illustrates a tradeoff because moving along Yucatan's *PPF* producing more of one good requires producing less of the other good. Yucatan trades off more production of one good for less production of the other.

FIGURE **2.2**

Problem 11



b. If Yucatan produces 150 kilograms of food per month, how much sunscreen must it produce if it achieves production efficiency?

If Yucatan produces 150 kilograms of food per month, then the point labelled *A* on the *PPF* in Figure 2.2 shows that Yucatan must produce 75 litres of sunscreen per month to achieve production efficiency.

c. What is Yucatan's opportunity cost of producing (i) 1 kilogram of food and (ii) 1 litre of sunscreen?

Yucatan's *PPF* is linear so the opportunity cost of producing 1 kilogram of food is the same at all quantities. Calculate the opportunity cost of producing 1 kilogram of food when increasing the production of food from 0 to 100 kilograms per month. The quantity of sunscreen produced falls from 150 litres per month to 100 litres per month, a decrease of 50 litres. The opportunity cost is 50 litres of sunscreen to gain 100 kilograms of food. The opportunity cost per kilogram of food equals (50 litres of sunscreen)/(100 kilograms of food), which is an opportunity cost of 0.5 litres of sunscreen per kilogram of food.

Similarly, the opportunity cost of producing 1 litre of sunscreen is the same at all quantities. Calculate the opportunity cost of producing 1 litre of sunscreen when increasing the production of sunscreen from 0 to 50 litres per month. The quantity of food produced falls from 300 kilograms per month to 200 kilograms per month, a decrease of 100 kilograms. The opportunity cost is 100 kilograms of food to gain 50 litres of sunscreen, or (100 kilograms of food)/(50 litres of sunscreen) which is an opportunity cost of 2.0 kilograms of food per litre of sunscreen.

d. What is the relationship between your answers to part (c)?

The answer to part (c) reflects the fact that opportunity cost is a ratio. The opportunity cost of gaining a unit of a good moving along the *PPF* equals the quantity of the other good or service forgone divided by the quantity of the good or service gained. The opportunity cost of one good, food, is equal to the inverse of the opportunity cost of the other good, sunscreen.

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12. What feature of a *PPF* illustrates increasing opportunity cost? Explain why Yucatan's opportunity cost does or does not increase.

If opportunity cost increases as more of a good is produced, the *PPF* bows outward. Yucatan's *PPF* is linear and along a linear *PPF* the opportunity cost is constant. Yucatan's opportunity cost of food remains constant, equal to 0.5 litres of sunscreen per kilogram of food. Yucatan's resources are equally productive in both activities.

13. In problem 11, what is the marginal cost of 1 kilogram of food in Yucatan when the quantity produced is 150 kilograms per day? What is special about the marginal cost of food in Yucatan?

The marginal cost of a kilogram of food in Yucatan is constant at all points along Yucatan's *PPF* and is equal to 0.5 litres of sunscreen per kilogram of food. The special point about Yucatan's marginal cost is the fact that the marginal cost is constant. This result reflects Yucatan's linear *PPF*.

14. The table describes the preferences in Yucatan.

Sunscreen (litres per month)	Willingness to pay (kilograms of food per litre)
25	3
75	2
125	1

a. What is the marginal benefit from sunscreen and how is it measured?

The marginal benefit from sunscreen is the benefit enjoyed by the person who consumes one more litre of sunscreen. It is equal to the willingness to pay for an additional litre.

b. What does Yucatan produce to achieve allocative efficiency?

When allocative efficiency is achieved, Yucatan is producing at the point on the *PPF* that is most preferred. At this point, the marginal benefit from sunscreen equals the marginal cost of sunscreen. The marginal cost of sunscreen is 2 kilograms of food per litre. The table shows that the marginal benefit from sunscreen is 2 kilograms of food per litre when the quantity produced is 75 litres of sunscreen per month.

Downtown Music Stores Squeezed out of Business

Music retailing is changing: Sony Music and Amazon are selling online, discount stores are selling at low prices, and downtown music retailers are all struggling.

Source: *The Economics*, January 20, 2007

15. a. Draw the *PPF* curves for downtown music retailers and online music retailers before and after the Internet became available.

Before the introduction of the Internet, a tradeoff existed between Main Street music retailing services and other goods and services. The *PPF* is bowed outward. With the introduction of the Internet, production of both Main Street music retailing services and other goods and services increases. The *PPF* shifts outward.

Before the introduction of the Internet, online music retailing did not exist. There was no tradeoff between online music retailing services and other goods and services. So for every quantity of other goods and services produced, there was no online music retailing services produced. The *PPF* is the *y*-axis. But with the introduction of the Internet, online music retailing became available. The *PPF* becomes a bowed-out shape, showing that a tradeoff exists between online music retailing services and other goods and services.

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b. Draw the marginal cost and marginal benefit curves for downtown music retailers and online music retailers before and after the Internet became available.

With the technology of the Internet, other goods and services become cheaper to produce, so more other goods and services must be given up to obtain a given quantity of Main Street music retailing services. So the expansion of the Internet increases the marginal cost of Main Street music retailing services. The marginal cost curve for Main Street music retailing services shifts leftward.

The expansion of the Internet results in the marginal cost of online music retailing services being less than the marginal cost of Main Street music retailing services prior to the introduction of the Internet. At every quantity of music retailing services, the marginal cost curve of online music retailing services is lower than the marginal cost curve of Main Street music retailing services.

The marginal benefit curve from Main Street music retailing services and from online music retailing is a downward-sloping curve.

c. Explain how changes in production possibilities, preferences or both have changed the way in which recorded music is retailed.

Easier access to the Internet has decreased the cost of downloading online music and the marginal cost of online music retailers has decreased. The marginal benefit from listening to music has not changed. The result is an increase in online music retailers and a decrease in Main Street music retailers.

Use the following news clip to work Problems 16 and 17.

Malaria Eradication Back on the Table

In response to the Gates Malaria Forum in October 2007, countries are debating the pros and cons of eradication. Dr. Arata Kochi of the World Health Organization believes that with enough money malaria cases could be cut by 90 percent, but it would be very expensive to eliminate the remaining 10 percent of cases, so countries should not strive to eradicate malaria.

Source: *The New York Times*, March 4, 2008

16. Is Dr. Kochi talking about *production efficiency* or *allocative efficiency* or both?

Dr. Kochi is talking about allocative efficiency. His assessment is that the last 10 percent eradication has such a high marginal cost that it almost surely exceeds its marginal benefit.

17. Make a graph with the percentage of malaria cases eliminated on the *x*-axis and the marginal cost and marginal benefit of driving down malaria cases on the *y*-axis. On your graph:

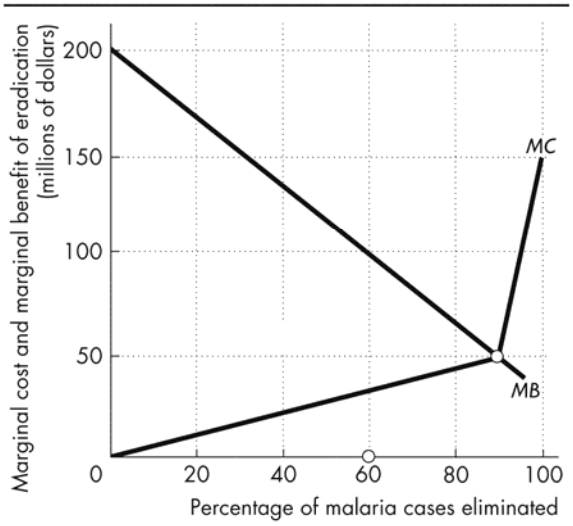
(i) Draw a marginal cost curve and marginal benefit curve that are consistent with Dr. Kochi's opinion.

(ii) Identify the quantity of malaria eradicated that achieves allocative efficiency.

Figure 2.3 shows a marginal cost curve and a marginal benefit curve that are

FIGURE **2.3**

Problem 17



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consistent with Dr. Kochi's views. Dr. Kochi believes that the last 10 percent of malaria would be very expensive to eradicate. The marginal cost curve in the figure reflects this view because the marginal cost curve rises rapidly after 90 percent of malaria is eradicated. The marginal benefit curve is downward sloping, reflecting diminishing marginal benefit from malaria eradication. The allocatively efficient quantity of malaria eradicated is 90 percent because that is the quantity for which the marginal benefit of eradication equals the marginal cost of eradication. This outcome demonstrates Dr. Kochi's conclusion that countries should not attempt to completely eradicate malaria.

18. Capital accumulation and technological change bring economic growth: Production that was unattainable yesterday becomes attainable today; production that is unattainable today will become attainable tomorrow. Why doesn't economic growth bring an end to scarcity one day?

People's wants are infinite—regardless of what a person already possesses, everyone can easily visualize something else he wants. Because people's wants are insatiable, scarcity will always exist regardless of economic growth.

Toyota Plans to Build a Better Company

Toyota will continue to produce 3 million cars per year and use the balance of its resources to upgrade its workers' skills and create new technology. In three years' time, Toyota plans to produce better cars and be more productive.

Source: *Financial Post*, April 7, 2014

19. a. What is the opportunity cost of Toyota upgrading its workers' skills and creating new technology?

When Toyota puts resources into workers' skills and creating new technology, there are fewer resources to produce cars today. The decrease in car production is the opportunity cost of Toyota upgrading workers' skills and creating new technology.

b. Sketch Toyota's *PPF* and mark its production point in 2014. Now show on your graph Toyota's *PPF* in 2018.

Measure new skills and new technology on the *y*-axis and cars on the *x*-axis. Toyota's *PPF* has a bowed-out shape, which shows increasing opportunity cost. In 2014, Toyota produces at the point on the *PPF* where production is 3 million cars a year. When workers' skills are upgraded and new technology is implemented, Toyota's *PPF* rotates outward. The *x*-axis intercept of the *PPF* increases. The *y*-axis intercept of the *PPF* does not change.

Use the following data to work Problems 19 and 20.

Kim can produce 40 pies or 400 cakes an hour. Liam can produce 100 pies or 200 cakes an hour.

20. a. Calculate Kim's opportunity cost of a pie and Liam's opportunity cost of a pie.

If Kim spends an hour baking pies, she gains 40 pies but forgoes 400 cakes. Kim's opportunity cost of 1 pie is (400 cakes)/(40 pies), or 10 cakes per pie. If Liam spends an hour baking pies, he gains 100 pies but forgoes 200 cakes. Liam's opportunity cost of 1 pie is (200 cakes)/(100 pies), or 2 cakes per pie.

b. If each spends 30 minutes of each hour producing pies and 30 minutes producing cakes, how many pies and cakes does each produce?

Kim produces 20 pies and 200 cakes. Liam produces 50 pies and 100 cakes. The total number produced is 70 pies and 300 cakes.

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c. Who has a comparative advantage in producing (i) pies and (ii) cakes?

Liam has the comparative advantage in producing pies because his opportunity cost of producing a pie is less than Kim's opportunity cost of producing a pie. Kim has the comparative advantage in producing cakes because her opportunity cost of producing a cake is less than Liam's opportunity cost of producing a cake.

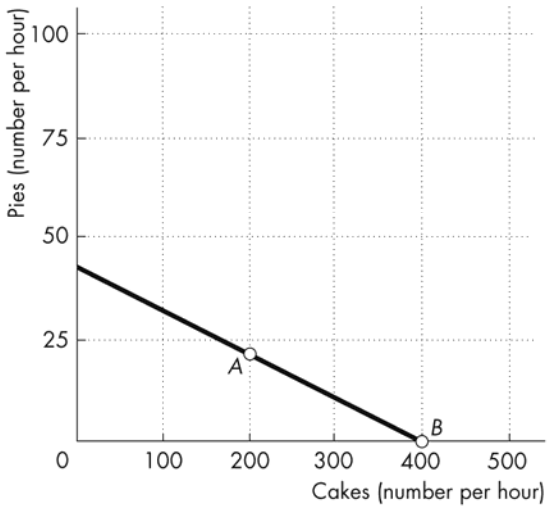
21. a. Draw a graph of Kim's *PPF* and Liam's *PPF* and show the point at which each produces when they spend 30 minutes of each hour producing pies and 30 minutes producing cakes.

Kim's *PPF* is illustrated in Figure 2.4; Liam's *PPF* is illustrated in Figure 2.5 (on the next page).

Point *A* in both figures shows their production points when each spends 30 minutes making cakes and 30 minutes making pies.

FIGURE **2.4**

Problem 21



b. On your graph, show what Kim produces and what Liam produces when they specialize.

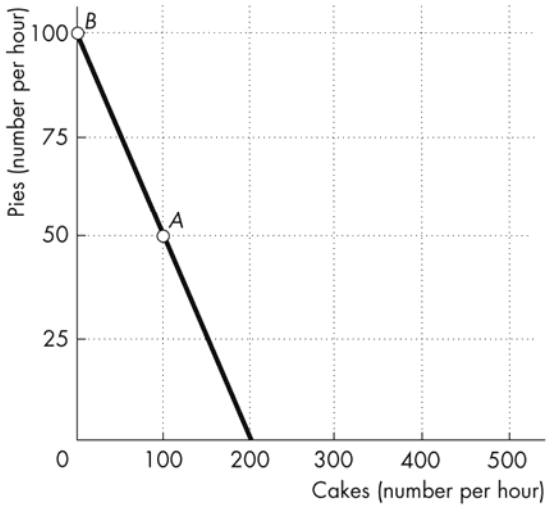
Kim will specialize in cakes and Liam will specialize in pies. Point *B* in both figures shows the production points when each specializes.

c. When they specialize and trade, what are the total gains from trade?

Kim will specialize in cakes and Liam will specialize in pies. If they specialize and trade, the total production of *both* cakes and pies increase. When each spends 30 minutes making cakes and 30 minutes making pies, together they produce 300 cakes and 70 pies. When they specialize, together they produce 400 cakes and 100 pies. The 100 increase in cakes and the 30 increase pies is the gains from trade.

FIGURE **2.5**

Problem 21



d. If Kim and Liam share the total gains equally, what trade takes place between them?

Kim will trade 50 cakes (half of the gain in cake production) to Liam in exchange for 15 pies (half of the increase in pie production).

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22. Tony and Patty produce skis and snowboards. The top table shows Tony's production possibilities and the bottom table shows Patty's production possibilities. Tony produces 5 snowboards and 40 skis a week; Patty produces 10 snowboards and 5 skis a week.

a. Who has a comparative advantage in producing (i) snowboards and (ii) skis?

The person with a comparative advantage in producing snowboards is the person who has the lower opportunity cost of producing a snowboard. Tony's production possibilities show that to produce 5 more snowboards he must produce 10 fewer skis. So Tony's opportunity cost of producing a snowboard is 2 skis.

Snowboards (per week)		Skis (per week)
25	and	0
20	and	10
15	and	20
10	and	30
5	and	40
0	and	50

Patty's production possibilities show that to produce 10 more snowboards, she must produce 5 fewer skis. So Patty's opportunity cost of producing a snowboard is ½ of a ski. Patty has a comparative advantage in producing snowboards because her opportunity cost of producing a snowboard is less than Tony's opportunity cost of producing a snowboard.

Snowboards (per week)		Skis (per week)
20	and	0
10	and	5
0	and	10

Tony has a comparative advantage in producing skis. For each ski produced, Tony must give up making 1/2 a snowboard, whereas for each ski that Patty produces, she must give up making 2 snowboards.

So Tony's opportunity cost of a producing ski is lower than Patty's opportunity cost of producing a ski.

b. If Tony and Patty specialize and trade 1 snowboard for 1 ski, what are the gains from trade?

Patty has a comparative advantage in producing snowboards, so she specializes in snowboards. Tony has a comparative advantage in producing skis, so he specializes in producing skis. Patty produces 20 snowboards and Tony produces 50 skis.

Before specializing, they produced 15 snowboards (Patty's 10 plus Tony's 5) and 45 skis (Tony's 40 plus Patty's 5). By specializing, they increase their total output by 5 snowboards and 5 skis. They can share this gain by trading 1 ski for 1 snowboard. Patty can obtain skis from Tony for less than it costs her to produce them. Tony can obtain snowboards from Patty for less than it costs him to produce them. Both Patty and Tony achieve gains from specialization and trade.

23. Indicate on a graph of the circular flows in the market economy, the real and money flows in which the following items belong:

a. You buy an iPad from the Apple Store.

Figure 2.6 shows the circular flows in a market economy. Your purchase of an iPad from Apple is the purchase of a good from a firm. This flow is in the black arrow indicated by point *a* in the figure. When you pay for the iPad, the money flow is in the grey arrow in the opposite direction to the black arrow labelled *a*.

b. Apple Inc. pays the designers of the iPad.

Apple's payment to the designers of the iPad is the payment of a wage to a factor of production. This flow is in the grey arrow shown by point *b* in the figure. The flow of design services from the designer to Apple is in the black arrow in the opposite direction to the grey arrow labelled *b*.

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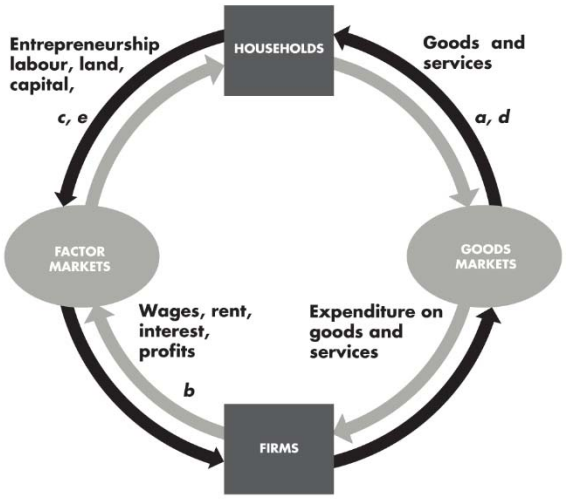
c. Apple Inc. decides to expand and rents an adjacent building.

Apple's decision to expand by renting a building means that Apple is increasing the capital it uses. This flow is in the black arrow indicated by point *c* in the figure. The flow of the payment for the rental services of the building is in the grey arrow in the opposite direction to the black arrow labelled *c*.

FIGURE **2.6**

Problem 23



d. You buy a new e-book from Amazon.

Your purchase of an e-book from Amazon is the purchase of a good from a firm. This flow is in the black arrow indicated by point *d* in the figure. When you pay for the e-book, the money flow is in the grey arrow in the opposite direction to the black arrow labelled *d*.

e. Apple Inc. hires a student as an intern during the summer.

Apple's decision to hire a student intern is Apple increasing the labour it uses. The flow of labour services is in the black arrow indicated by point *e* in the figure. The flow of the payment for the labour services is in the grey arrow in the opposite direction to the black arrow labelled *e*.

Economics in the News

24. After you have studied *Economics in the News* on pp. 46–47, answer the following questions.

a. How does the discovery of new oil and gas reserves change Canada's *PPF*?

If we measure oil and gas production on the *x*-axis of Canada's *PPF* and other goods and services on the *y*-axis of Canada's *PPF*, then with the discovery of new oil and gas reserves, Canada's *PPF* rotates outward. The *x*-axis intercept increases. At every quantity of other goods and services produced, Canada can produce more oil and gas.

b. How do technological advances in the production of other goods and services change Canada's *PPF*?

Measure oil and gas production on the x-axis of Canada's *PPF* and other goods and services on the y-axis of Canada's *PPF.* Then with technological advances in the production of other goods and services, Canada's *PPF* rotates outward. The *y*-axis intercept increases. At every quantity of oil and gas produced, Canada can produce more other goods and services.

c. How are Husky's discoveries changing Canada's opportunity cost of producing oil and gas?

With Husky's discoveries, fewer other goods and services must be given up to produce an additional barrel of oil or an additional barrel of gas. The opportunity cost of producing oil and gas decreases.

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d. When technological advances in the production of other goods and services occur, how does the opportunity cost of producing oil and gas change? Does it increase or decrease?

Technological discoveries in the production of other goods and services means that less production of oil and gas must be given up to produce more other goods and services. The opportunity cost of producing other goods and services decreases. The opportunity cost of producing oil and gas is the inverse of the opportunity cost of producing other goods and services. So the opportunity cost of producing oil and gas increases.

25. **Lots of Little Screens**

Inexpensive broadband access has created a generation of television producers for whom the Internet is their native medium. As they redirect the focus from TV to computers, cell phones, and iPods, the video market is developing into an open digital network.

Source: *The New York Times*, December 2, 2007

a. How has inexpensive broadband changed the production possibilities of video entertainment and other goods and services?

Inexpensive broadband has increased the production possibilities.

b. Sketch a *PPF* for video entertainment and other goods and services before broadband.

The *PPF* measures video entertainment on one axis and other goods and services on the other axis. The *PPF* is bowed outward.

c. Show how the arrival of inexpensive broadband has changed the *PPF*.

The arrival of inexpensive broadband rotates the *PPF*. The intersection of the new *PPF* along the axis measuring video entertainment increases and the intersection of the new *PPF* along the axis measuring other goods and services does not change.

d. Sketch a marginal benefit curve for video entertainment.

The marginal benefit curve is a downward-sloping curve. The marginal benefit from video entertainment is measured along the vertical axis and the quantity of video entertainment is measured along the horizontal axis.

e. Show how the new generation of TV producers for whom the Internet is their native medium might have changed the marginal benefit from video entertainment.

The marginal benefit increases because these new producers will be better able to take advantage of the Internet since it is their native medium. Because they will be able to create entertainment designed for the Internet, the marginal benefit from video entertainment increases. The marginal benefit curve shifts rightward.

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2 THE ECONOMIC PROBLEM

The Big Picture

Where we have been:

Chapter 1 introduced the economic reality that wants exceed the resources available to satisfy them—we face scarcity. Chapter 2 reinforces these central themes by laying out the core economic model, the Production Possibilities Frontier (*PPF*), and uses it to illustrate the concepts of tradeoff and opportunity cost. Chapter 2 further details the concepts of marginal cost and marginal benefit, presenting a first look at the concept of efficiency. It concludes with an explanation of the source of the gains from specialization and exchange and the roles of firms and markets in achieving those gains.

Where we are going:

The key concept of *opportunity cost* and the widespread tendency for the opportunity cost of a good to increase as the quantity produced of that good increases returns in Chapter 3 when we explain the supply curve and in Chapters 11 and 12 when we study a firm's costs and cost curves. Preferences return and are treated more rigorously when we explain marginal utility theory in Chapter 8 and indifference curves in Chapter 9. Efficiency returns in Chapter 5 when we study the efficiency of markets and first preview the impediments to efficiency. The gains from trade are explored more completely in the context of international trade in Chapter 7 in *Economics* and *Microeconomics* and Chapter 31 in *Macroeconomics.* Finally, the role of markets and prices in allocating resources and coordinating activity is an ongoing theme throughout most of the rest of the text. The next task, in Chapter 3, is to develop the central demand and supply model.

What's New to the Ninth Edition

Chapter 2 has been slightly rewritten. Parts of Joe and Liz's Smoothie Bar example are written more concisely without a loss or change in content. There are two new *Economics in the News* pieces, one on energy production and one on cocoa production.

We have renamed the *Reading Between the Lines* as *Economics in the News.* In this chapter, it discusses expanding Canada's production possibilities. The end of chapter material now includes a new section called Worked Problem. This problem includes questions, solutions, and a key figure. The Worked Problem is available in the Study Plan and the key figure is available as an interactive animation. The Study Plan Problems and Applications have been reduced to one page, but all the questions deleted from the printed book are available in the MyEconLab Study Plan as Extra Problems. Additional problems and Applications remain at two pages. In this chapter the Worked Problem gives data for a production possibilities frontier and then asks a variety of questions. The first question asks the students if a combination of products is attainable and the second question asks if another combination is efficient. The answers point out how the available resources limit production. The next question asks if a combination of products has a tradeoff and the last question asks the opportunity of increasing the production of a product. The answers point out the relationship among production efficiency, tradeoff, and opportunity cost

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Lecture Notes

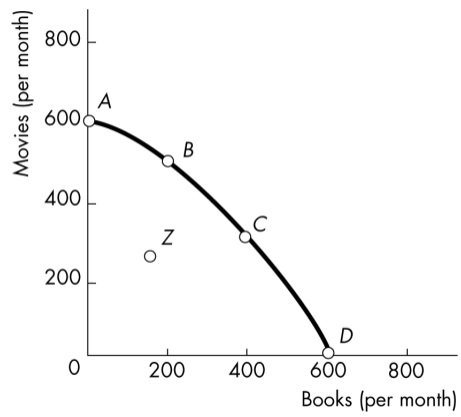
The Economic Problem

- Scarcity creates the need to make choices.
- Economic choices can be evaluated in terms of their efficiency.
- We can expand possible choices through capital accumulation and specialization and trade.

I. Production Possibilities Frontier and Opportunity Cost

- The **production possibilities frontier** (***PPF***) is the boundary between those combinations of goods and services that can be produced and those that cannot.
- Consider the production choices for two goods: books and movies. The table with the data for the *PPF* is below and a figure showing the *PPF* is to the right.

	Books	Movies
A	0	600
B	200	500
C	400	300
D	600	0



- Production points beyond the *PPF are* not attainable; production points on and within the *PPF* are attainable, but production points within the *PPF,* such as point *Z,* are inefficient.
- The *PPF* illustrates how scarcity creates the need to make choices. Producing more books (moving from point *A* to point *B*) means producing fewer movies, and producing more movies (moving from point *C* to point B) means producing fewer books.

Using the *PPF* above, make a point outside the *PPF* and ask the students about it. Once they state it is not possible, ask them how we could get there. After they highlight a few shifters, summarize for them that the resources and technology we held constant when we drew the PPF now relocate it when they change.

Now give them an example of a new movie camera invention and ask them if this will help us get more books? You will likely get an immediate round of "NO." Reply, "Are you sure?" and you should be able to find a student who sees that the new resource frees up other resources that can now be used for more books. Show them graphically a shift that is pinned at the book axis and it will open their eyes to how technology and resource growth in any sector can make more of all goods!

Production Efficiency

Production is efficient only on the frontier.

- We achieve **production efficiency** if we cannot produce more of one good without producing less of some other good.
- Inside the frontier (point *Z*), production is inefficient. Resources could be better employed to increase production of both books and movies.

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Tradeoff Along the *PPF*

- Moving along the *PPF,* there is always a tradeoff involved in diverting resources from the production of one thing to another. We gain one thing but at the opportunity cost of losing something else.

The key here is to make sure the student understands that given scarcity, because we produce one thing, we cannot produce something else. Some students will see the tradeoff immediately as a cost (giving up something), but they will incorrectly interpret that cost as only that valued in money units. To eliminate this ambiguity (better now than later), ask them to think about a meal they purchased recently. Now ask them what the money cost was as well as what else they might have picked for a meal? Most students pick up on this concept quickly with one or two more examples. And since this is a consumption example, tell them to put themselves in the place of an office manager, who must produce a service but can do so only given tradeoffs. While money costs are measurable and useful, propose to the students that opportunity costs are indeed even more useful in identifying the tradeoffs made in production.

The money cost of something does not represent its true cost, although it is a convenient way to *measure* costs. The true cost of spending $50 on lottery tickets is forgoing other things that you could have bought instead. You know you are an economist when someone asks you, "What was the cost of those lottery tickets you bought?" and you reply, "Those lottery tickets cost me the opportunity to see my favorite band in concert."

Opportunity Cost

- The **opportunity cost** of an action is the highest valued alternative forgone.
- Efficiency means that the opportunity cost of producing more books or movies is the tradeoff along the frontier.

Increasing Opportunity Costs

- The "bowed-out" shape of the *PPF* reflects the principle of increasing opportunity cost.
- Not all resources are the same, which is why the *PPF* bows out. Publishers are better at producing books and Hollywood studios are better at producing movies. Moving along the frontier and producing more movies inevitably means that more and more publishers must produce movies. As this happens, the increase in movies becomes smaller and the decrease in books becomes larger.
- Emphasize the intercepts where the *PPF* crosses the axes. Take the vertical intercept in the figure. At this point all resources are used to produce movies. Basically to get to that point the economy has crammed and slammed every resource into movie production. Now when the economy moves down the *PPF* to produce the first book, that book is really inexpensive—has very low opportunity cost—because the economy uses resources better suited for book production first rather than movies.
- As more and more resources are diverted from production of one good to another, the smaller the additional increase in the production of the one good will be and the larger the decrease in the production of the other good will be.

You can bring in the relationship of slope and opportunity cost here if you want. OPTION 1: A soft way to bring in slope is to offer it as a double check on calculating marginal cost: "The opportunity cost of whatever is being measured on the horizontal axis is equal to the magnitude of the slope of the *PPF*" OPTION 2: You can also introduce the slope of a curve is the slope of a tangent line to the curve.

The bowed-out shape is a key feature of typical *PPFs,* often overlooked by the student (and too often not accentuated by the instructor). The key here is to link the ever increasing opportunity cost exhibited by the shape of a bowed out *PPF* with that of the marginal cost curve, which is upward sloping.

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To make the *PPF* model useful, it was necessary to simplify. By considering the case where production of all goods other than two remain fixed, we can use a relatively simple picture to see how concepts apply to the real world. With three goods, we would have a 3-D frontier surface. With more than 3 goods, it would be impossible to represent the frontier using a graph. The cool thing is that all relevant results of the 2-D model are true in the N-good model.

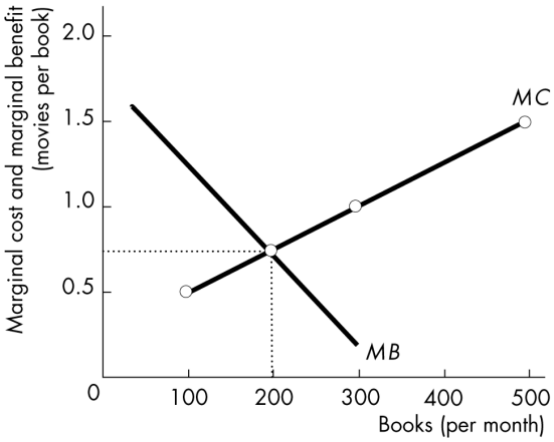
II. Using Resources Efficiently

Which point on the *PPF* best serves the public interest? To answer this question, we must measure and compare costs and benefits of different points.

The *PPF* and Marginal Cost

- **Marginal cost** is the opportunity cost of producing one more unit of a good.
- As more books are produced, the marginal cost of a book increases. The table shows the marginal cost of producing books from the *PPF* data presented before and the figure shows the upward sloping marginal cost curve.

	Books	Marginal cost of a book (movies per book)
A	0	
		0.5
B	200	
		1.0
C	400	
		1.5
D	600	



Preferences and Marginal Benefit

- **Preferences** are a description of a person's likes and dislikes.
- The **marginal benefit** of a good or services is the benefit received from consuming one more unit of it.
- The *principle of decreasing marginal benefits* is why the **marginal benefit curve** in the figure above slopes downwards.

You might have some students that have had a microeconomics course in their past, and have already been introduced to the concept of marginal cost and marginal benefit. And, they might inquire if the marginal benefit curve is linked to the Law of Diminishing Marginal Utility. While this might be adequate discussion for an advanced undergraduate course, and certainly a graduate micro seminar, pass it up in your principles course. Let the student know that the goal is to employ demand side concepts, in a marginal sense. As such, key in on the fact that the marginal benefit curve can be characterized as a willingness to pay curve.

Keep the discussion of marginal cost and marginal benefit separate and distinct. Make sure that the student realizes these are in essence the foundation of market forces (supply and demand, respectively). While the *PPF* can tell us the opportunity costs in production, and the tradeoffs therein, it is the market that allows us to determine the allocatively efficient point. Allocative efficiency only occurs with a balance between benefits and costs, *at the margin.*

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Efficient Use of Resources

Allocative efficiency occurs only when marginal benefit equal marginal cost.

- In the figure, when 100 books per month are produced, the marginal benefit from another book exceeds its marginal cost, which means that people prefer another book more than the movies they must give up.
- When the allocatively efficient number of books, 200 per month, is produced, the *PPF* in the previous figure shows that the allocatively efficient number of movies is 500 movies per month.
- When marginal cost equals marginal benefit it is impossible to make people better off by reallocating resources.

III. Economic Growth

Economic growth expands production possibilities and shifts the *PPF* outward.

- **Technological change** (the development of new goods and of better ways of producing goods and services) and **capital accumulation** (the growth of capital resources, which includes human capital) lead to economic growth.

You can have some fun and generate some discussion by getting the students to think about what life might be like after another 200 years of economic growth. Provide some numbers: In 2008, income per person in the United States was about $100 a day. In 1808 it was about 70¢ a day, and if the past growth rate prevails for another 200 years, in 2208 it will be $14,000 a day. Emphasize the magic of compound growth. If they think that $14,000 a day is a big income, get them to do a ballpark estimate of the daily income of Bill Gates (about $10 *million*!). Encourage a discussion of why scarcity is still present even at these large incomes.

The Cost of Economic Growth

- Economic growth requires that resources must be devoted to developing technology or accumulating capital, which means that current consumption decreases. The decrease in current consumption is the opportunity cost of economic growth.

A Nation's Economic Growth

- A nation that devotes a higher share of resources to developing technology or accumulating capital is more likely to grow faster.
- Some nations, such as Hong Kong, have chosen faster capital accumulation at the expense of current consumption and so have experienced faster economic growth.

Running through the above example can really help students catch on to how economic growth is linked to choices (less consumption now for more later). You may wish to demonstrate more consumption or more capital biased shifts of the *PPF*, to demonstrate changes in opportunity costs.

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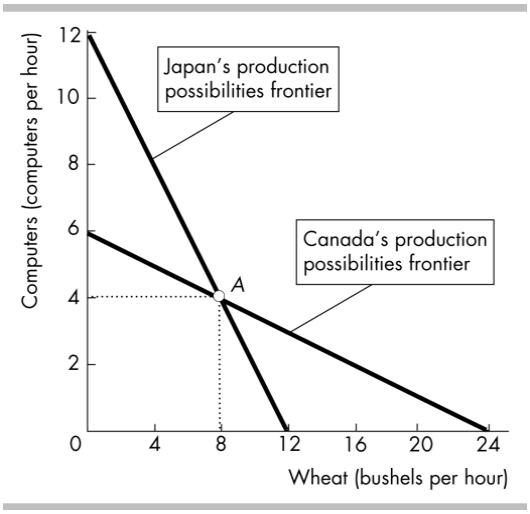
IV. Gains from Trade

Specialization and trade expand consumption possibilities

Comparative Advantage

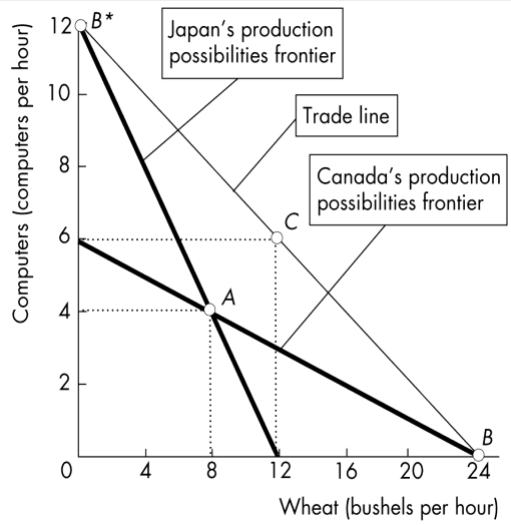
- A person has a **comparative advantage** in an activity
  if that person can perform the activity at a lower opportunity cost than anyone else.
- The *PPF* shows opportunity cost. In the figure the opportunity cost of a bushel of wheat in Canada is 1/4 of a computer and in Japan it is 1 computer. In Canada the opportunity cost of a computer is 4 bushels of wheat and in Japan it is 1 bushel of wheat. Canada has a comparative advantage in producing wheat and Japan has a comparative advantage in producing computers.
- A person has an **absolute advantage** if that person is more productive than others. A person (or country) can have an absolute advantage in all activities but that person (or country) will *not* have a comparative advantage in all activities.



An easy way for students to remember the difference between comparative and absolute advantages is that with comparative advantage, the opportunity costs comparison matters. If one has a comparative advantage in producing something, they should specialize in production of that good or service. An absolute advantage can be characterized by being able to "absolutely out-produce" the other economic agent. Even though a country might have absolute advantages, it should not produce everything, and should focus on identifying its comparative advantages.

Achieving the Gains from Trade

- When countries specialize by producing the good in which each has a comparative advantage more goods in total can be produced. If Canada and Japan *each* produce at point *A,* a total of 8 computers and 6 bushels of wheat are produced. If they specialize according to comparative advantage, Japan produces at point *B** and Canada produces at point *B* for a combined total of 12 computers and 24 bushels of wheat.
- Specialization and free trade allows each nation's consumption to be beyond its *PPF.* Canada can trade wheat for computers and Japan can trade computers for wheat and because more computers and more wheat are produced, both nations can consume more than they can produce on their own. For example, suppose that the market price of wheat is ½ computer per 1 bushel of wheat. As illustrated, each country can now be consuming at point *C* along the trade line. Note that each country's consumption point lies *beyond* its own *PPF.*



- The gains from trade can now be easily seen in terms of Japan and Canada each gaining 2 computers and 4 bushels of wheat compared to their initial, no-trade consumption points.

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Exchange is not a zero-sum game. If it is voluntary, both parties will believe they are better off, by definition (or else they would never agree to the trade in the first place). Imagine what would happen to your consumption if you couldn't trade and had to be self-sufficient.

V. Economic Coordination

Firms and Markets

- A **firm** is an economic unit that hires factors of production and organizes those factors to produce and sell goods and services.
- A **market** is any arrangement that enables buyers and sellers to get information and to do business with each other.

Property Rights and Money

- The social arrangements that govern the ownership, use, and disposal of resources, goods, and services are called **property rights.** Types of property include real (buildings and land), financial (stocks and bonds) and intellectual (ideas and technology).
- **Money** is anything generally accepted as a means of payment. Money's main purpose is to facilitate trade.

Students are usually fixated on money, but ask them to dig deeper. It is what we can do or buy with money that brings us happiness not the actual bills themselves.

Circular Flows through Markets

- Firms and households interact in markets and it is this interaction that determines what will be produced, how it will be produced, and who will get it.

Coordinating Decisions

- Prices within markets coordinate firms' and households' decisions.

Everyone knows what prices are. But not everyone knows why prices rise or fall. The point is that no one needs to know *why* a price has changed when making the choice to buy or sell. All that someone needs to know is what the price is relative to what he or she believes the item to be worth.

- Enforced property rights ensure that exchange is voluntary (not theft). Property rights and prices help insure that production takes place efficiently without waste because the owner of a firm has the property right to any profit the firm can earn.

Willingness to pay affects production and production affects willingness to pay. It would appear that we have the classic "which came first, the chicken or the egg" conundrum. However, in the next chapter, we will discuss the most powerful model in economics, Demand and Supply, which allows us to think clearly about the behavior of markets.

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Additional Discussion Questions

1. ***Using the PPF model to analyze an "Arms Race" between nations.*** You might like to get the students to realize how useful even a simple economic model (such as the *PPF* model) is for helping us understand and interpret important political events in history. Draw a *PPF* for *military* goods and *civilian* goods production (or, simply, the traditional example of "guns versus butter"). Then draw another *PPF* for a country that is about twice the size of the first, but with the same degree of concavity as the *PPF* for the first country. Now assume that each country considers the other as a mortal "enemy," and that they engage in a costly "arms race." Each country picks a point on the *PPF* that produces an equal level of military output (in absolute terms).

   What would happen if the larger country decided to increase military production? Emphasize that while the distance on the military output axis at the point of production is *equal* for both countries, the resulting distance on the civilian output axis is (by definition) a smaller quantity for the smaller country. The large country can create significant economic and political pressures on the government of the small country by forcing the small country to *match* the increase in military production. The *PPF* reveals how much more additional civilian output is forgone by the citizens of the small economy relative to the citizens of the larger economy. Emphasize also that the *opportunity cost* of civilian goods is higher for the smaller country.

   What were the economic repercussions of the Cold War? History and political science majors quickly perceive that these two *PPF* models reflect the Cold War relationship between the West and the U.S.S.R. during the early 1980s. The Reagan administration increased U.S. military expenditures during the early 1980s to a post–Viet Nam War peak of 6.6 percent of GDP (as compared to about 3.5 percent of GDP in the late 1990s). Many experts agree that this strategy contributed to the many political and economic pressures that ultimately lead to the dissolution of the U.S.S.R.

   "What are the implications for the next 50 years?" China is currently the world's third largest economy. It becomes the second in a few years and the biggest by mid-century. How does this development influence the strategic balance and the position of the United States?

2. ***Using the PPF model to analyze global environmental agreements between nations.*** This application of the *PPF* is a less "hawkish" and perhaps a more "green" perspective on a timely international policy issue. Compare a rich economy *PPF* to a poor economy *PPF*, each with the same degree of concavity. (Production levels are now measured as output per person.) The goods are now "cleaner air" and "other goods and services."

   What if the citizens of each country were required to make equal reductions in per-person greenhouse gas emissions? Show an equal quantity increase in per person output on the clean air axis for both countries' *PPF* curves. Show how the opportunity cost of requiring additional pollution reduction (cleaner air) of equal amounts per person is much greater for the citizens of a poorer country than for the citizens of the richer country. This fact has been used to persuade developed countries (like the United States) to accept larger pollution reduction targets than developing countries (like China, India, and African nations).

3 ***Why do some of the brightest students not get a 4.0 GPA?*** The answer—because it doesn't achieve allocative efficiency—can now be approached. The first conceptual step is to derive the marginal cost curve from the *PPF*. The following table provides eight points on the *MC* curve. Tell the students that this table is from a *PPF* between hours spent at recreation and GPA. Use this opportunity to explain why we plot marginal values at the midpoints of changes because the marginal cost at the midpoint approximately equals the average of the opportunity costs across the interval.

Recreation (hours per Day)	Marginal cost (GPA points per hour)
0.5	0.1
1.5	0.2
2.5	0.3
3.5	0.4
4.5	0.5
5.5	0.6
6.5	0.7
7.5	0.8

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The students must now think about *preferences* for recreation and study. You'll be surprised how many students want to derive preferences from the *PPF!* Explain that the *PPF* provides the constraint—what is feasible—and preferences provide the objective—what is desirable in the opinion of the chooser.

Each additional hour of recreation likely yields a smaller marginal benefit to the student. Translate this to the proposition that the student's willingness to give up GPA points for additional hours of recreation decreases and provide a table similar to that in Figure 2.3 that captures this observation. The table has a preference schedule. Stress once again that this table did *not* come from the *PPF*.

Recreation (hours per day)	Willingness to pay (GPA points per hour)
0.5	0.7
1.5	0.6
2.5	0.5
3.5	0.4
4.5	0.3
5.5	0.2
6.5	0.1
7.5	0

To determine the efficient amount of recreation and hence study time, the student must ask "Do I study a little bit longer?" That is the question. Walk the student through the though experiment:

1. If I study for 8 hours a day I get a 4.0, but I am willing to pay much more than I will pay if a take a bit of time off studying and have some fun. So I will be better off if study less and take more recreation time.
2. If I don't study at all I get a 0.4, and I am paying much more in lost GPA than I am willing to pay for the last bit of fun. So I will be better off if I study more and take less recreation time.
3. The only allocation at which I can't become better off by studying a little bit more or a little bit less is where I am just willing to pay what the last bit of recreation costs—where marginal cost equals marginal benefit.

In this example, the student studies for 4.5 hours and takes 3.5 hours a week of recreation time. Explain that there is nothing strange or wrong with the fact that the student gets no net benefit from the last seconds-worth of recreation time. He or she is just willing to pay what it costs him or her.

4. ***Gains from Trade*** The gain from trade is a real eye-opener for students. Their first reaction is one of skepticism. Convincing students of the power of trade to raise living standards and the costs of trade restriction is one of the most productive things we will ever do. Here are some questions to drive home the idea of comparative advantage.

Why didn't Billy Sunday do his own typing? Billy Sunday, an evangelist in the 1930s, was reputed to be the world's fastest typist. Nonetheless, he employed a secretary who was a slower typist than he. Why? Because in one hour of preaching, Billy could raise several times the revenue that he could raise by typing for an hour. So Billy plays to his comparative advantage.

Why doesn't Martha Stewart bake her own bread? Martha Stewart is probably a better cook than most people, but she is an even better writer and TV performer on the subject of food. So Martha plays to her comparative advantage and writes about baking bread but buys her bread.

Why doesn't Vinnie Jones play soccer? Vinnie Jones was one of the world's best soccer players. But he stopped playing soccer and started making movies some years ago. Why? Because, as he once said, "You go to the bank more often when you're in movies." Vinnie's comparative advantage turned out to be in acting.

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ECONOMICS

CANADA IN THE GLOBAL ENVIRONMENT NINTH EDITION

PARKIN BADE

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2 THE ECONOMIC PROBLEM

Interactive Figures and Tables

Click on button to go to figure

Figure 2.1	Production Possibilities Frontier
Figure 2.1 with table	Production Possibilities Frontier
Figure 2.2(a)	The *PPF* and Marginal Cost: *PPF* and Opportunity Cost
Figure 2.2(b)	The *PPF* and Marginal Cost: Marginal Cost
Figure 2.3	Preferences and Marginal Benefit Curve
Figure 2.3 with table	Preferences and Marginal Benefit Curve
Figure 2.4	Efficient Use of Resources

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Figure 2.5	Economic Growth
Figure 2.6	The Production Possibilities Frontiers
Figure 2.7	The Gains from Trade
Figure 2.8	Circular Flows in the Market Economy
Table 2.1	Joe's Production Possibilities
Table 2.2	Liz's Production Possibilities
Table 2.3	Liz and Joe Gain from Trade

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Economics in the News	*PPF* for Cocoa and Other Goods and Services
Economics in Action	Economic Growth in Canada and Hong Kong
Economics in the News Figure 1	Oil and Gas Production Possibilities Expand
Economics in the News Figure 2	Production, Exports, and Consumption of Oil and Gas in 2013
Worked Problem	The Production Possibilities Frontier

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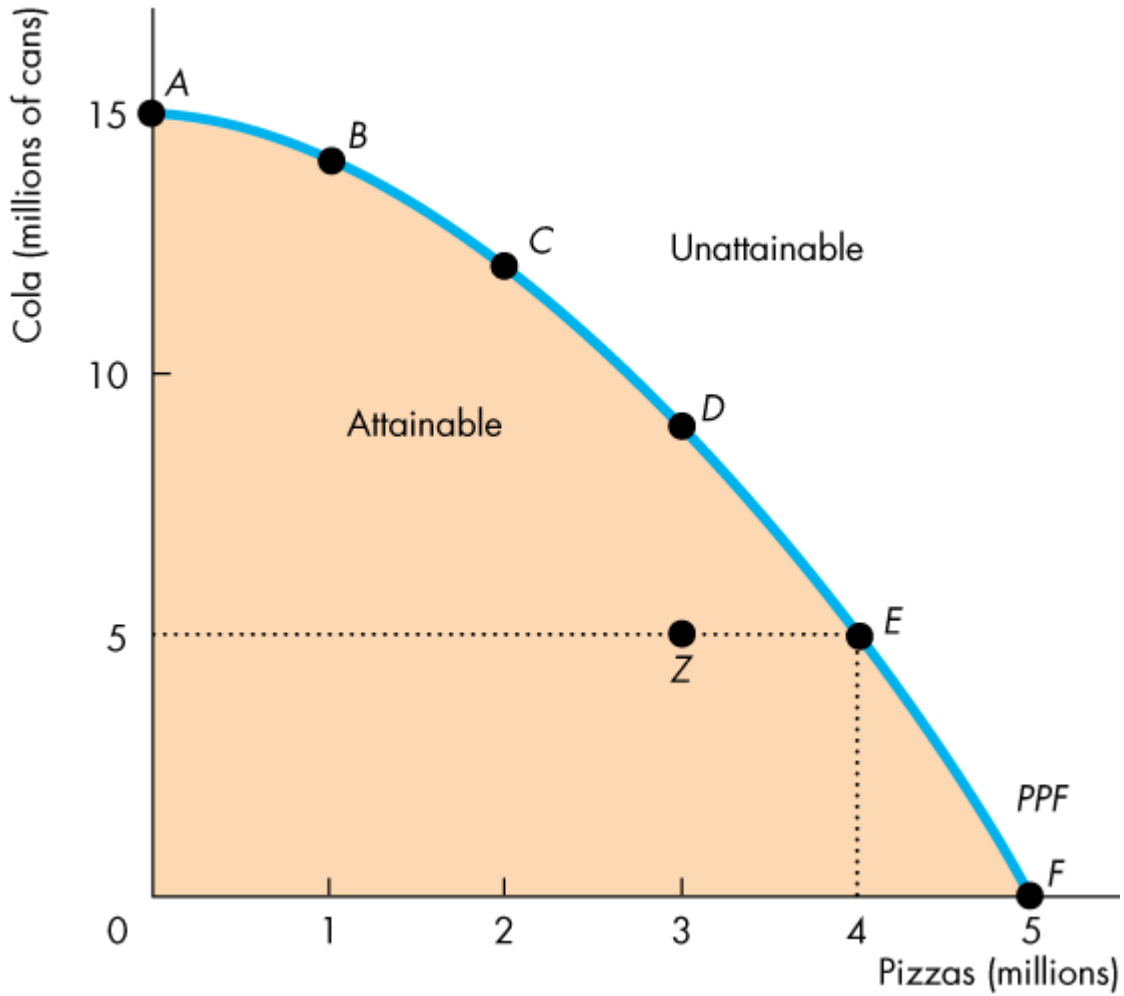

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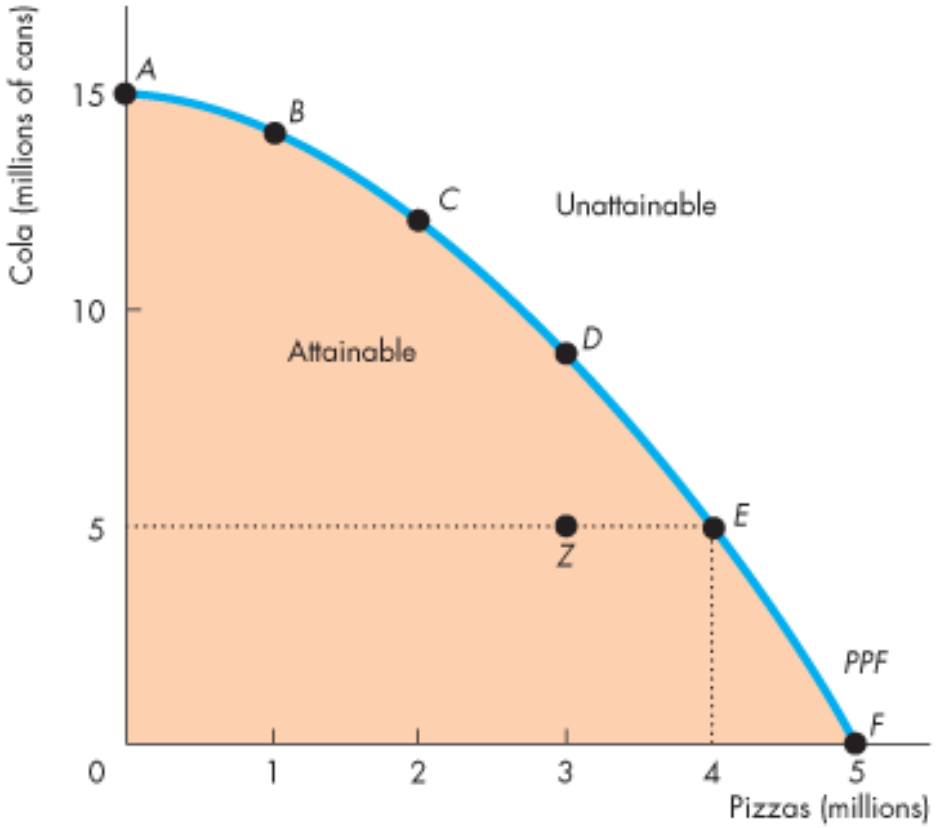
Possibility	Pizzas (millions)		Cola (millions of cans)
A	0	and	15
B	1	and	14
C	2	and	12
D	3	and	9
E	4	and	5
F	5	and	0



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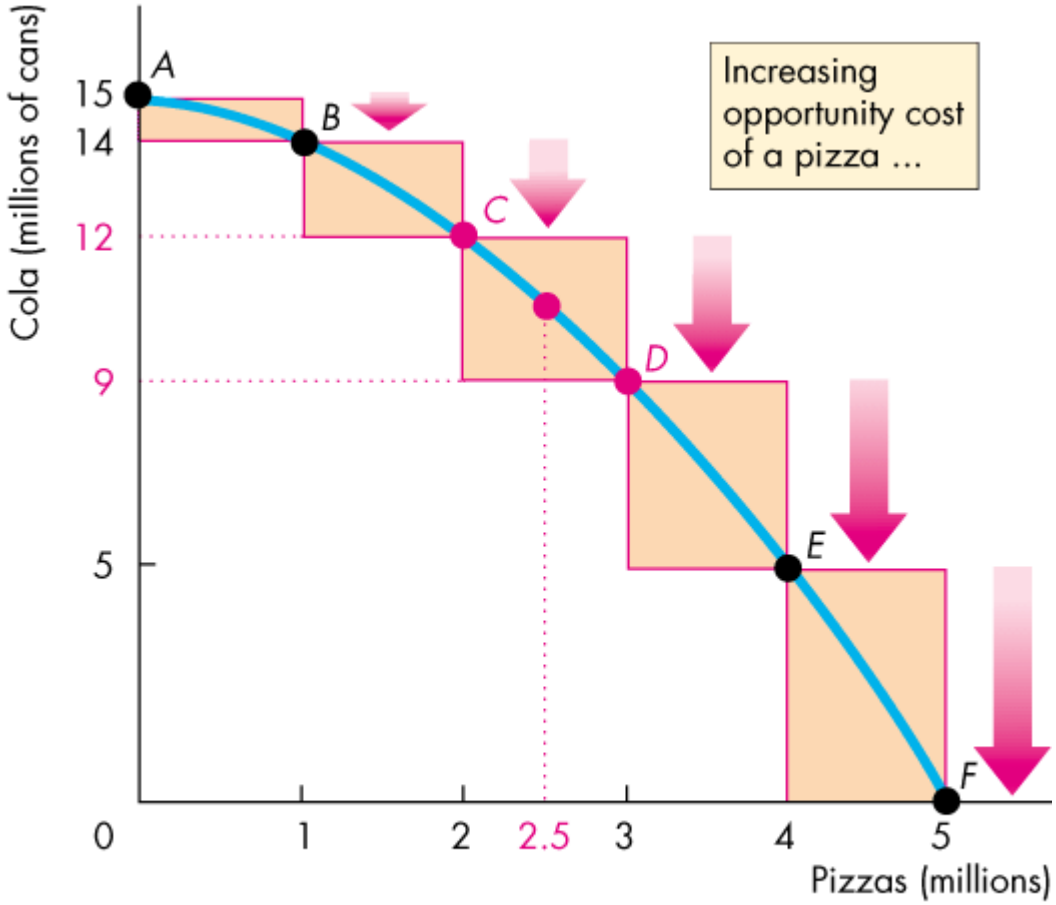

(a) *PPF* and opportunity cost

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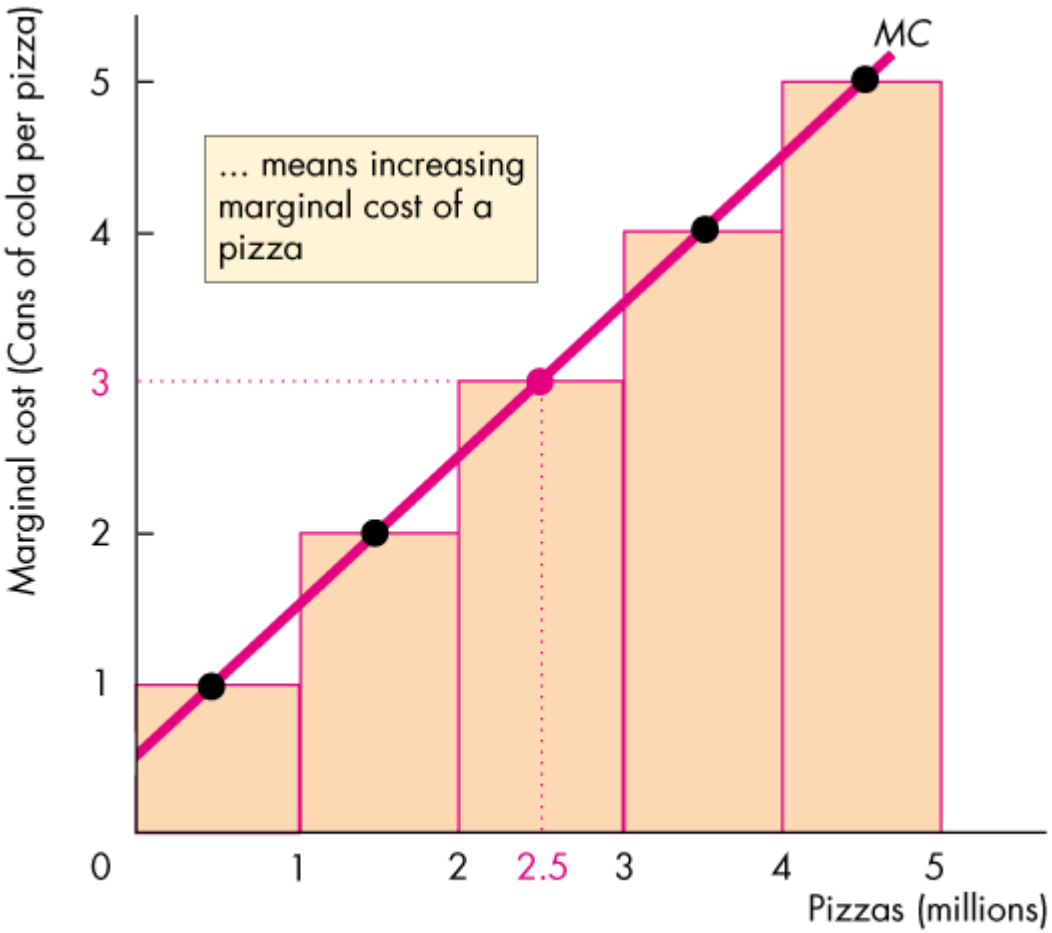

(b) Marginal cost

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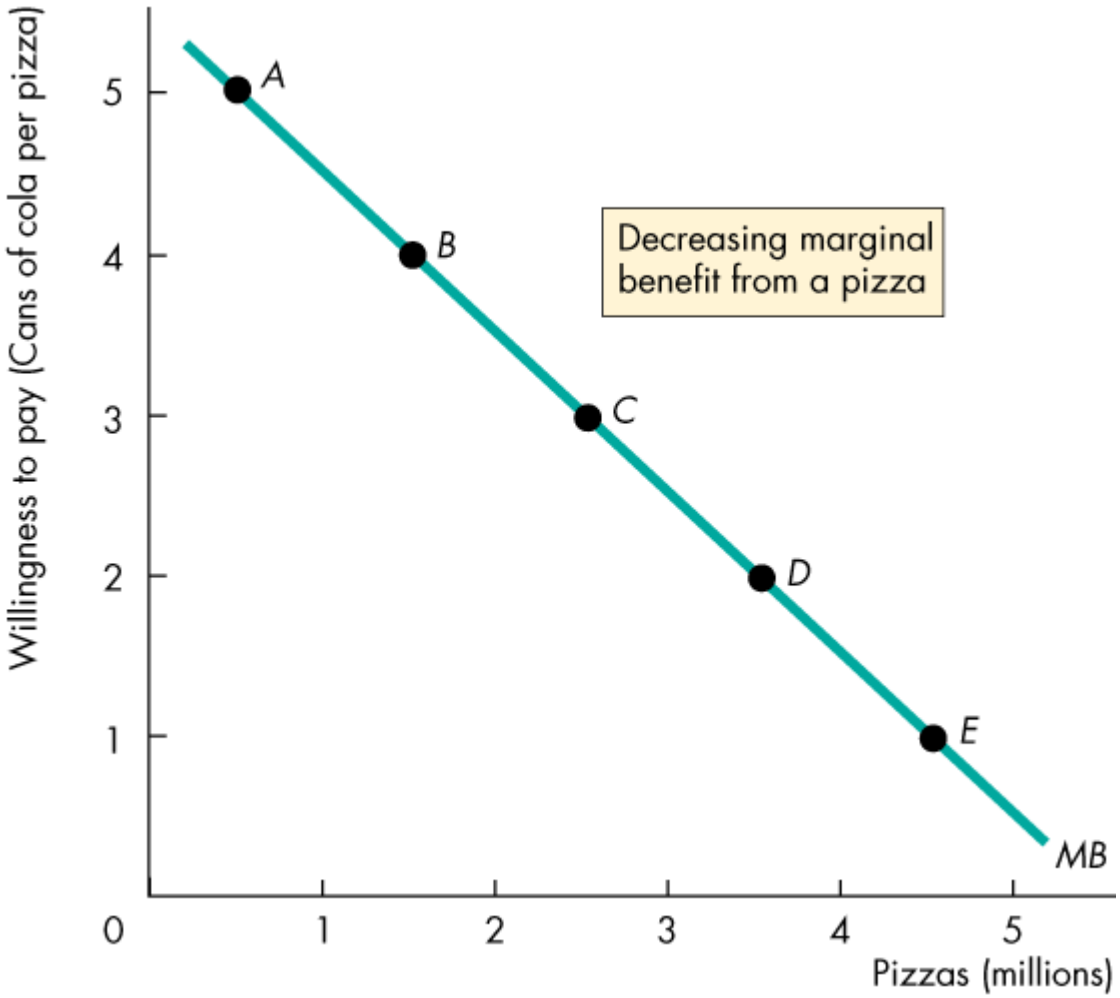

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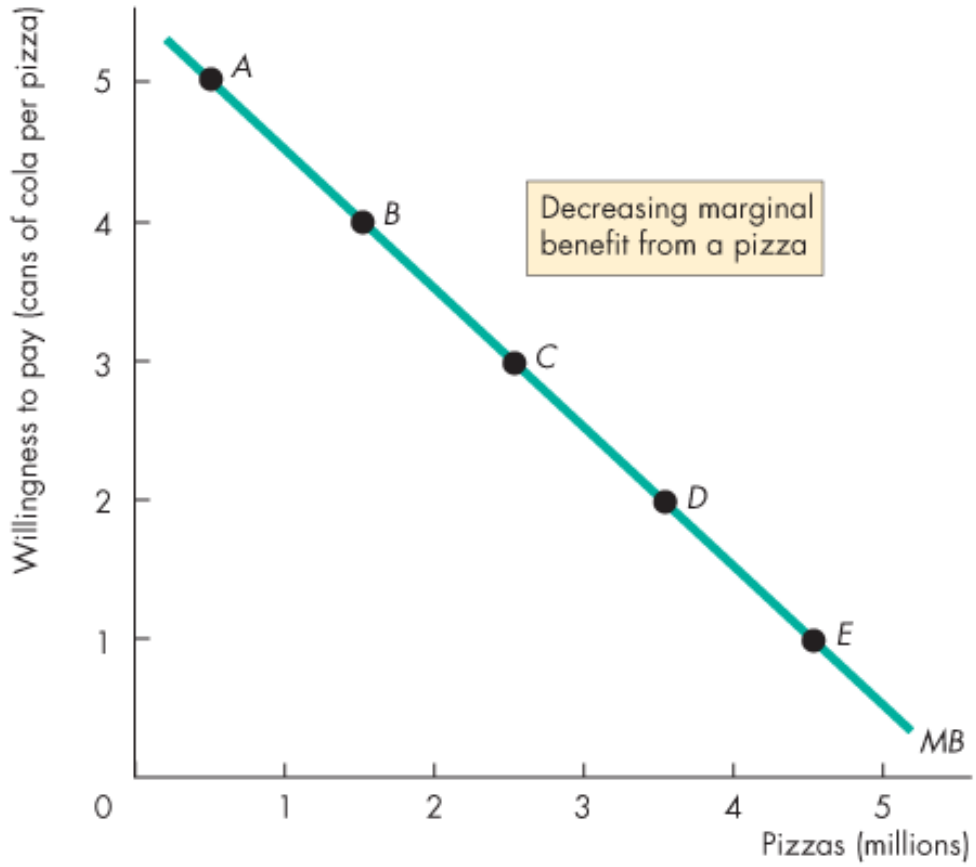
Possibility	Pizzas (millions)	Willingness to pay (cans of cola per pizza)
A	0.5	5
B	1.5	4
C	2.5	3
D	3.5	2
E	4.5	1



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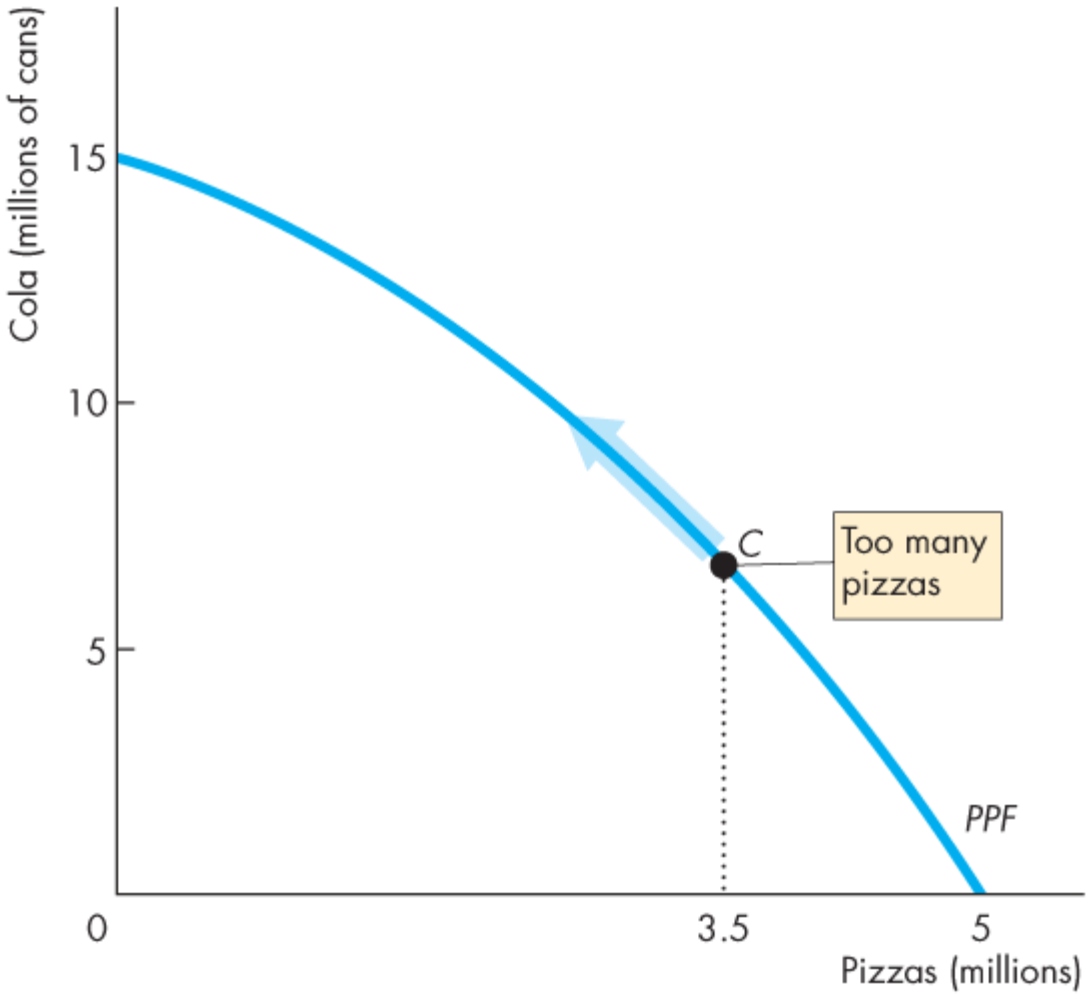

(a) On the *PPF*

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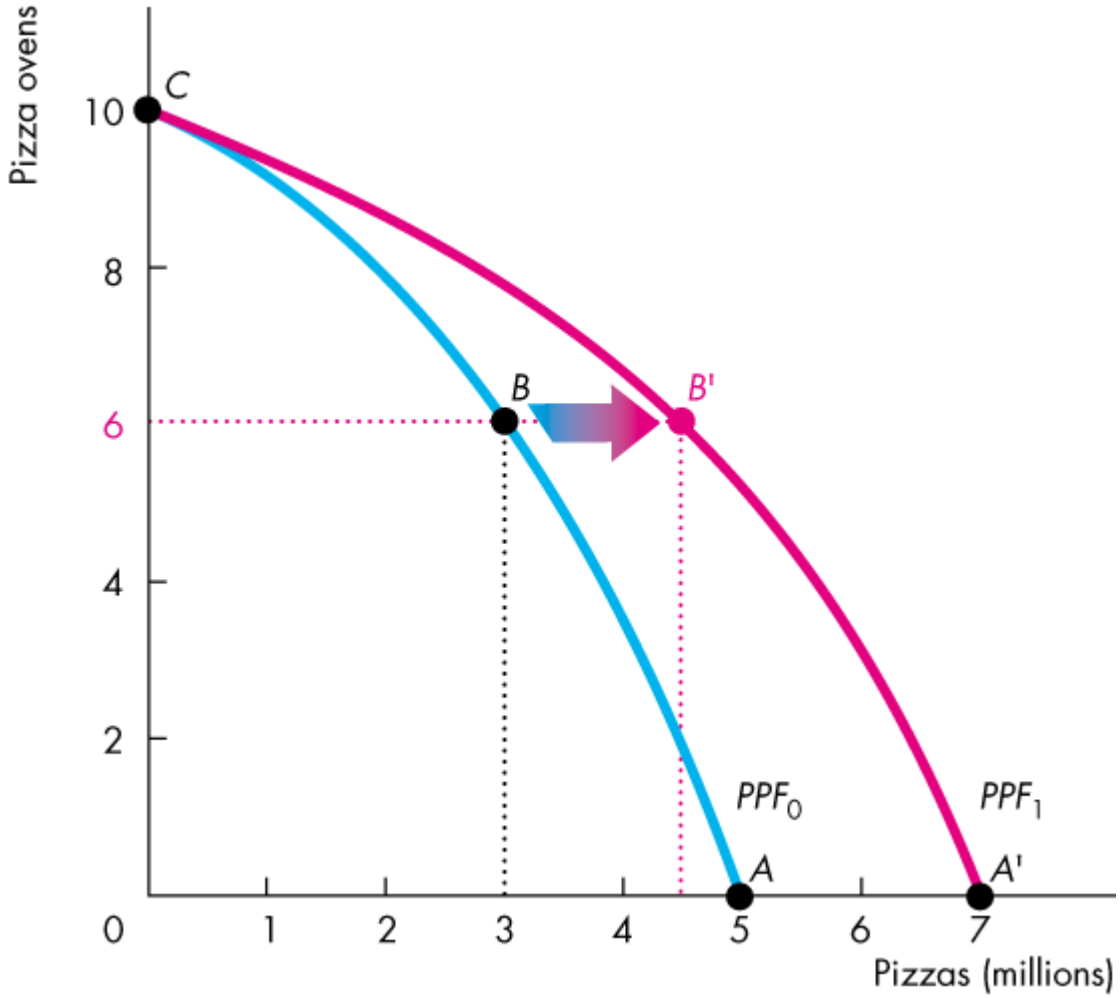

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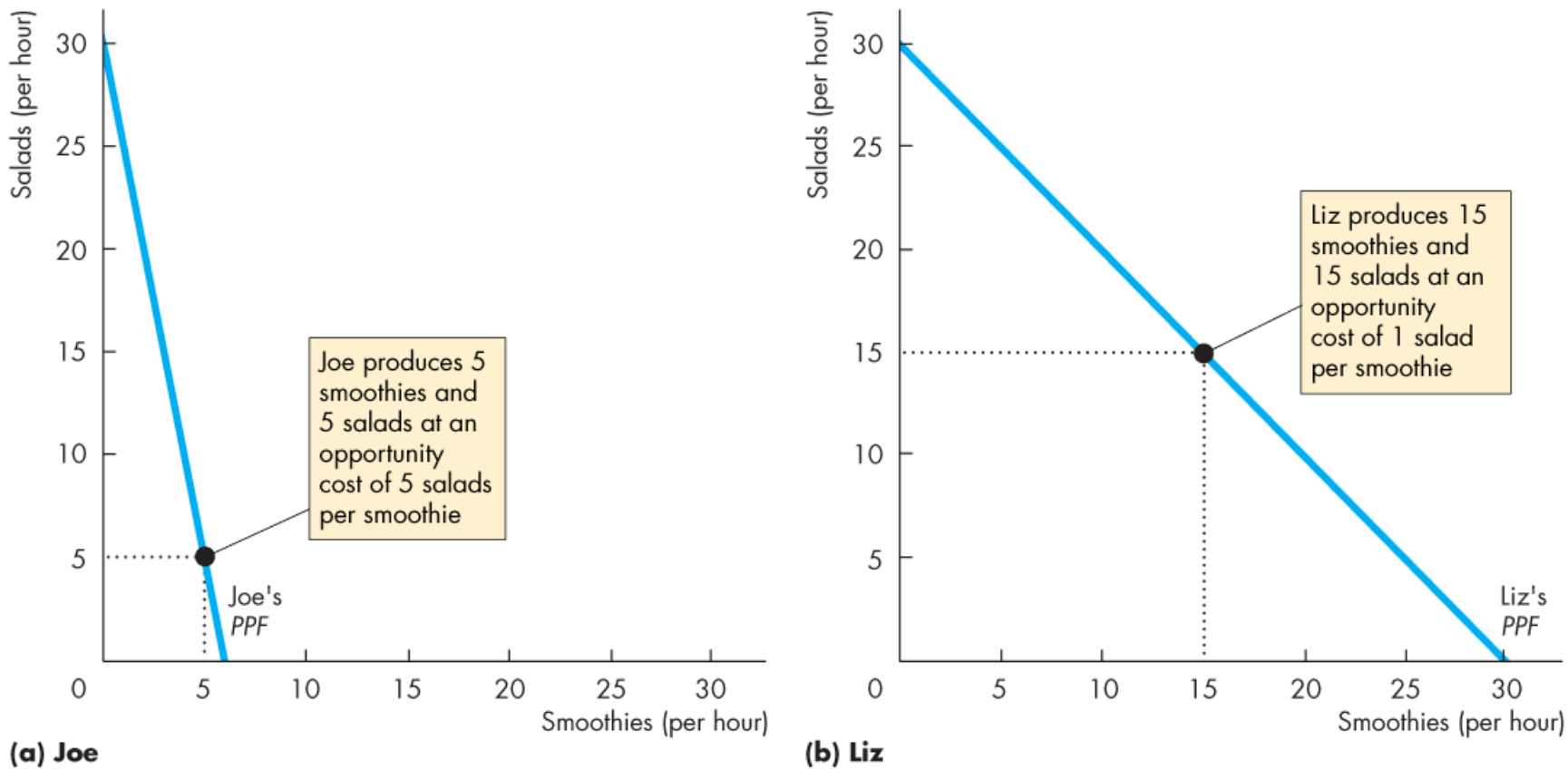

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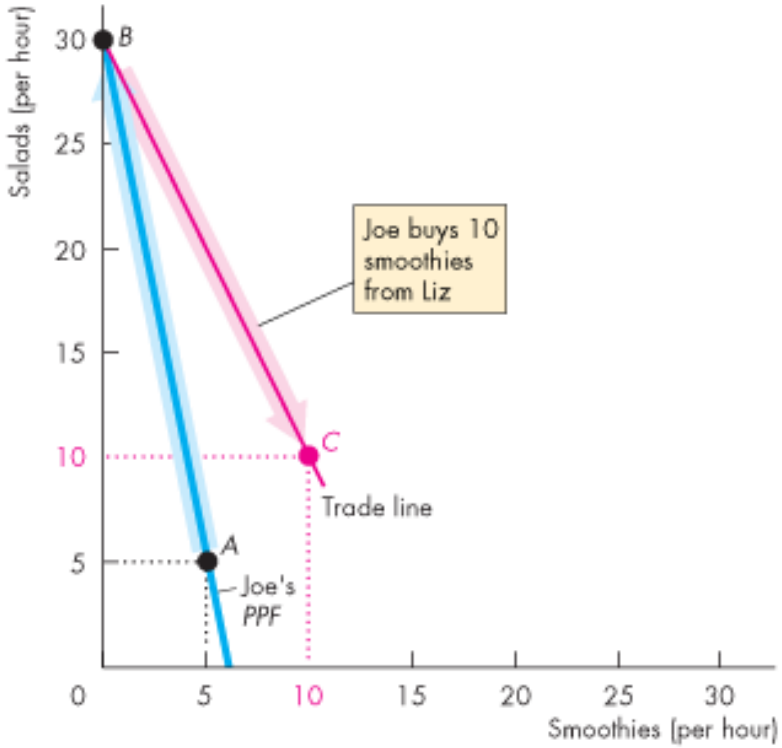
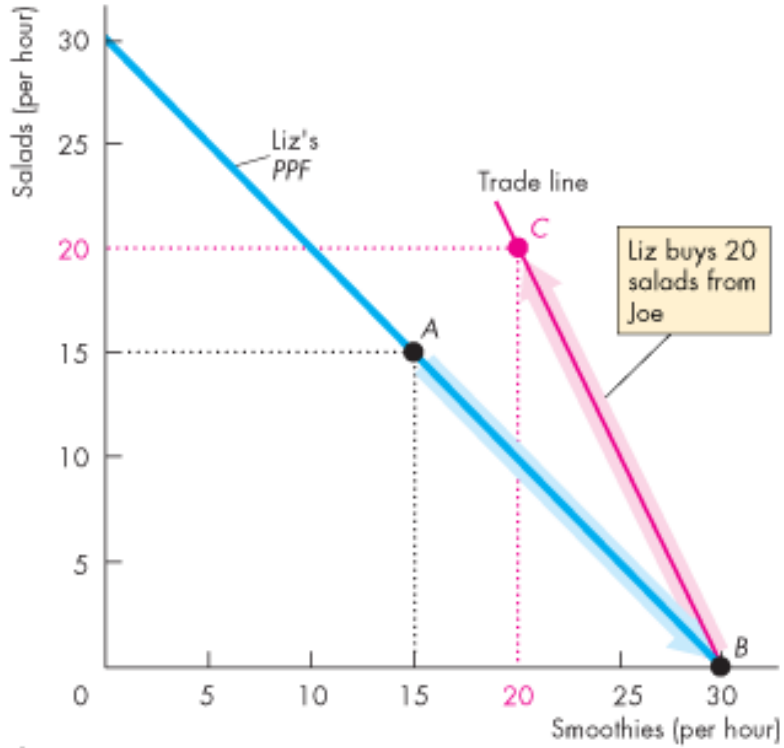


(a) Joe



(b) Liz

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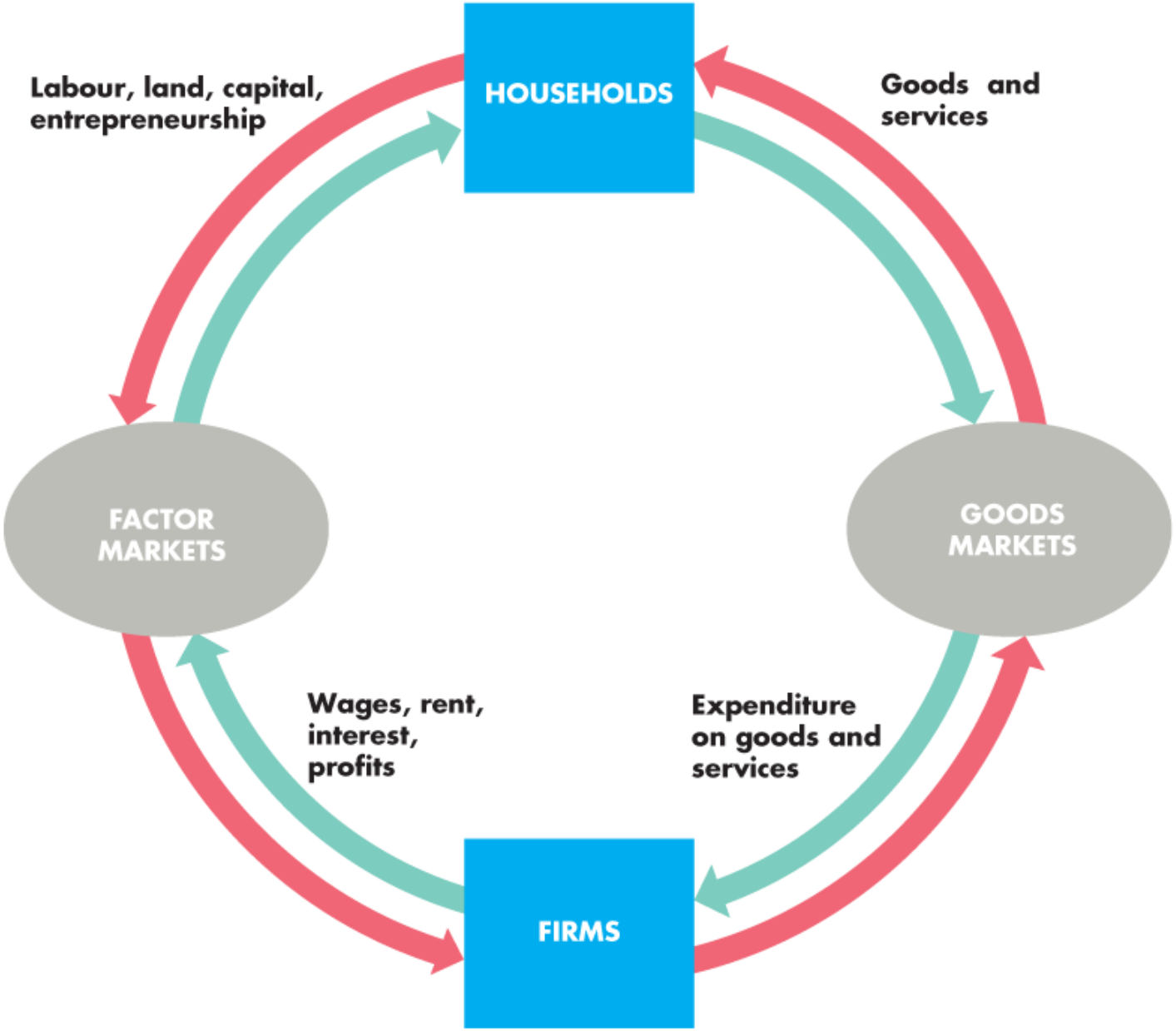

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TABLE 2.1 Joe's Production Possibilities

Item	Minutes to produce 1	Quantity per hour
Smoothies	10	6
Salads	2	30

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TABLE 2.2 Liz's Production Possibilities

Item	Minutes to produce 1	Quantity per hour
Smoothies	2	30
Salads	2	30

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TABLE 2.3 Liz and Joe Gain from Trade

(a) Before trade	Liz	Joe
Smoothies	15	5
Salads	15	5
(b) Specialization	**Liz**	**Joe**
Smoothies	30	0
Salads	0	30
(c) Trade	**Liz**	**Joe**
Smoothies	sell 10	buy 10
Salads	buy 20	sell 20
(d) After trade	**Liz**	**Joe**
Smoothies	20	10
Salads	20	10
(e) Gains from trade	**Liz**	**Joe**
Smoothies	+5	+5
Salads	+5	+5

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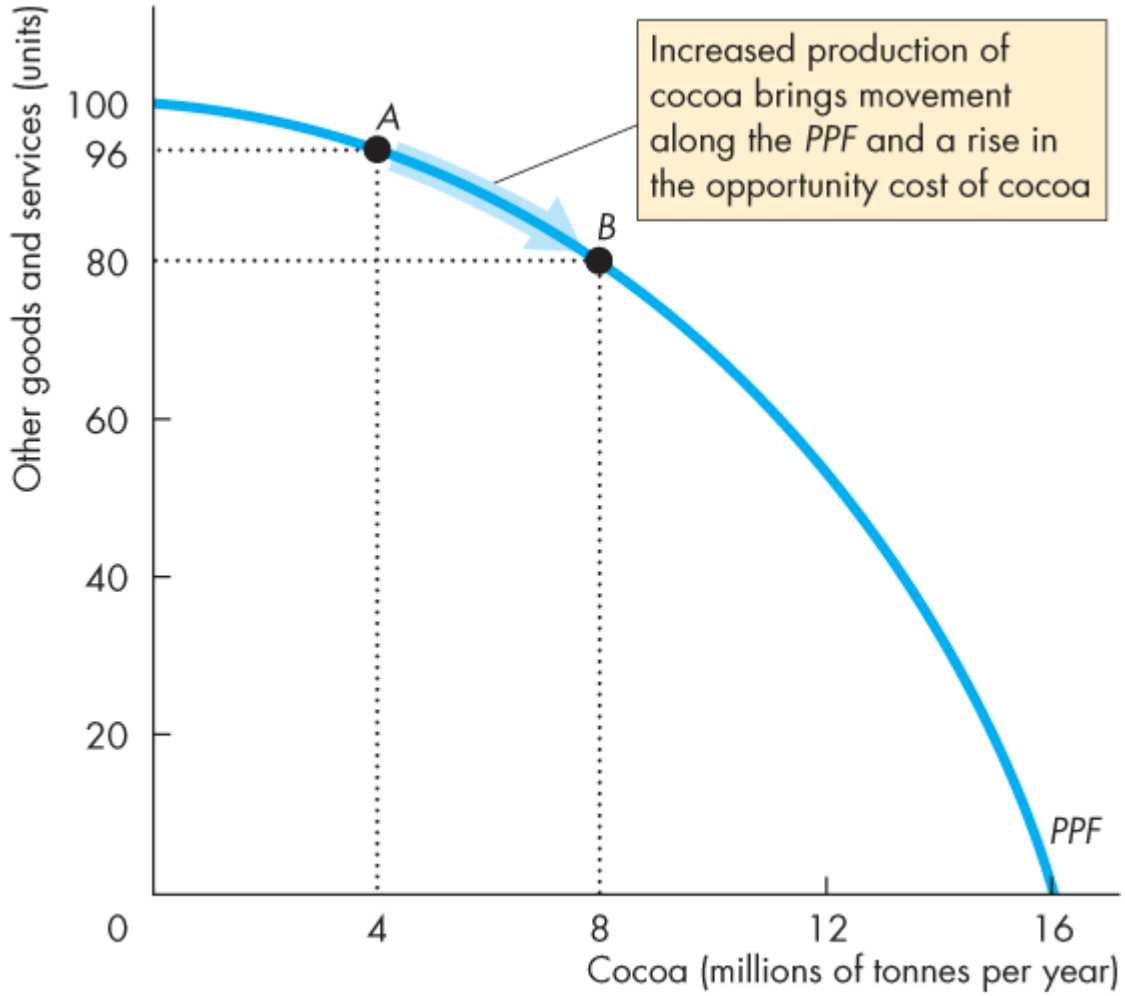

***PPF* for Cocoa and Other Goods and Services**

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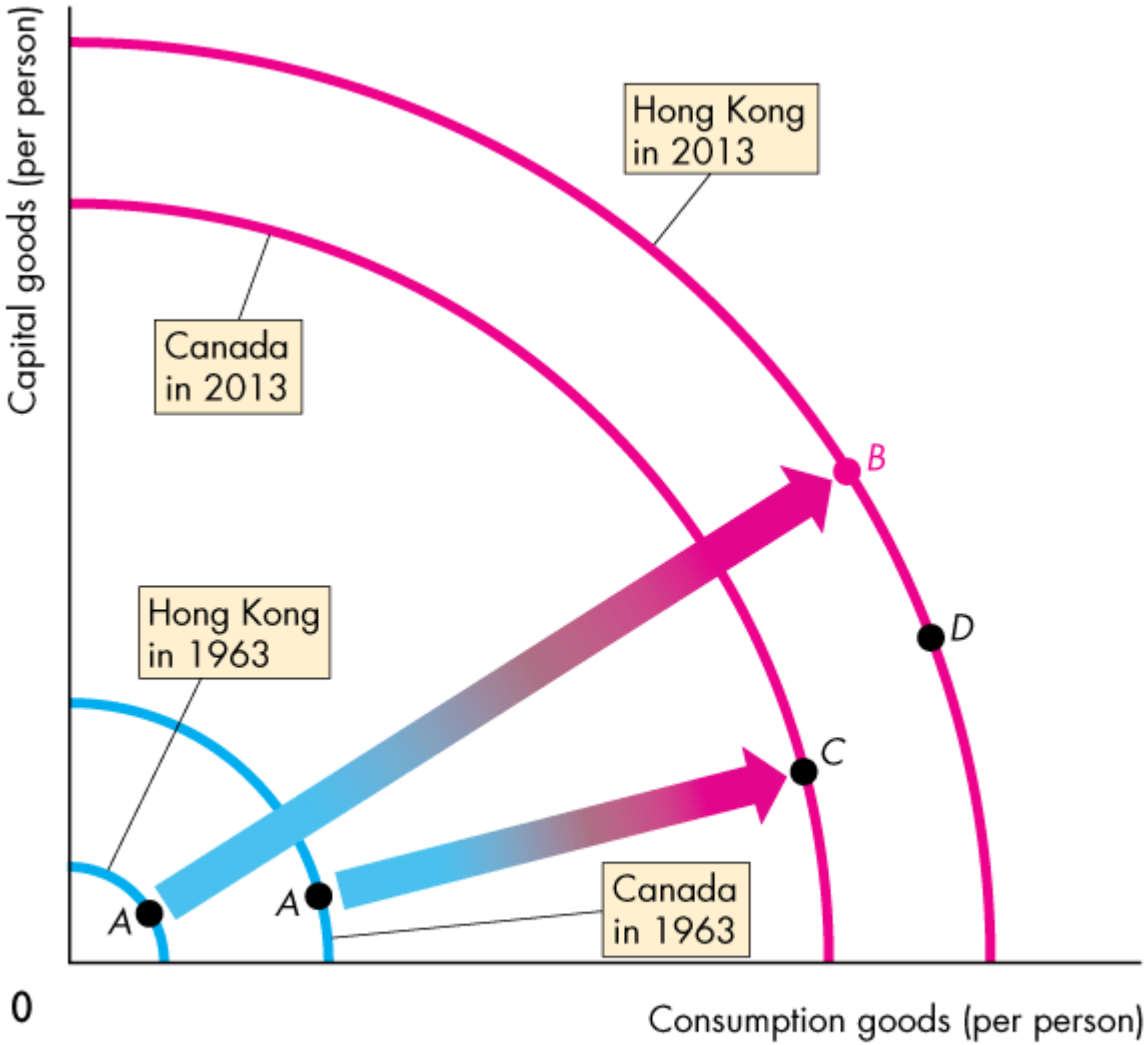

Economic Growth in Canada and Hong Kong

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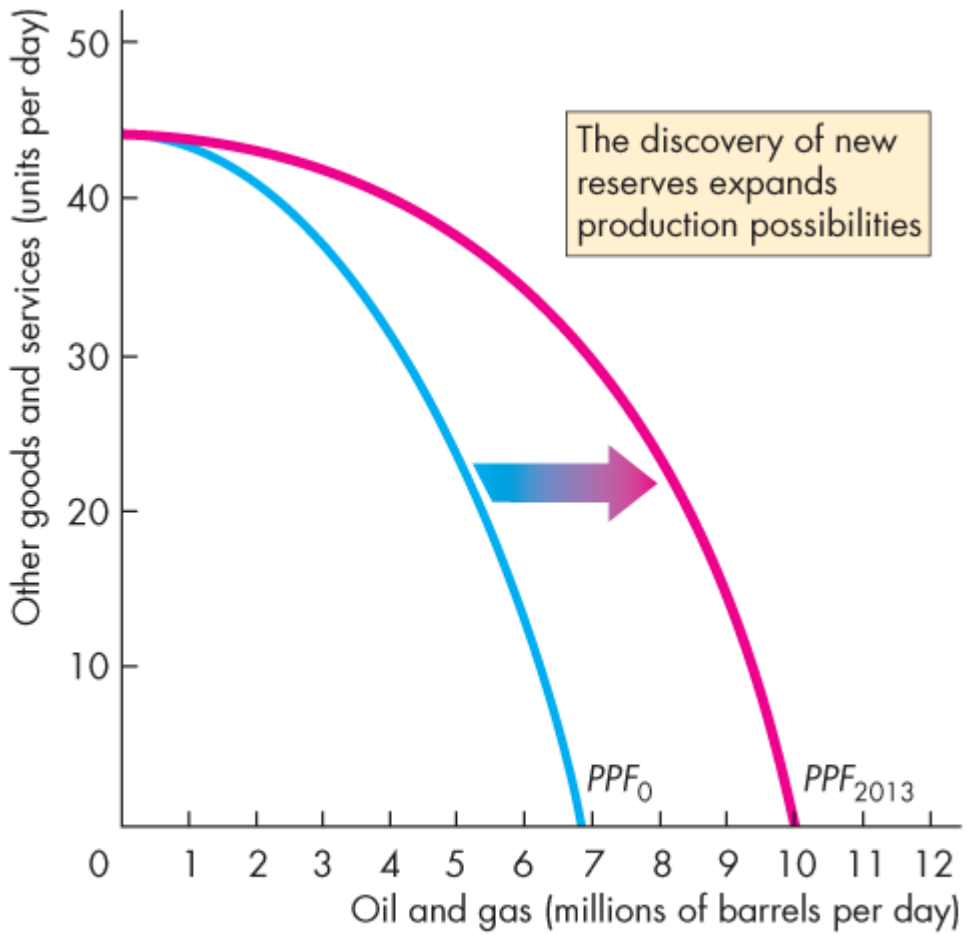

Figure 1 Oil and Gas Production Possibilities Expand

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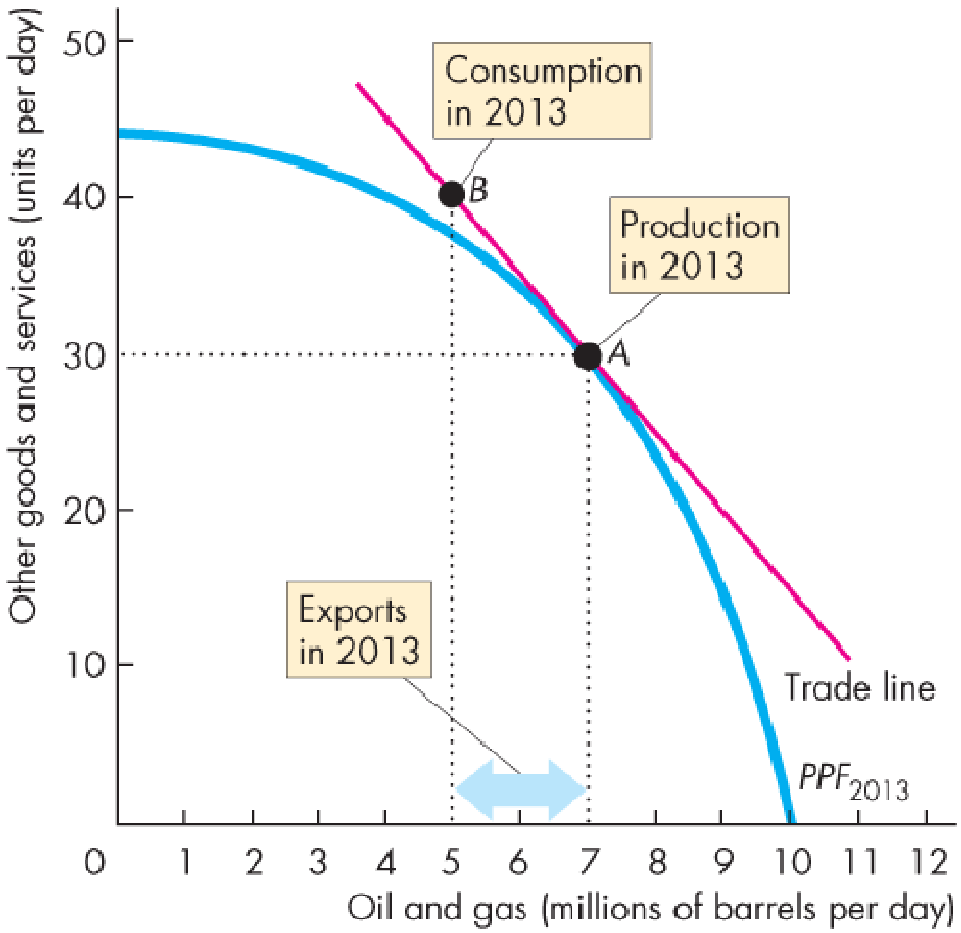

Figure 2 Production, Exports, and Consumption of Oil and Gas in 2013

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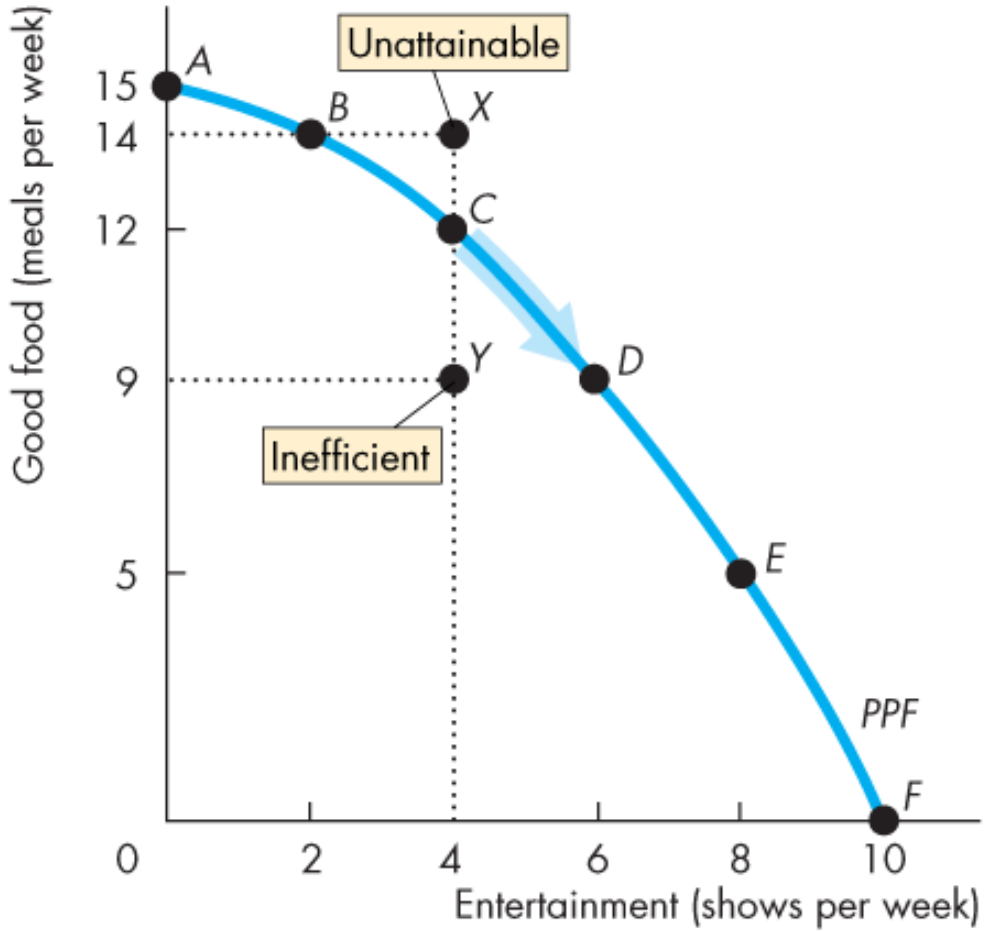

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ECONOMICS

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2 THE ECONOMIC PROBLEM

After studying this chapter, you will be able to:

- Define the production possibilities frontier and use it to calculate opportunity cost
- Distinguish between production possibilities and preferences and describe an efficient allocation of resources
- Explain how current production choices expand future production possibilities
- Explain how specialization and trade expand production possibilities
- Describe the economic institutions that coordinate decision

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Production Possibilities and Opportunity Cost

The **production possibilities frontier** (*PPF*) is the boundary between those combinations of goods and services that can be produced and those that cannot.

To illustrate the *PPF*, we focus on two goods at a time and hold the quantities of all other goods and services constant.

That is, we look at a model economy in which everything remains the same (*ceteris paribus*) except the two goods we're considering.

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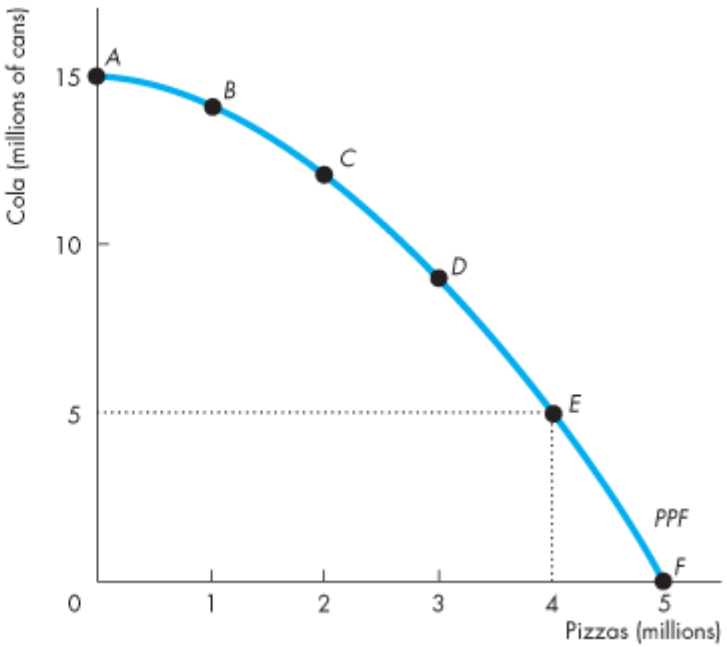
Production Possibilities and Opportunity Cost

Production Possibilities Frontier

Figure 2.1 shows the *PPF* for two goods: cola and pizzas.

Possibility	Pizzas (millions)		Cola (millions of cans)
A	0	and	15
B	1	and	14
C	2	and	12
D	3	and	9
E	4	and	5
F	5	and	0



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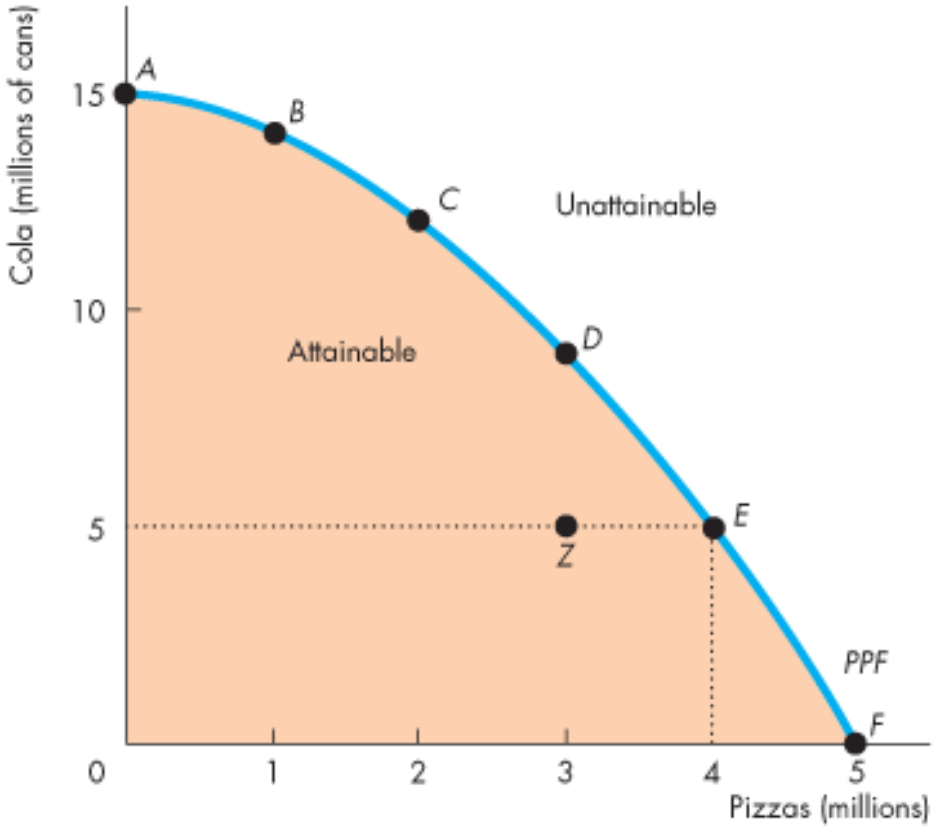
Possibility	Pizzas (millions)		Cola (millions of cans)
A	0	and	15
B	1	and	14
C	2	and	12
D	3	and	9
E	4	and	5
F	5	and	0



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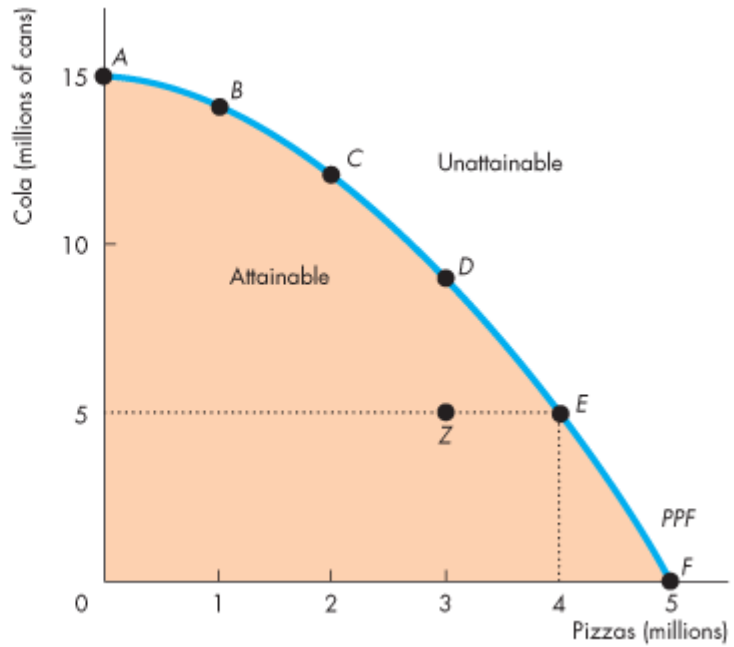
Production Possibilities and Opportunity Cost

Any point *on* the frontier such as *E* and any point *inside* the *PPF* such as *Z* are attainable.

Points outside the *PPF* are unattainable.

Possibility	Pizzas (millions)		Cola (millions of cans)
A	0	and	15
B	1	and	14
C	2	and	12
D	3	and	9
E	4	and	5
F	5	and	0



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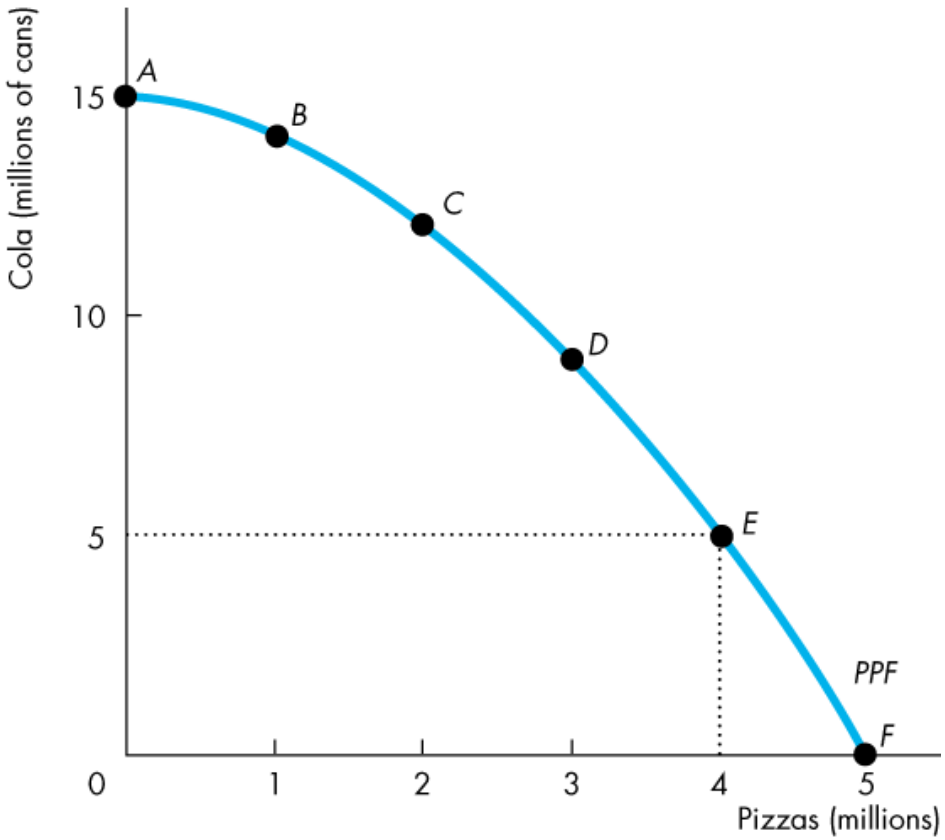
Production Possibilities and Opportunity Cost

Production Efficiency

We achieve **production efficiency** if we cannot produce more of one good without producing less of some other good.

Points on the frontier are *efficient*.



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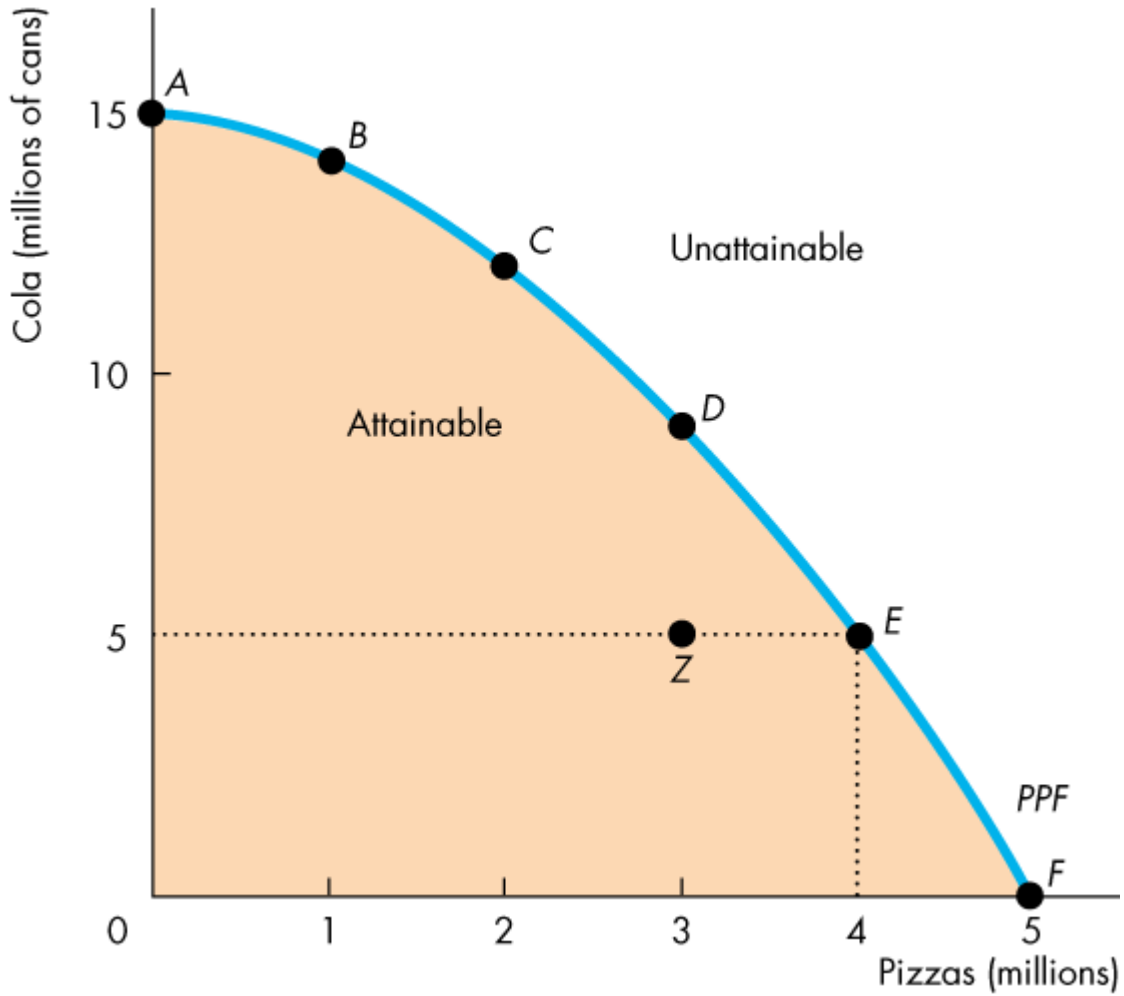

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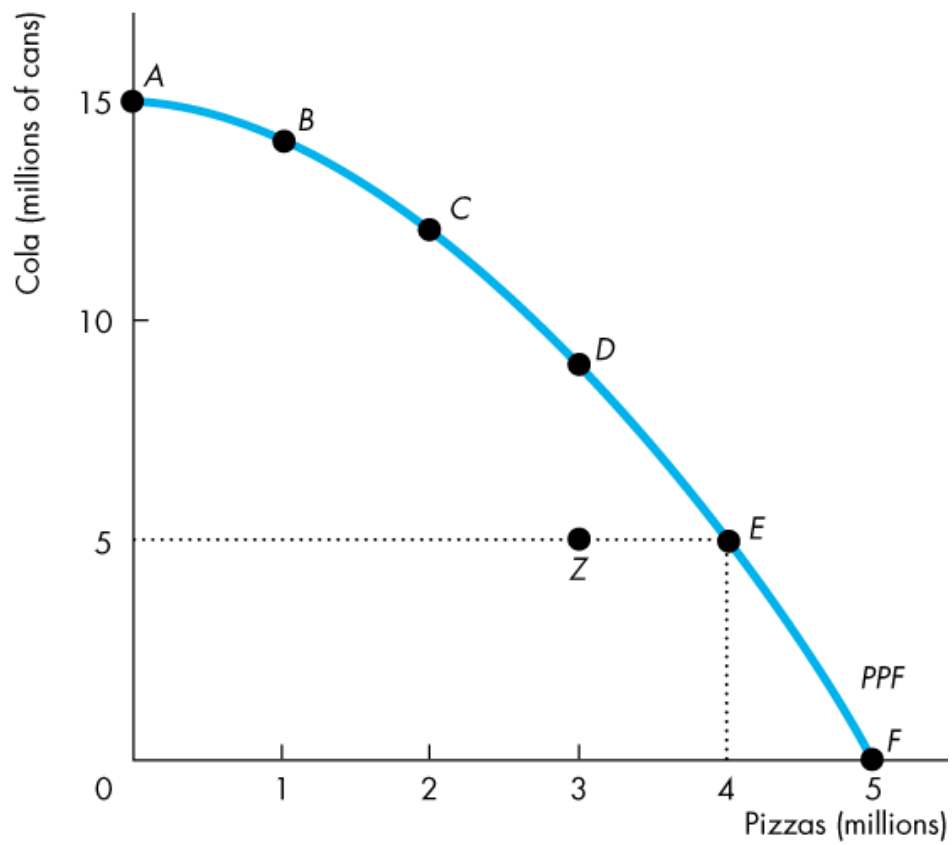
Production Possibilities and Opportunity Cost

Any point inside the frontier, such as *Z*, is *inefficient*.

At such a point, it is possible to produce more of one good without producing less of the other good.

At *Z*, resources are either unemployed or misallocated.



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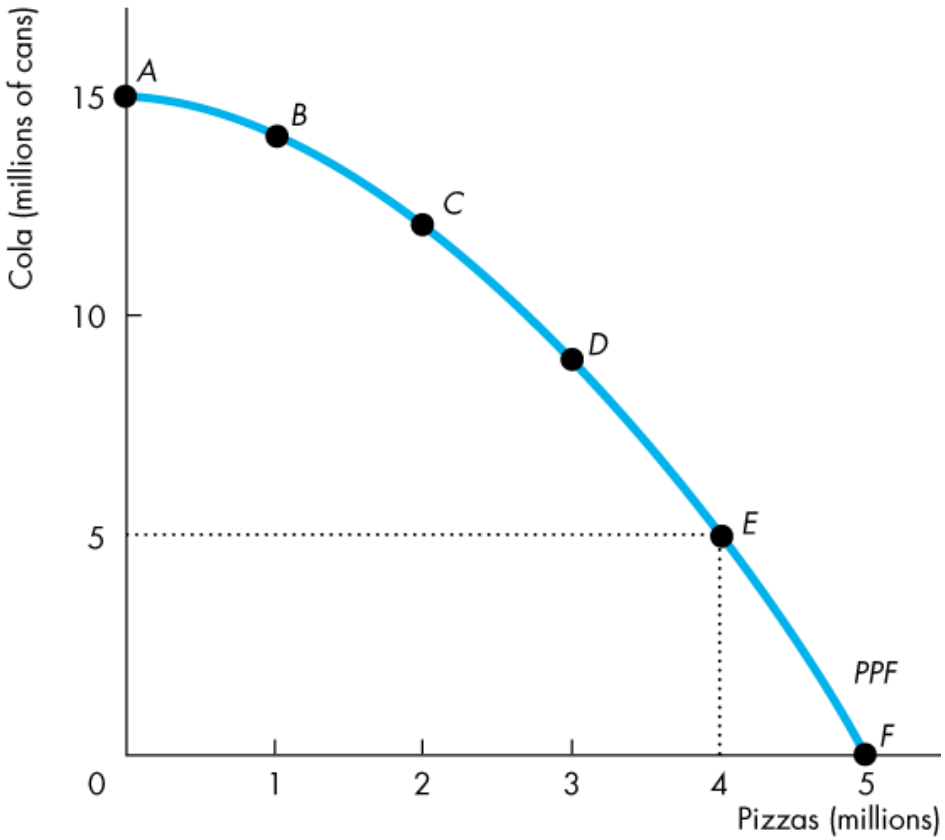
Production Possibilities and Opportunity Cost

Tradeoff Along the *PPF*

Every choice along the *PPF* involves a *tradeoff*.

On this *PPF*, we must give up some cola to get more pizzas or give up some pizzas to get more cola.



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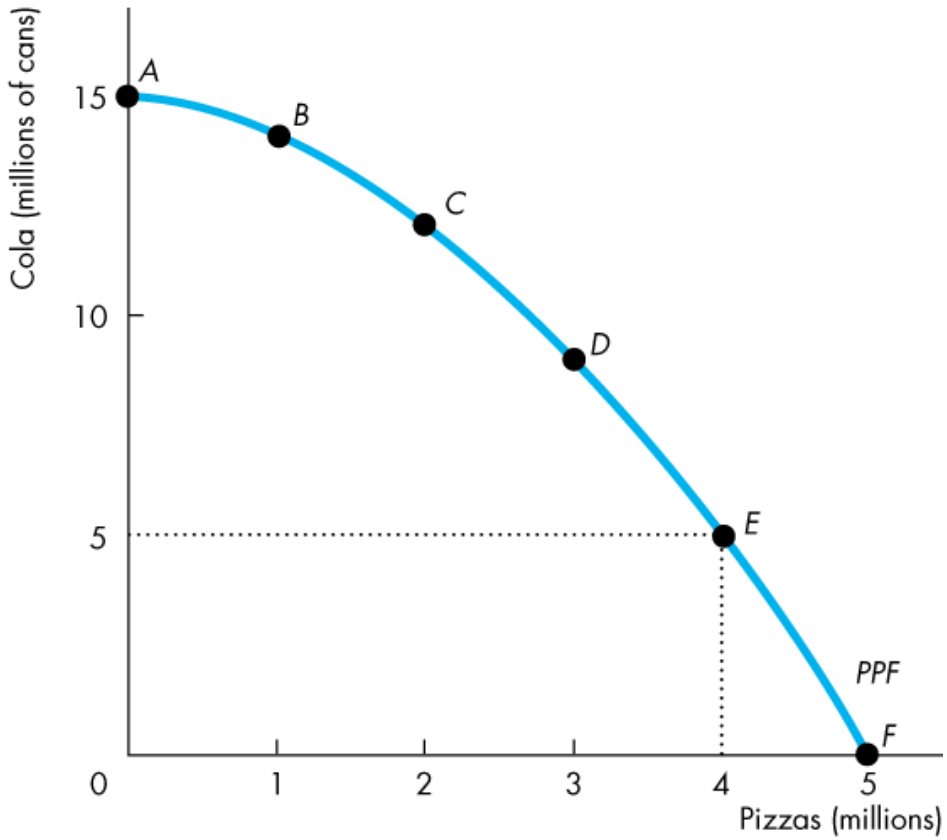
Production Possibilities and Opportunity Cost

Opportunity Cost

As we move down along the *PPF,*

we produce more pizzas, but the quantity of cola we can produce decreases.

The opportunity cost of a pizza is the cola forgone.



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Production Possibilities and Opportunity Cost

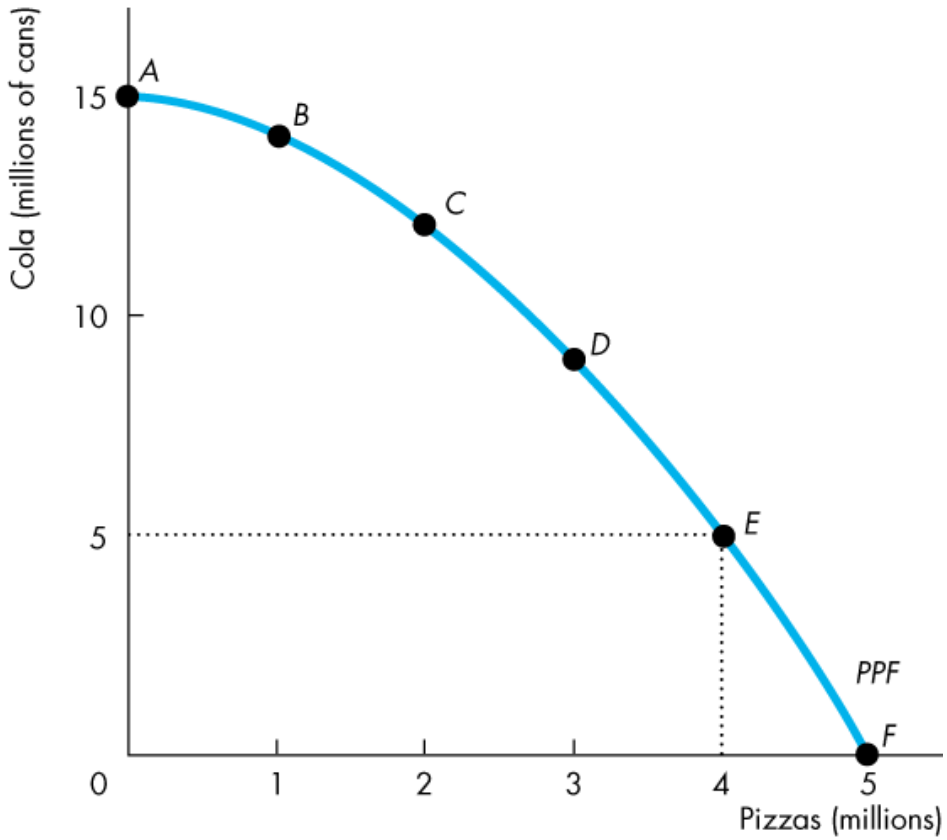
In moving from *E* to *F*:

The quantity of pizzas increases by 1 million.

The quantity of cola decreases by 5 million cans.

The opportunity cost of the fifth 1 million pizzas is 5 million cans of cola.

One of these pizzas costs 5 cans of cola.



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Production Possibilities and Opportunity Cost

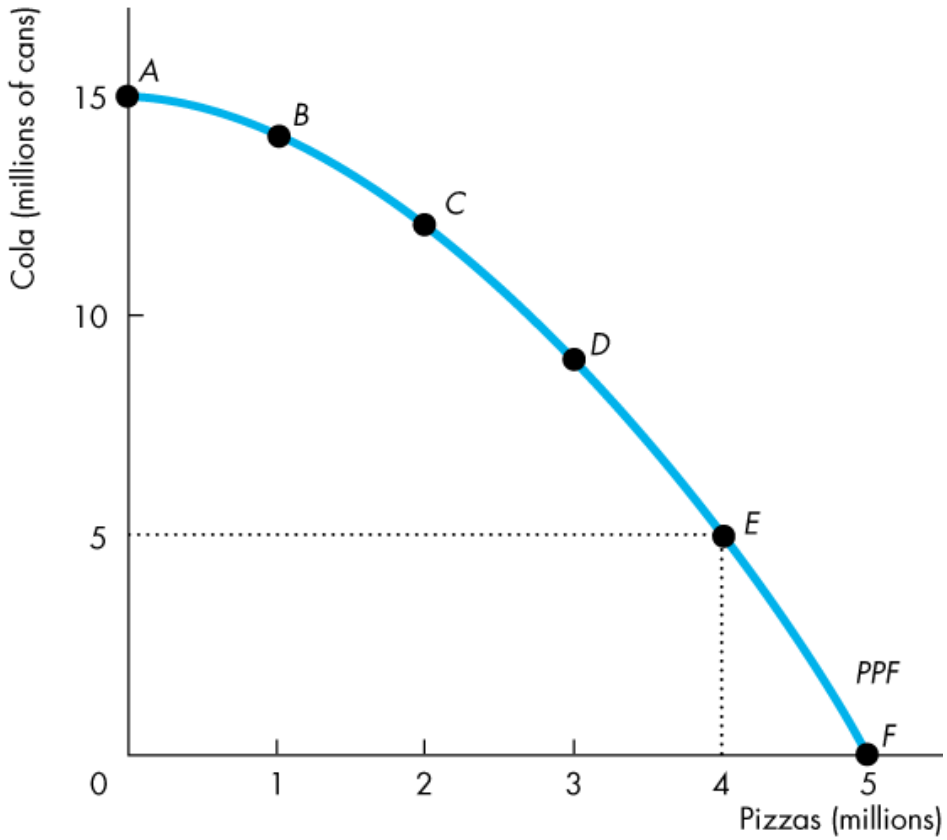
In moving from *F* to *E*:

The quantity of cola increases by 5 million cans.

The quantity of pizzas decreases by 1 million.

The opportunity cost of the first 5 million cans of cola is 1 million pizzas.

One of these cans of cola costs 1/5 of a pizza.



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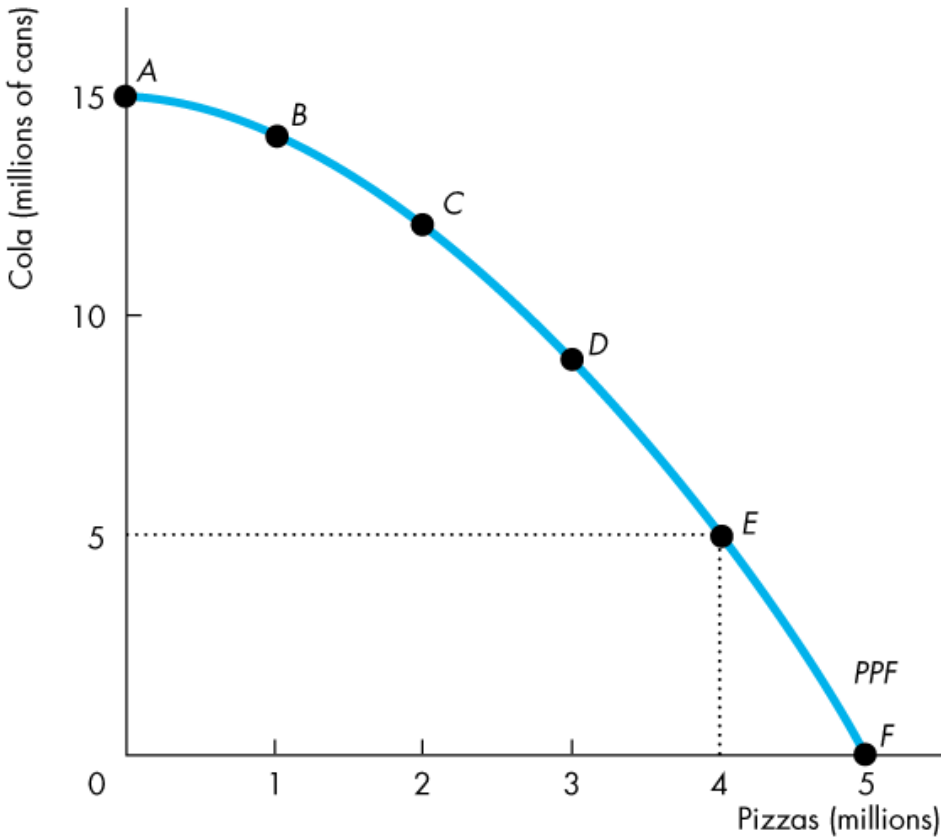
Production Possibilities and Opportunity Cost

Opportunity Cost Is a Ratio

Note that the opportunity cost of a can of cola is the *inverse* of the opportunity cost of a pizza.

One pizza costs 5 cans of cola.

One can of cola costs 1/5 of a pizza.



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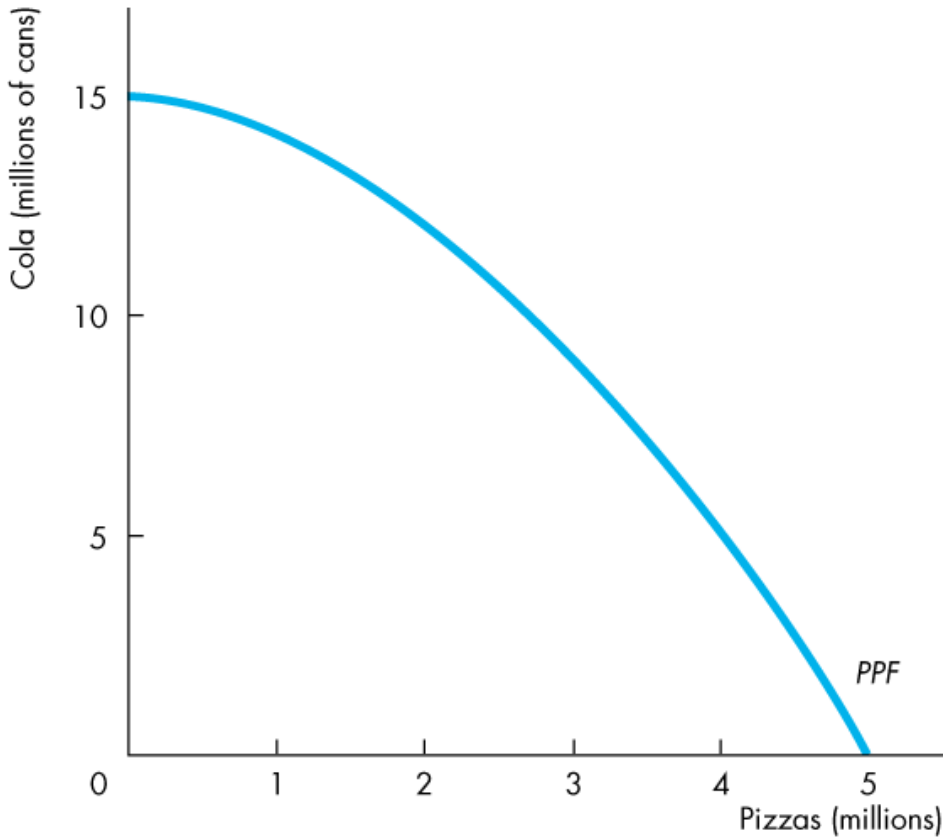
Production Possibilities and Opportunity Cost

Increasing Opportunity Cost

Because resources are not equally productive in all activities, the *PPF* bows outward.

The outward bow of the *PPF* means that as the quantity produced of each good increases, so does its opportunity cost.



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Using Resources Efficiently

All the points along the *PPF* are efficient.

To determine which of the alternative efficient quantities to produce, we compare costs and benefits.

The *PPF* and Marginal Cost

The *PPF* determines opportunity cost.

The **marginal cost** of a good or service is the opportunity cost of producing *one more unit* of it.

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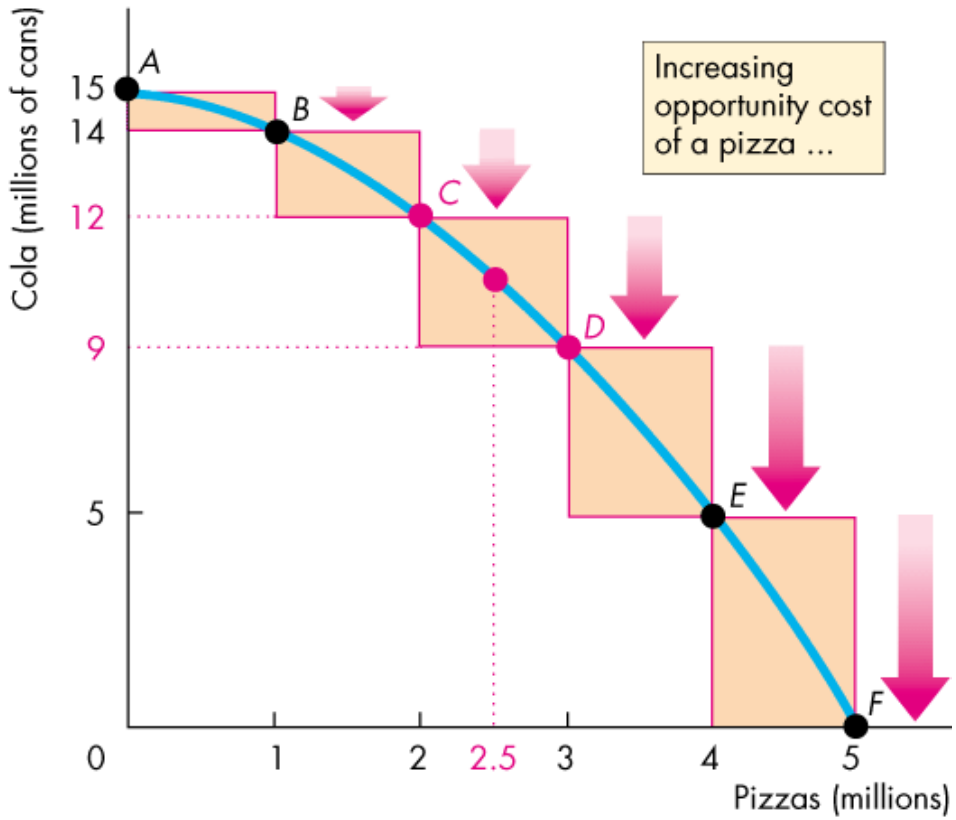
Using Resources Efficiently

Figure 2.2 illustrates the marginal cost of a pizza.

As we move along the *PPF*, the opportunity cost of a pizza increases.

The opportunity cost of producing one more pizza is the marginal cost of a pizza.



(a) *PPF* and opportunity cost

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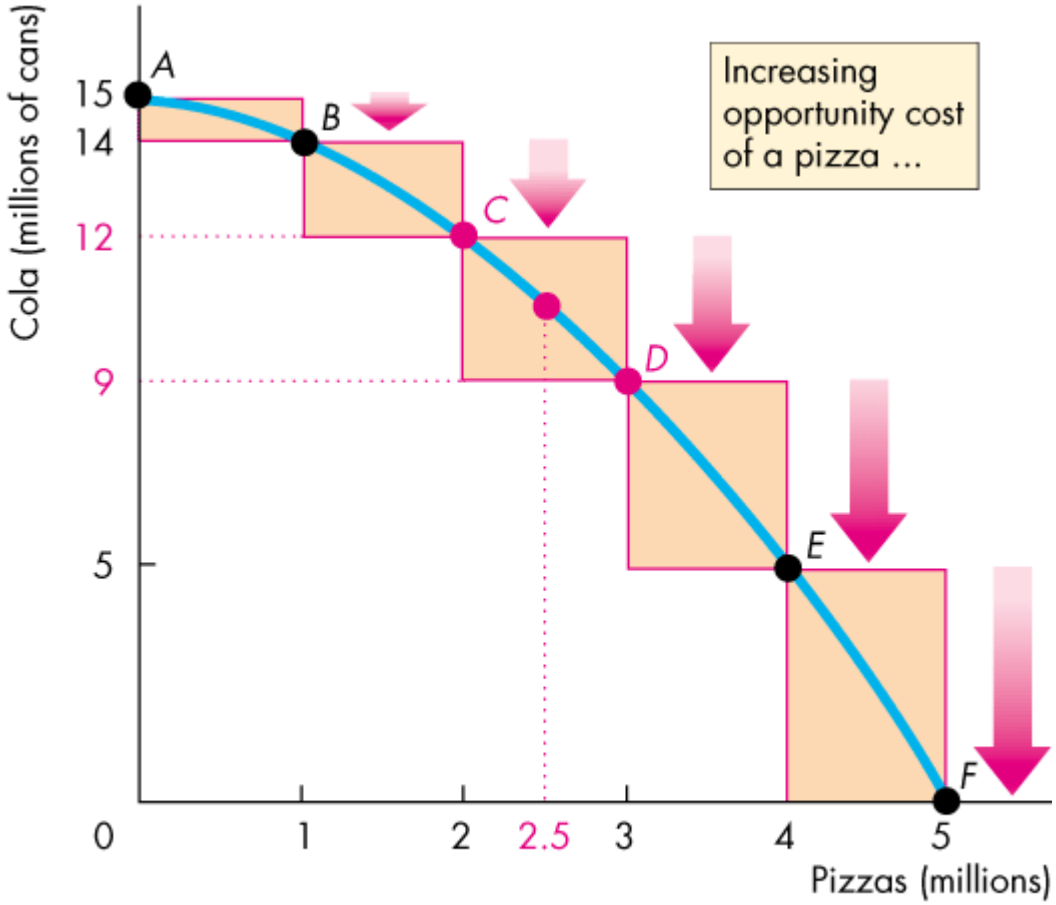

(a) *PPF* and opportunity cost

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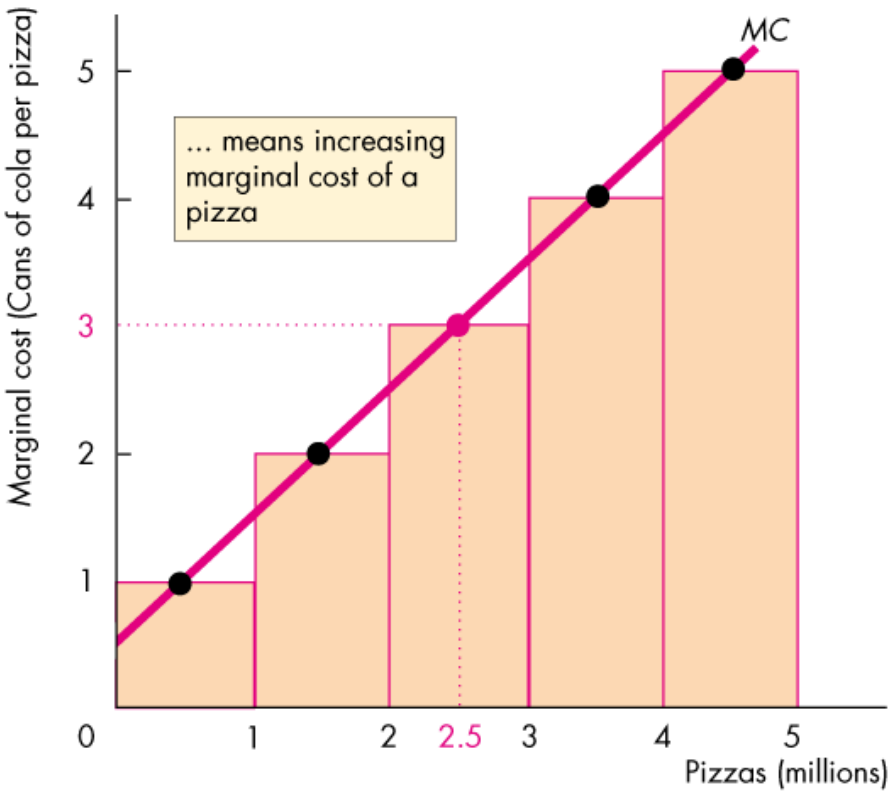
Using Resources Efficiently

In part (b) of Fig. 2.2, the bars illustrate the increasing opportunity cost of a pizza.

The black dots and the line *MC* show the marginal cost of producing a pizza.

The *MC* curve passes through the center of each bar.



(b) Marginal cost

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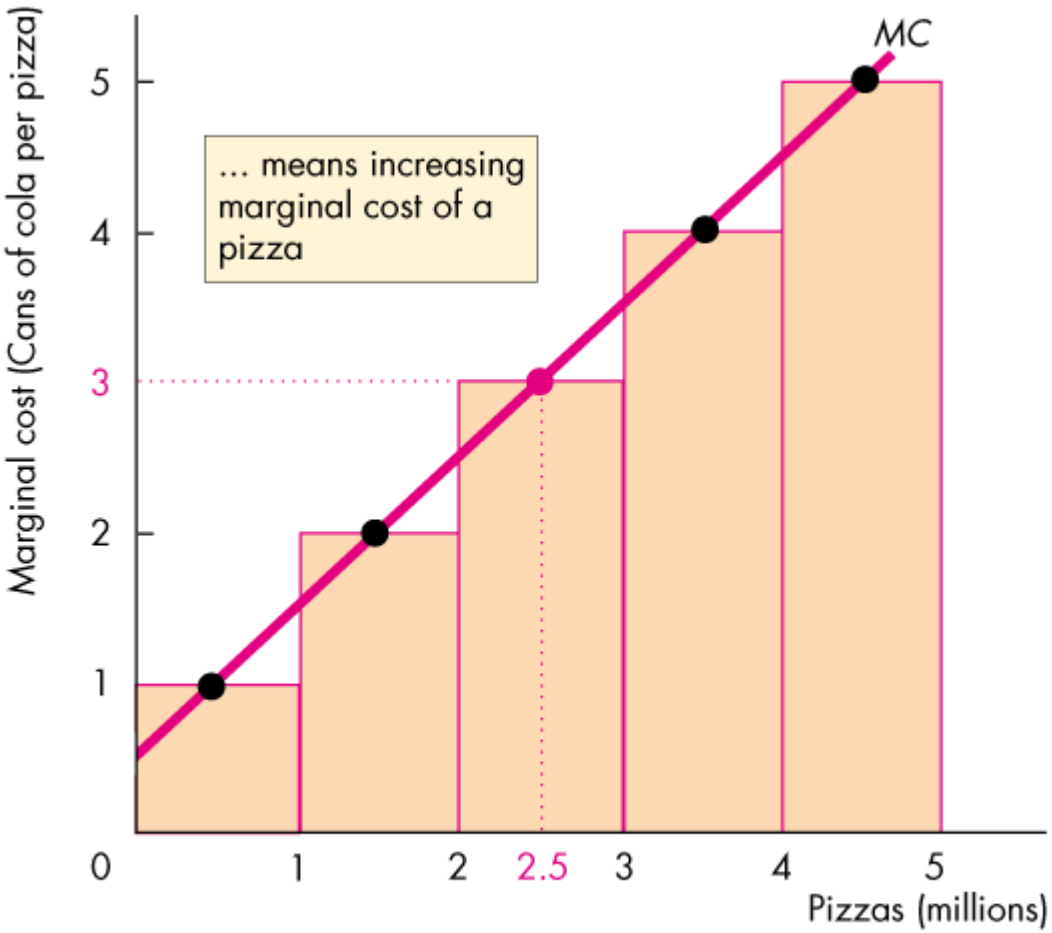

(b) Marginal cost

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Using Resources Efficiently

Preferences and Marginal Benefit

Preferences are a description of a person's likes and dislikes.

To describe preferences, economists use the concepts of marginal benefit and the marginal benefit curve.

The **marginal benefit** of a good or service is the benefit received from consuming one more unit of it.

We measure marginal benefit by the amount that a person is *willing to pay* for an additional unit of a good or service.

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Using Resources Efficiently

It is a general principle that:

The more we have of any good, the smaller is its marginal benefit and …

the less we are willing to pay for an additional unit of it.

We call this general principle the *principle of decreasing marginal benefit*.

The **marginal benefit curve** shows the relationship between the marginal benefit of a good and the quantity of that good consumed.

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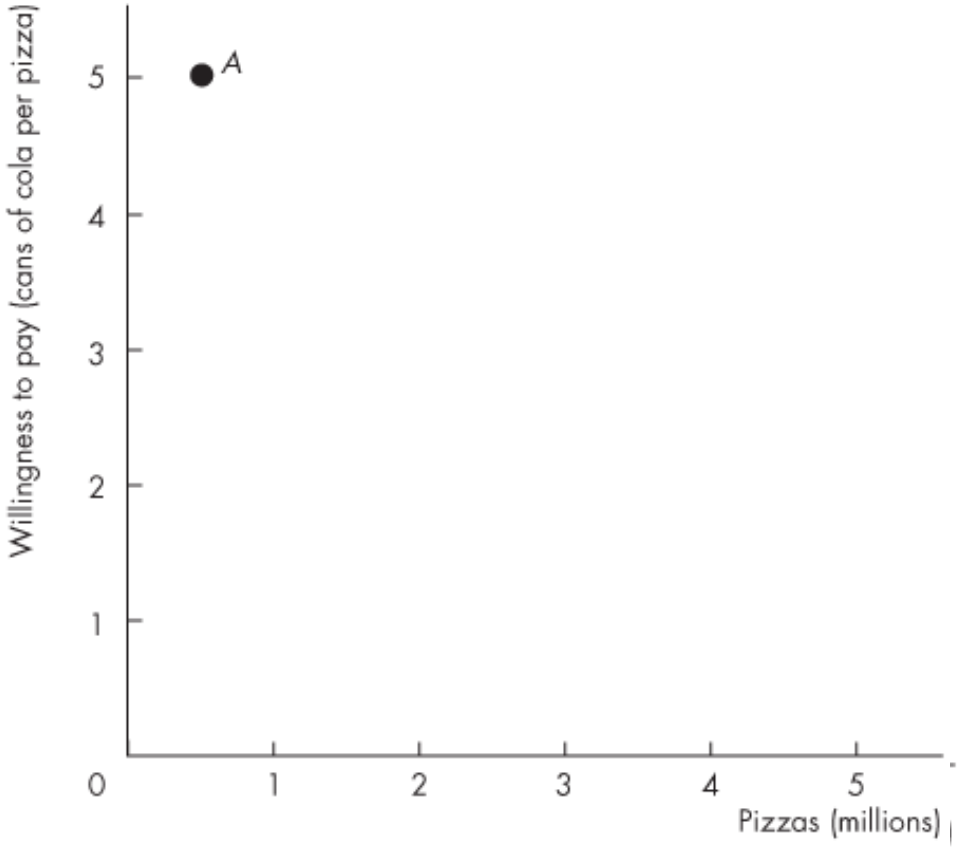
Using Resources Efficiently

At point *A*, with 0.5 million pizzas available, people are willing to pay 5 cans of cola for a pizza.

Possibility	Pizzas (millions)	Willingness to pay (cans of cola per pizza)
A	0.5	5



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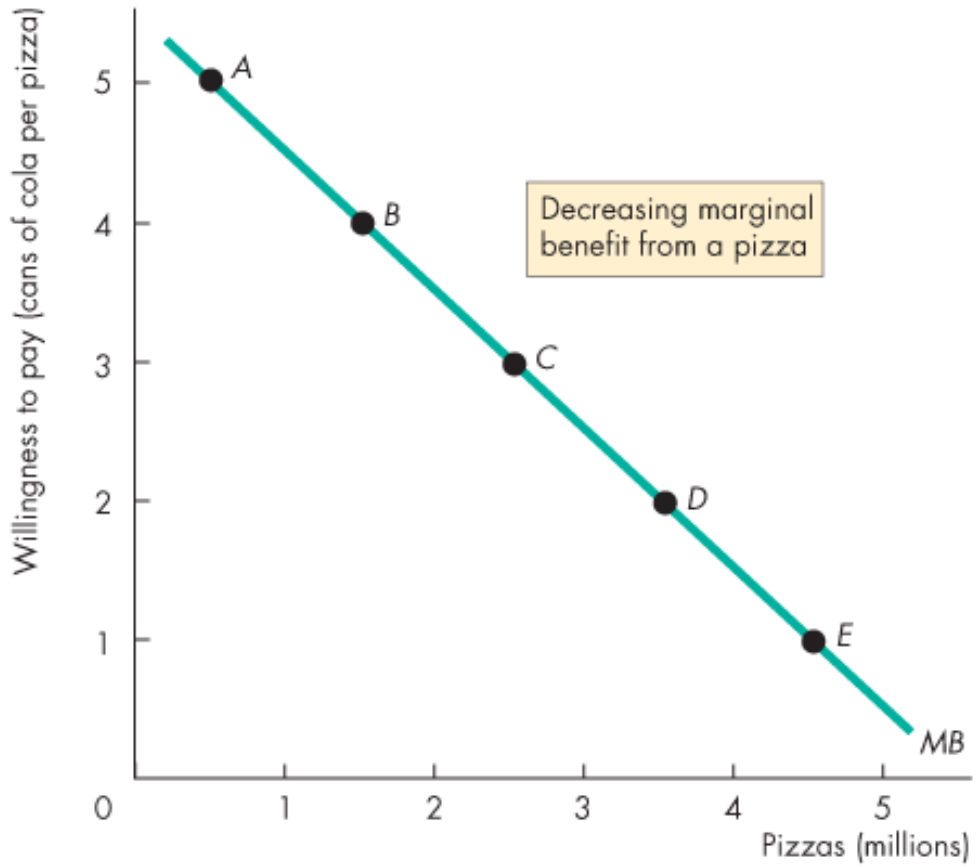
Possibility	Pizzas (millions)	Willingness to pay (cans of cola per pizza)
A	0.5	5
B	1.5	4
C	2.5	3
D	3.5	2
E	4.5	1



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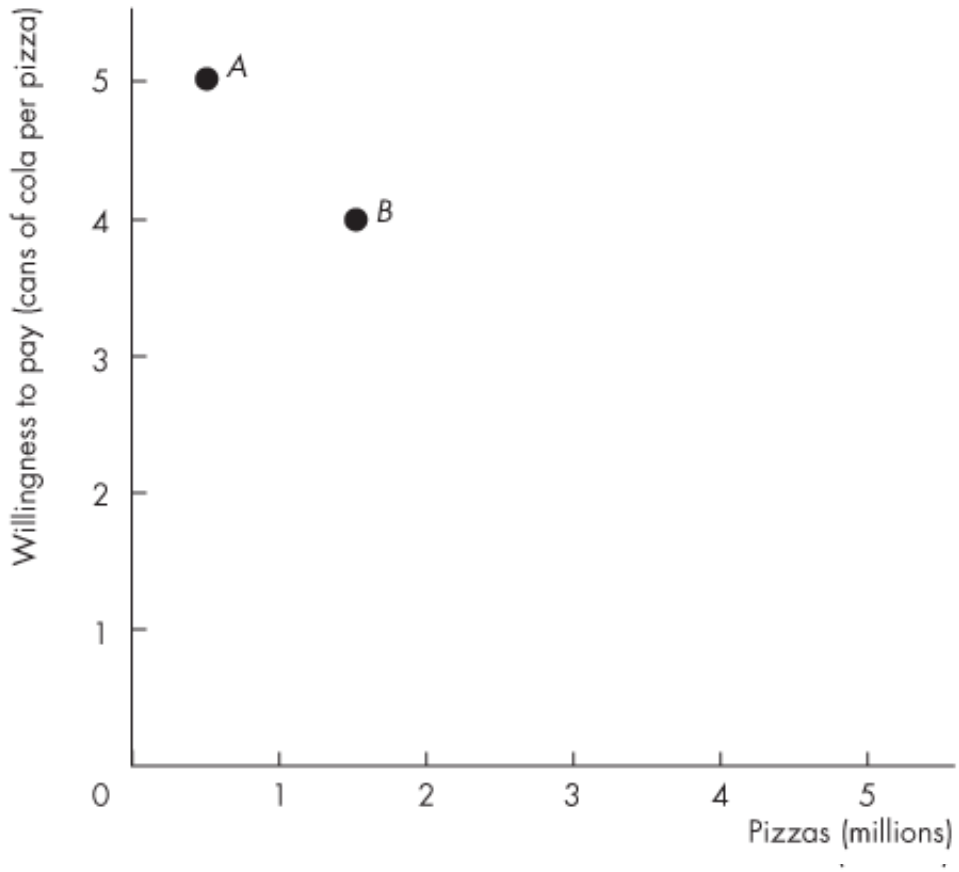
Using Resources Efficiently

At point *B*, with 1.5 million pizzas available, people are willing to pay 4 cans of cola for a pizza

Possibility	Pizzas (millions)	Willingness to pay (cans of cola per pizza)
A	0.5	5
B	1.5	4



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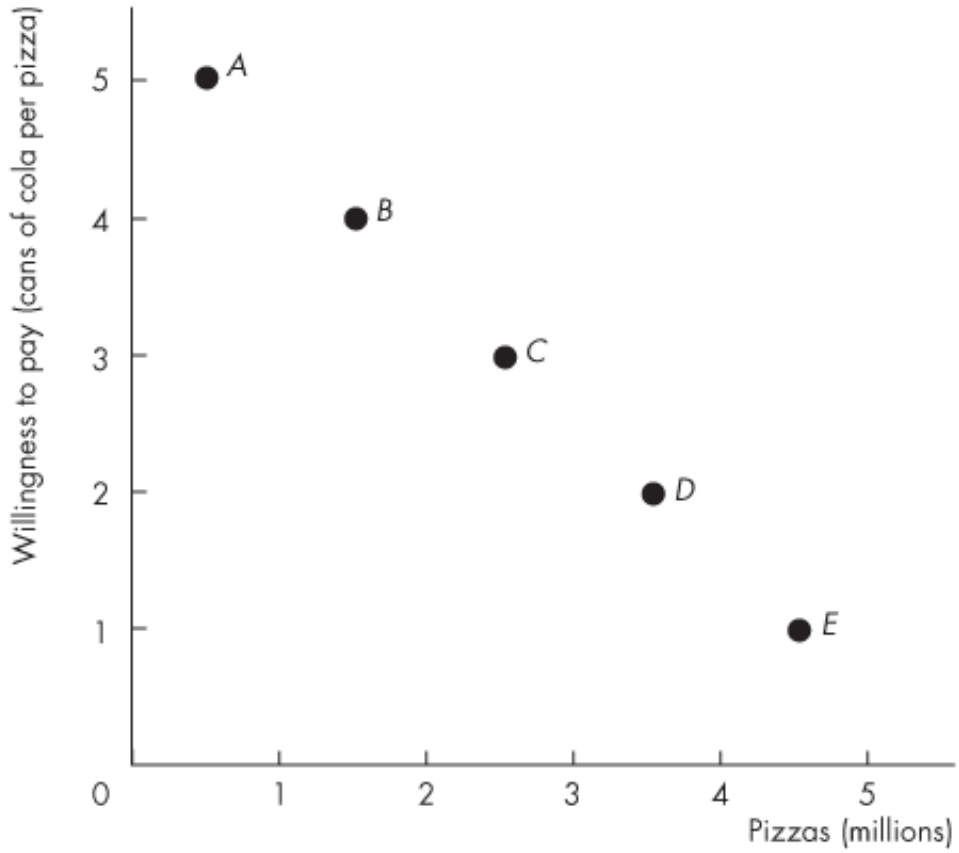
Using Resources Efficiently

At point *E*, with 4.5 million pizzas available, people are willing to pay 1 can of cola for a pizza.

Possibility	Pizzas (millions)	Willingness to pay (cans of cola per pizza)
A	0.5	5
B	1.5	4
C	2.5	3
D	3.5	2
E	4.5	1



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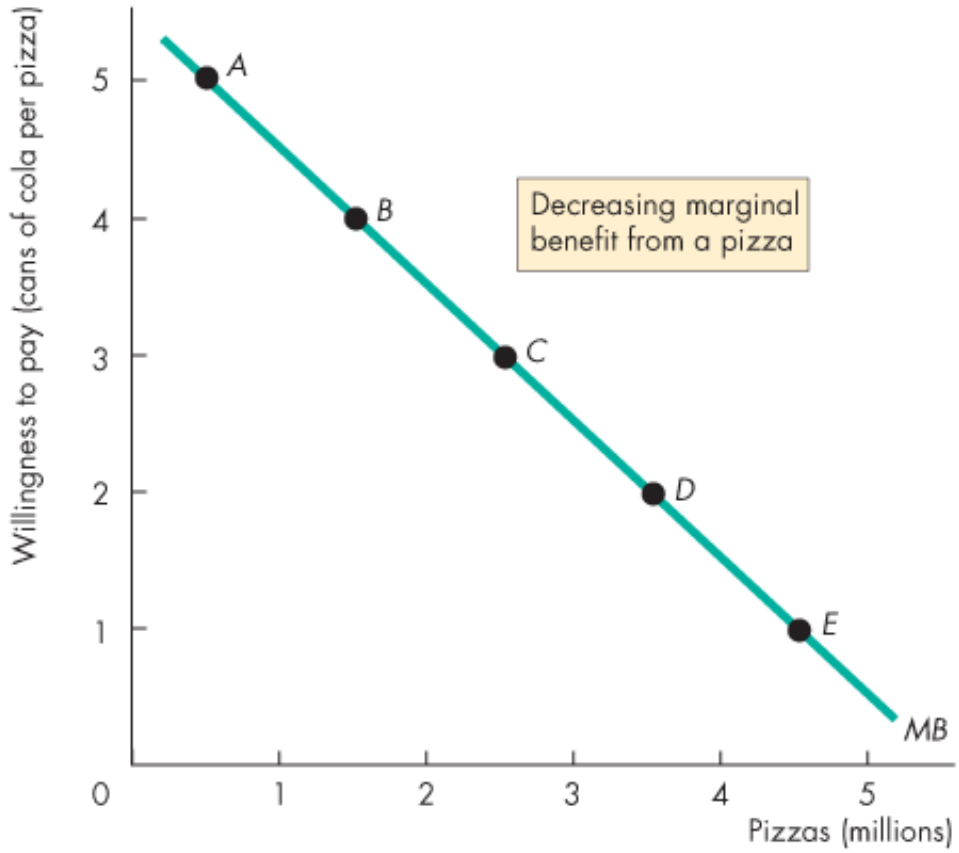
Using Resources Efficiently

The line through the points shows the marginal benefit from a pizza.

Possibility	Pizzas (millions)	Willingness to pay (cans of cola per pizza)
A	0.5	5
B	1.5	4
C	2.5	3
D	3.5	2
E	4.5	1



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Using Resources Efficiently

Allocative Efficiency

When we cannot produce more of any one good without giving up some other good, we have achieved *production efficiency.*

We are producing at a point *on* the *PPF*.

When we cannot produce more of any one good without giving up some other good *that we value more highly*, we have achieved **allocative efficiency**.

We are producing at *the* point on the *PPF* that we prefer above all other points.

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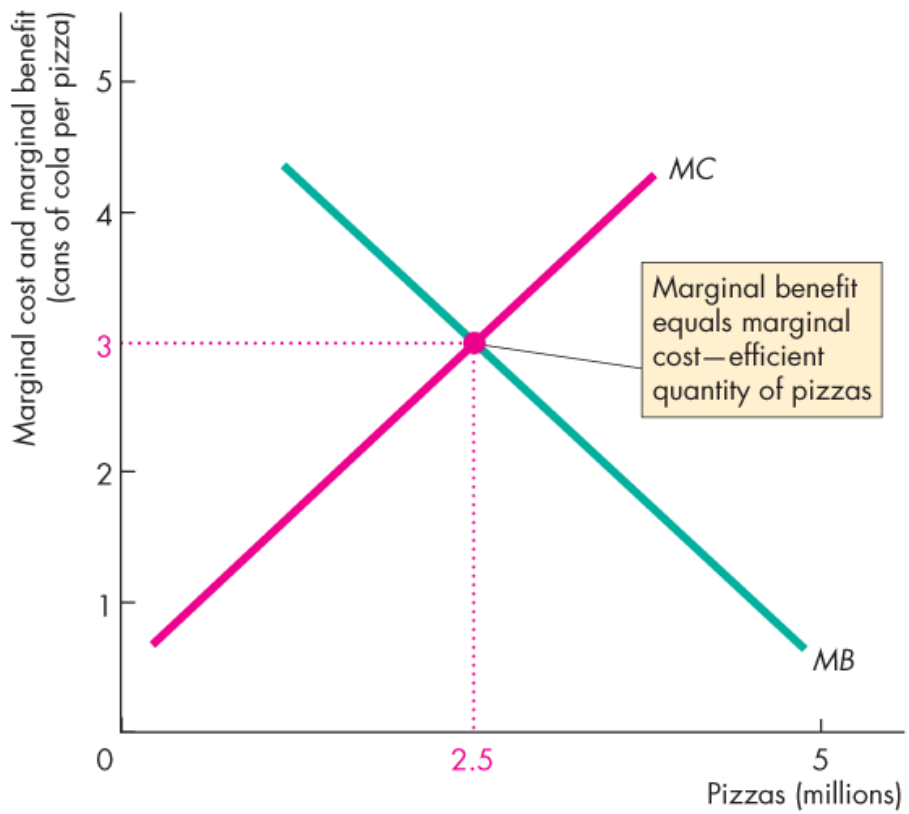
Using Resources Efficiently

Figure 2.4 illustrates allocative efficiency.

The point of allocative efficiency is the point on the *PPF* at which marginal benefit equals marginal cost.

This point is determined by the quantity at which the marginal benefit curve intersects the marginal cost curve.



(b) Marginal benefit equals marginal cost

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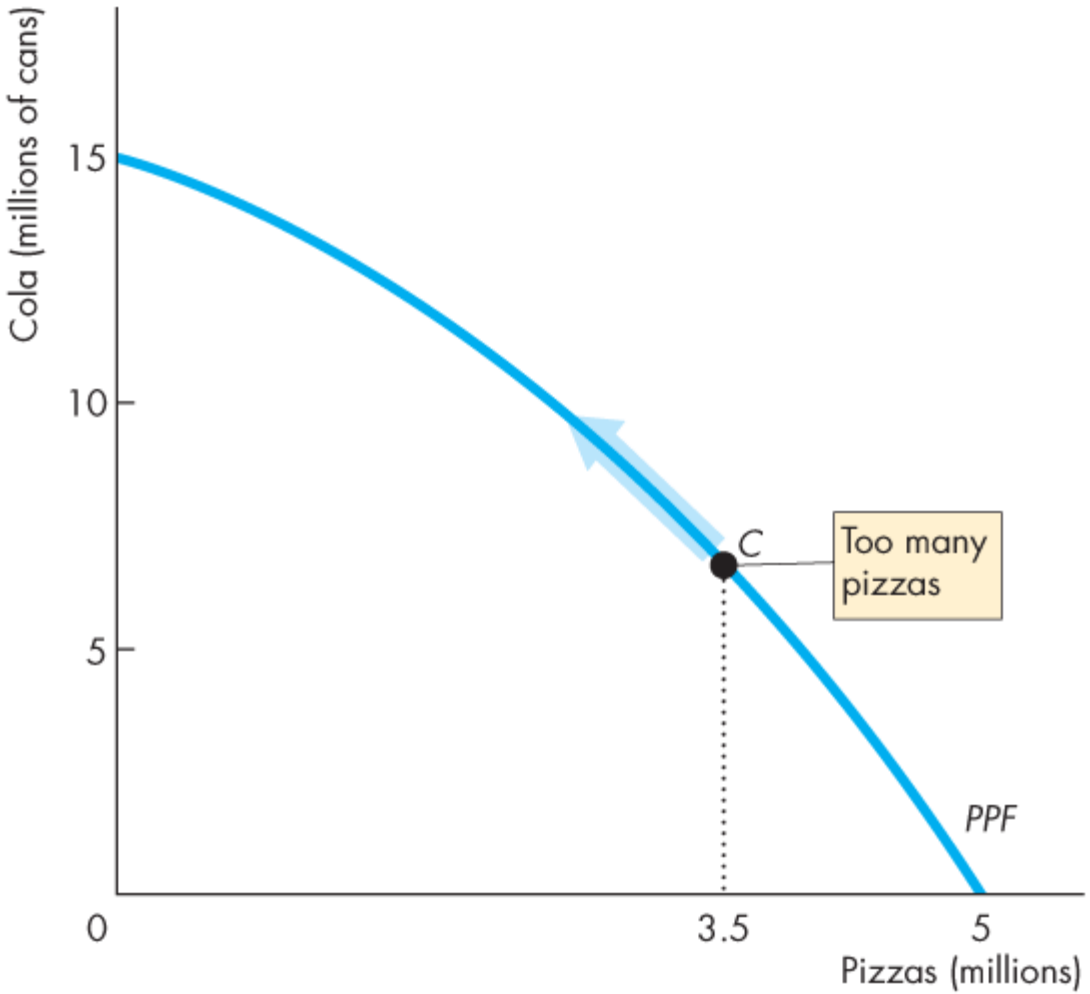

(a) On the *PPF*

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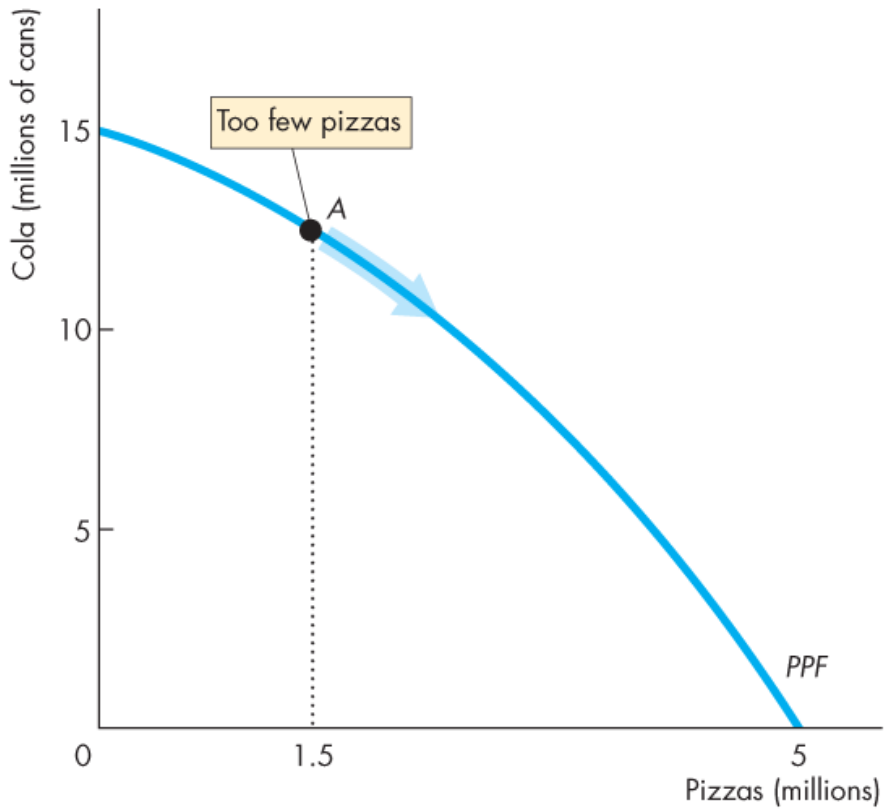
Using Resources Efficiently

If we produce fewer than 2.5 million pizzas, marginal benefit exceeds marginal cost.

We can get more value by producing more pizzas.

On the *PPF* at point *A*, we are producing 1.5 million pizzas, which is too few.

We are better off moving along the *PPF* to produce more pizzas.



(a) On the *PPF*

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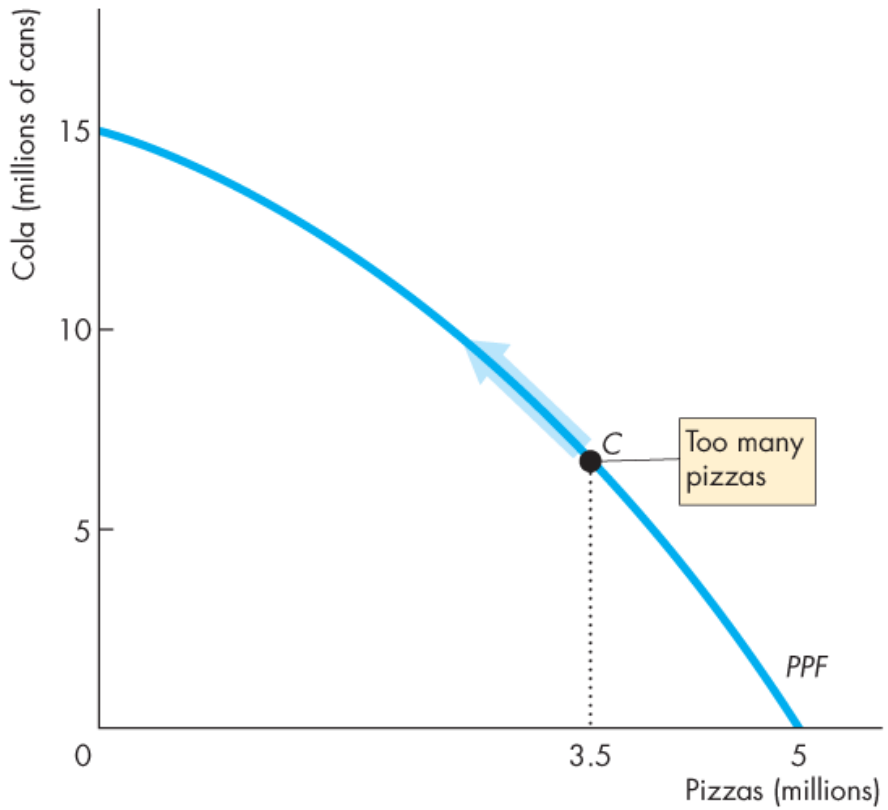
Using Resources Efficiently

If we produce more than 2.5 million pizzas, marginal cost exceeds marginal benefit.

We can get more value from our resources by producing fewer pizzas.

On the *PPF* at point *C*, we are producing 3.5 million pizzas, which is too many.

We are better off moving along the *PPF* to produce fewer pizzas.



(a) On the *PPF*

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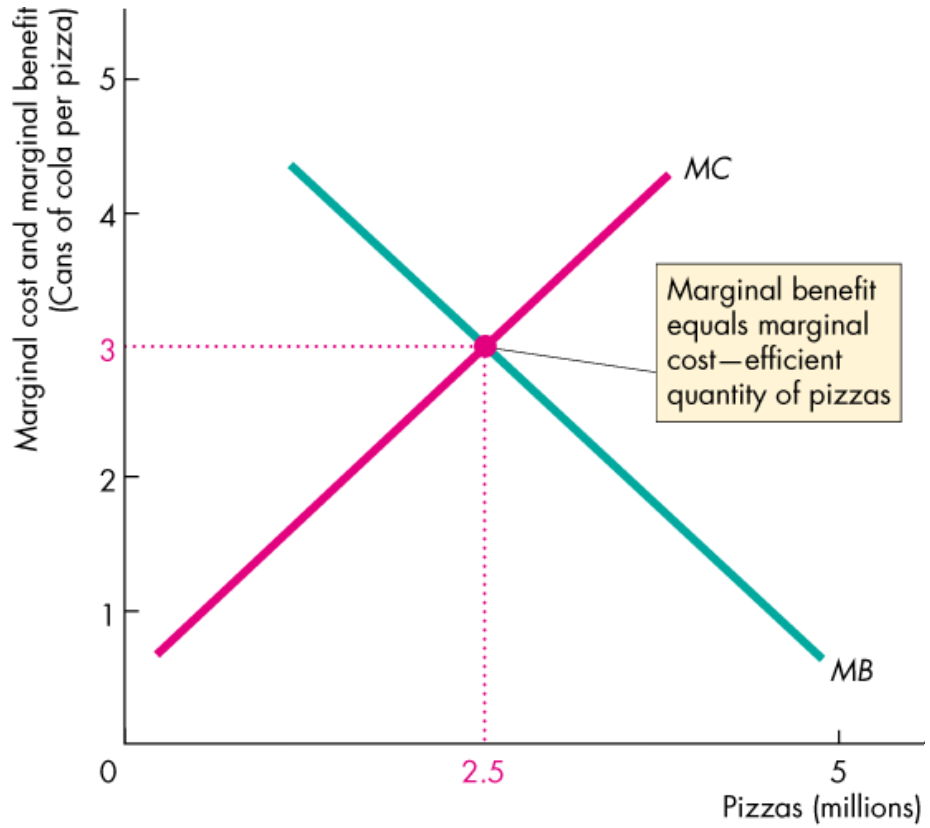
Using Resources Efficiently

On the *PPF* at point *B*, we are producing the efficient quantities of pizzas and cola.

If we produce exactly 2.5 million pizzas, marginal cost equals marginal benefit.

We cannot get more value from our resources.



(b) Marginal benefit equals marginal cost

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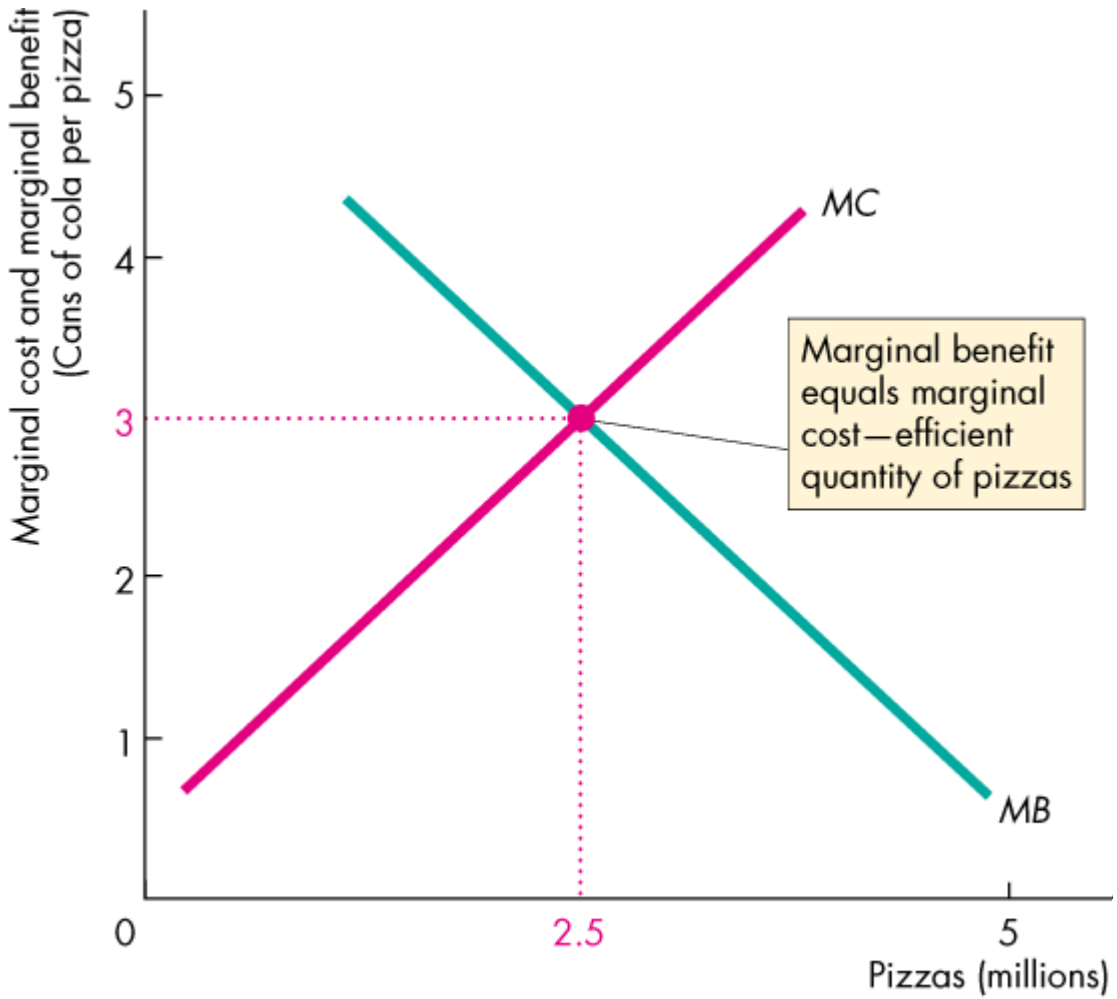

(b) Marginal benefit equals marginal cost

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Economic Growth

The expansion of production possibilities—an increase in the standard of living—is called **economic growth**.

Two key factors influence economic growth:

- Technological change
- Capital accumulation

Technological change is the development of new goods and of better ways of producing goods and services.

Capital accumulation is the growth of capital resources, which includes *human capital*.

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Economic Growth

The Cost of Economic Growth

To use resources in research and development and to produce new capital, we must decrease our production of consumption goods and services.

So economic growth is not free.

The opportunity cost of economic growth is less current consumption.

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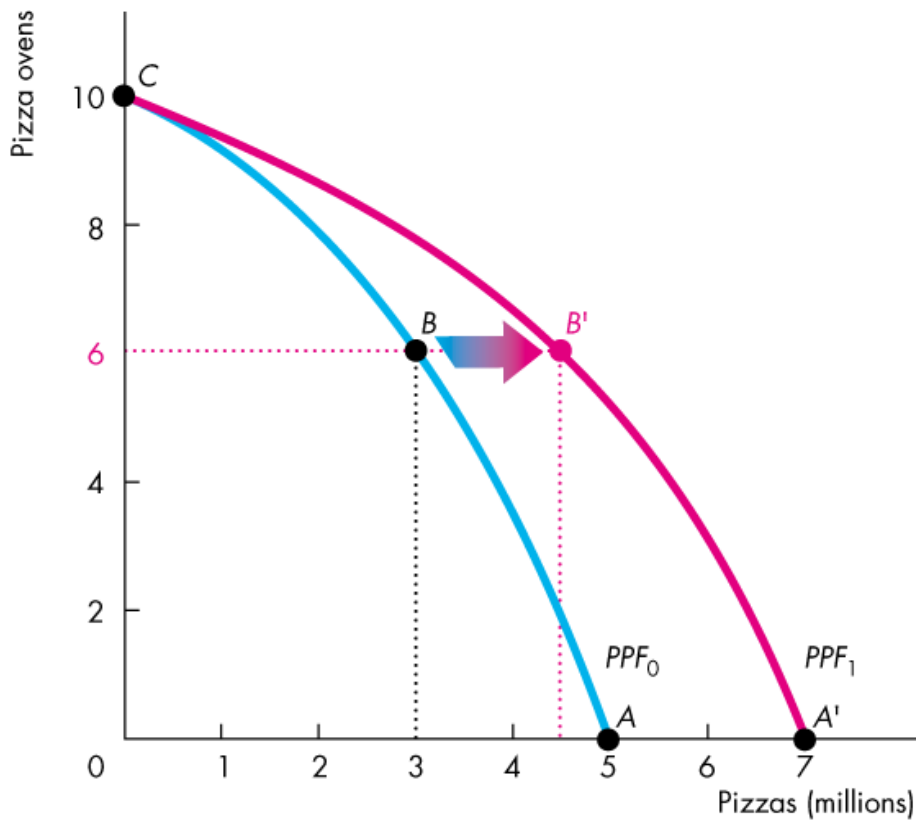
Economic Growth

Figure 2.5 illustrates the tradeoff we face.

We can produce pizzas or pizza ovens along PPF_0.

By using some resources to produce pizza ovens today, the *PPF* shifts outward in the future.



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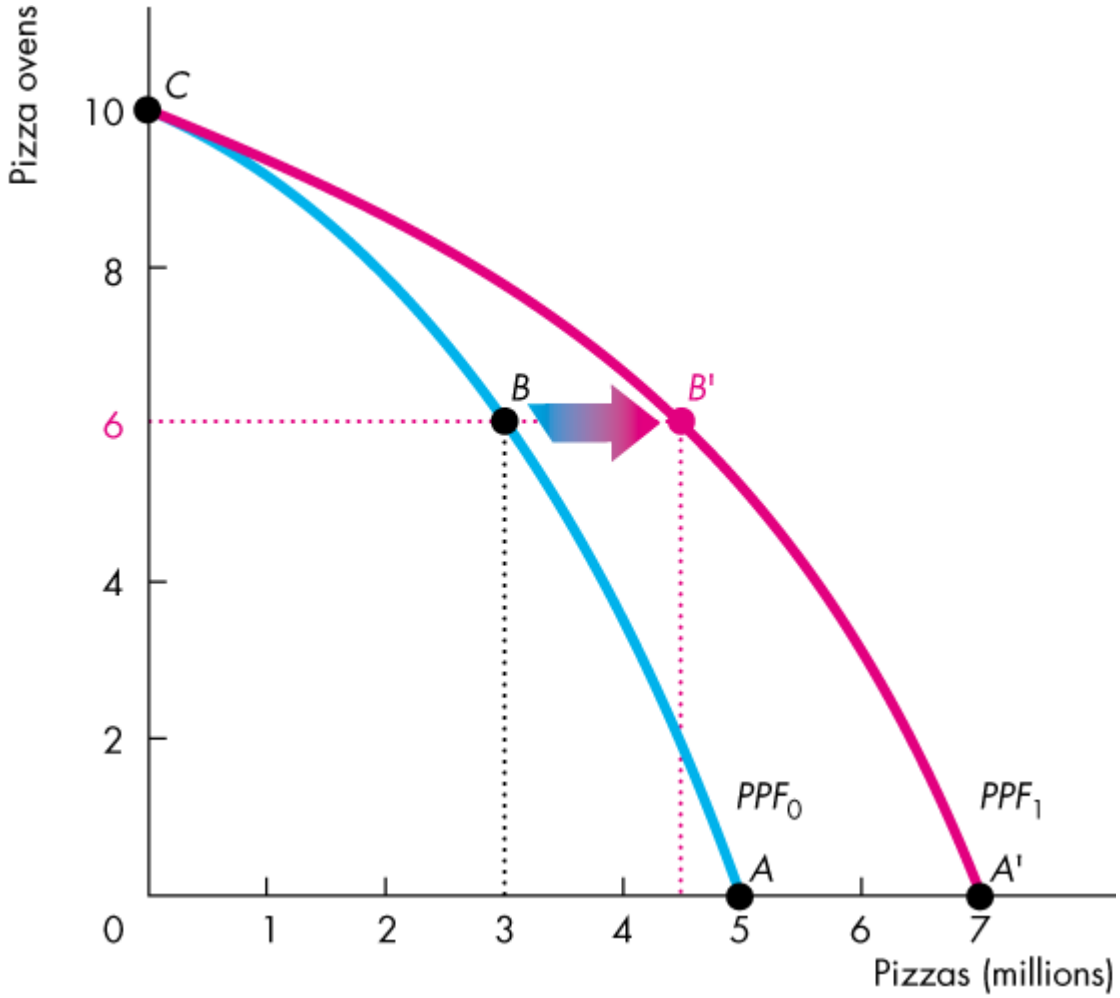

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Gains from Trade

Comparative Advantage and Absolute Advantage

A person has a **comparative advantage** in an activity if that person can perform the activity at a lower opportunity cost than anyone else.

A person has an **absolute advantage** if that person is more productive than others.

Absolute advantage involves comparing productivities while comparative advantage involves comparing opportunity costs.

Let's look at Joe and Liz who operate smoothie bars.

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Gains from Trade

Joe's Smoothie Bar

In an hour, Joe can produce 6 smoothies or 30 salads.

Joe's opportunity cost of producing 1 smoothie is 5 salads.

TABLE 2.1 Joe's Production Possibilities

Item	Minutes to produce 1	Quantity per hour
Smoothies	10	6
Salads	2	30

Joe's opportunity cost of producing 1 salad is 1/5 smoothie.

Joe spends 10 minutes making salads and 50 minutes making smoothies, so he produces 5 smoothies and 5 salads an hour.

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Gains from Trade

Liz's Smoothie Bar

In an hour, Liz can produce 30 smoothies or 30 salads.

Liz's opportunity cost of producing 1 smoothie is 1 salad.

TABLE 2.2 Liz's Production Possibilities

Item	Minutes to produce 1	Quantity per hour
Smoothies	2	30
Salads	2	30

Liz's opportunity cost of producing 1 salad is 1 smoothie.

Liz's customers buy salads and smoothies in equal number, so she produces 15 smoothies and 15 salads an hour.

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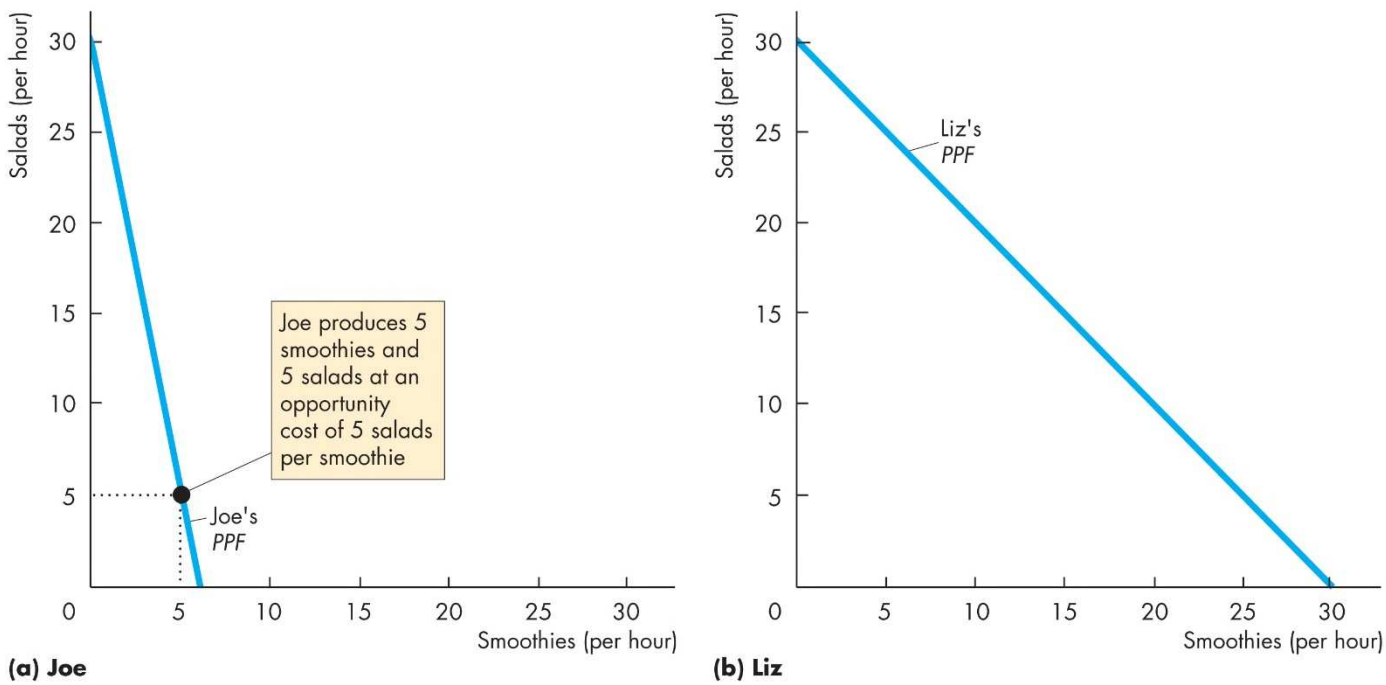
Gains from Trade

Figure 2.6 shows the production possibility frontiers.

In part (a), Joe's opportunity cost of a smoothie is 5 salads. Joe produces at point *A* on his *PPF.*



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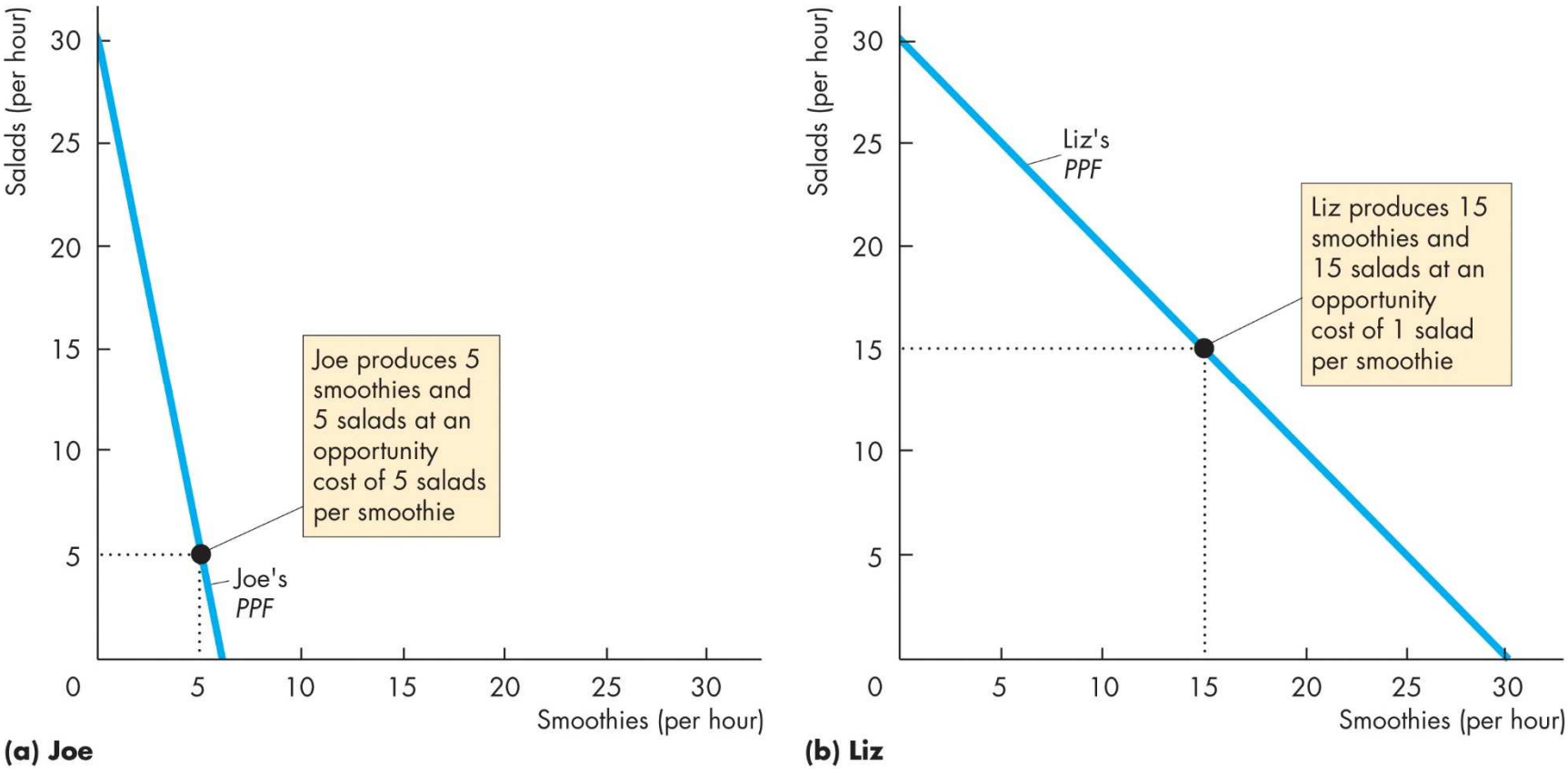

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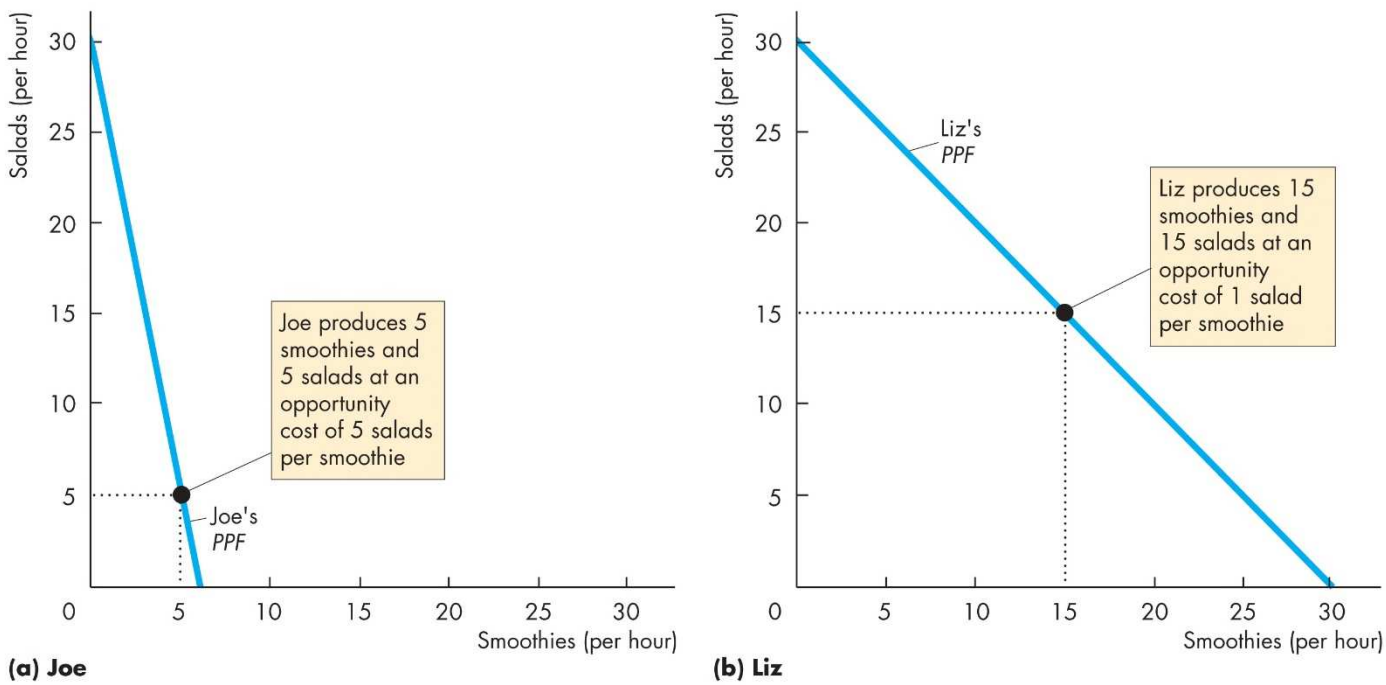
Gains from Trade

In part (b), Liz's opportunity cost of a smoothie is 1 salad. Liz produces at point *A* on her *PPF.*



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Gains from Trade

Joe's Comparative Advantage

Joe's opportunity cost of a salad is 1/5 smoothie.

Liz's opportunity cost of a salad is 1 smoothie.

Joe's opportunity cost of a salad is less than Liz's.

So Joe has a comparative advantage in producing salads.

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Gains from Trade

Liz's Comparative Advantage

Liz's opportunity cost of a smoothie is 1 salad.

Joe's opportunity cost of a smoothie is 5 salads.

Liz's opportunity cost of a smoothie is less than Joe's.

So Liz has a comparative advantage in producing smoothies.

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Gains from Trade

Achieving the Gains from Trade

Liz and Joe produce the good in which they have a comparative advantage:

- Liz produces 30 smoothies and 0 salads.
- Joe produces 30 salads and 0 smoothies.

TABLE 2.3 Liz and Joe Gain from Trade

(a) Before trade	Liz	Joe
Smoothies	15	5
Salads	15	5
(b) Specialization	**Liz**	**Joe**
Smoothies	30	0
Salads	0	30

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TABLE 2.3 Liz and Joe Gain from Trade

(a) Before trade	Liz	Joe
Smoothies	15	5
Salads	15	5
(b) Specialization	**Liz**	**Joe**
Smoothies	30	0
Salads	0	30
(c) Trade	**Liz**	**Joe**
Smoothies	sell 10	buy 10
Salads	buy 20	sell 20
(d) After trade	**Liz**	**Joe**
Smoothies	20	10
Salads	20	10
(e) Gains from trade	**Liz**	**Joe**
Smoothies	+5	+5
Salads	+5	+5

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Gains from Trade

Liz and Joe trade:

- Liz sells Joe 10 smoothies and buys 20 salads.
- Joe sells Liz 20 salads and buys 10 smoothies.

After trade:

- Liz has 20 smoothies and 20 salads.
- Joe has 10 smoothies and 10 salads.

TABLE 2.3 Liz and Joe Gain from Trade

(a) Before trade	Liz	Joe
Smoothies	15	5
Salads	15	5
(b) Specialization	**Liz**	**Joe**
Smoothies	30	0
Salads	0	30
(c) Trade	**Liz**	**Joe**
Smoothies	sell 10	buy 10
Salads	buy 20	sell 20
(d) After trade	**Liz**	**Joe**
Smoothies	20	10
Salads	20	10

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Gains from Trade

Gains from trade:

- Liz gains 5 smoothies and 5 salads an hour
- Joe gains 5 smoothies and 5 salads an hour

TABLE 2.3 Liz and Joe Gain from Trade

(a) Before trade	Liz	Joe
Smoothies	15	5
Salads	15	5
(b) Specialization	**Liz**	**Joe**
Smoothies	30	0
Salads	0	30
(c) Trade	**Liz**	**Joe**
Smoothies	sell 10	buy 10
Salads	buy 20	sell 20
(d) After trade	**Liz**	**Joe**
Smoothies	20	10
Salads	20	10
(e) Gains from trade	**Liz**	**Joe**
Smoothies	+5	+5
Salads	+5	+5

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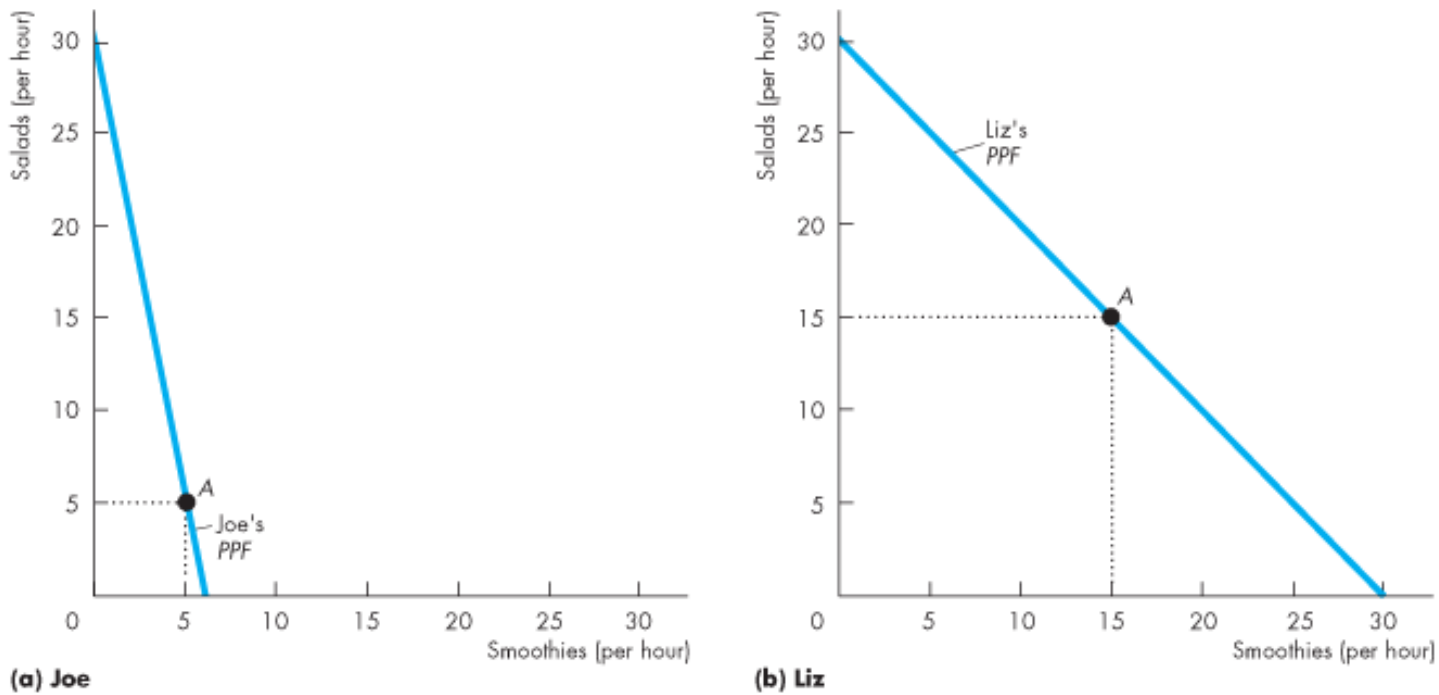
Gains from Trade

Figure 2.7 shows the gains from trade.

Joe's opportunity cost of producing a salad is less than Liz's.

So Joe has a comparative advantage in producing salads.



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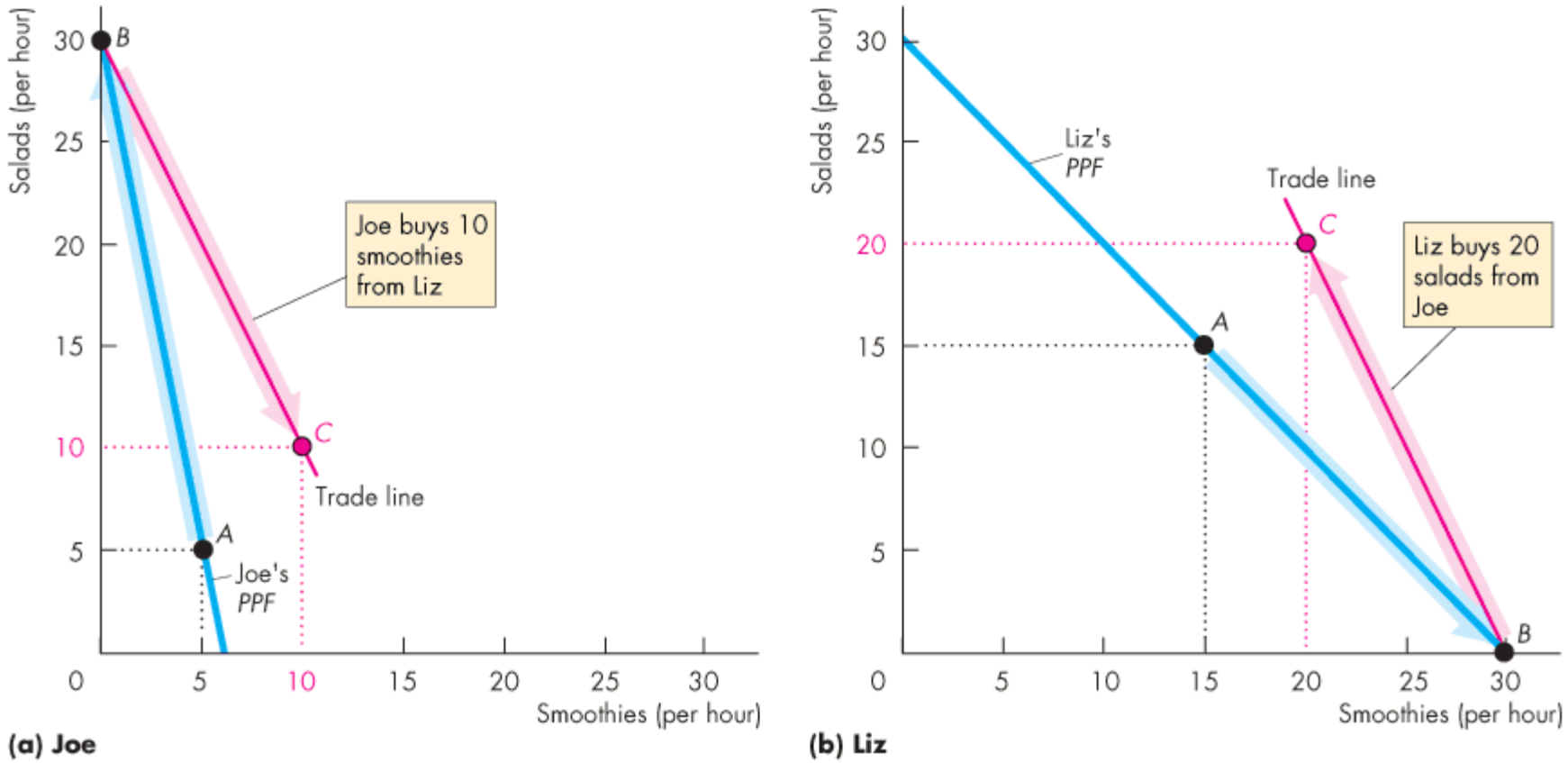

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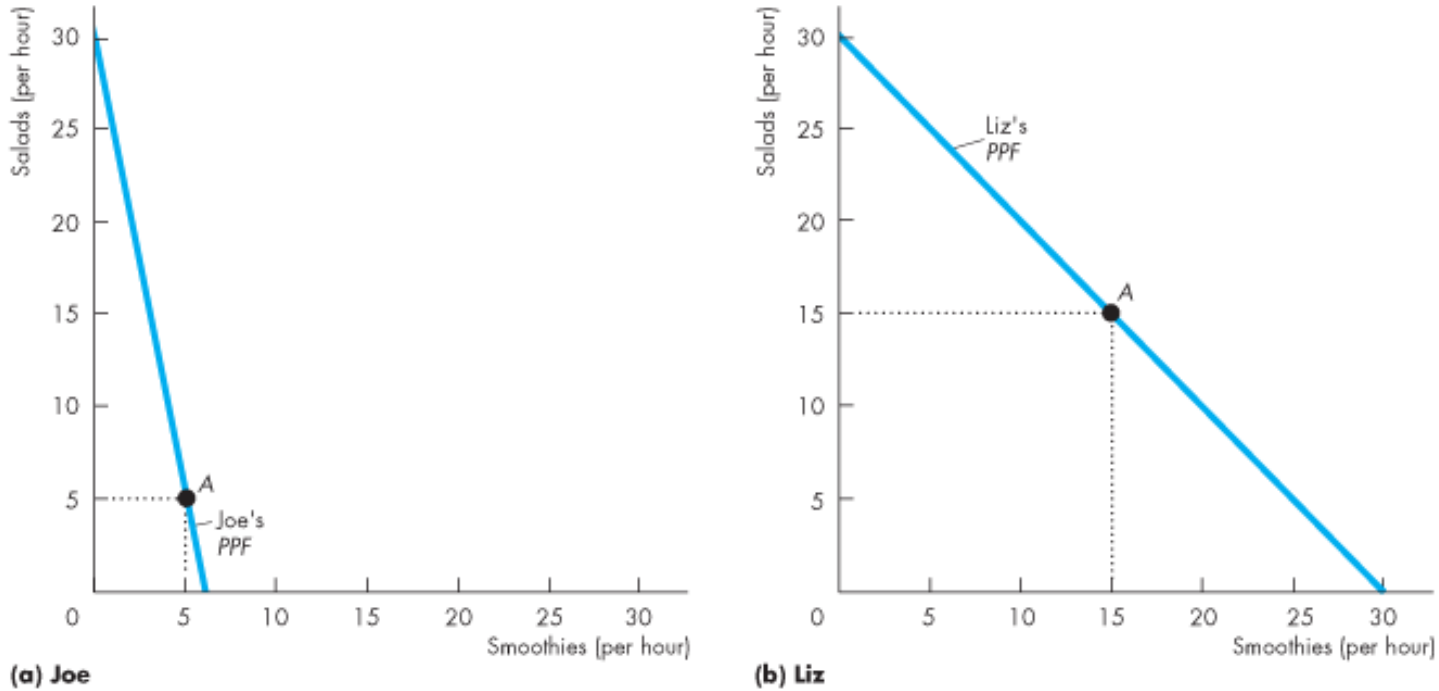
Gains from Trade

Liz's opportunity cost of producing a smoothie is less than Joe's.

So Liz has a comparative advantage in producing smoothies.



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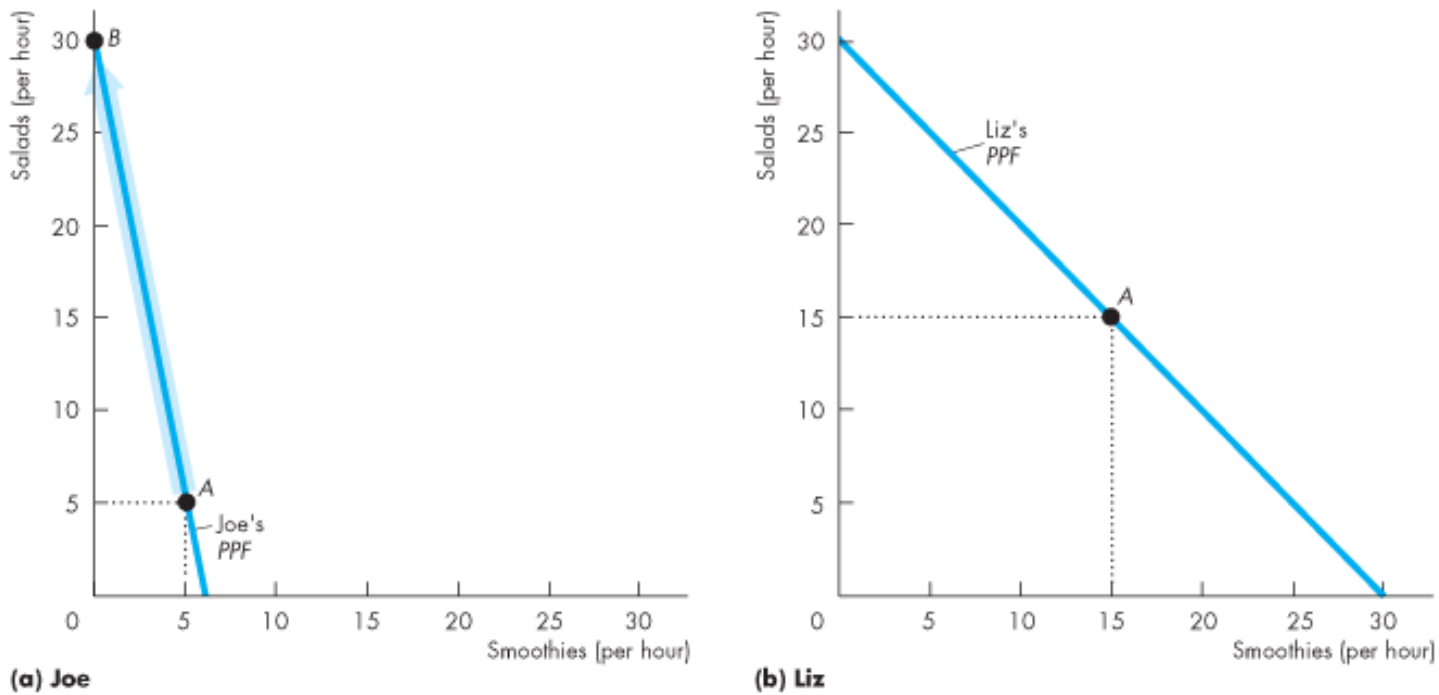
Gains from Trade

Joe specializes in producing salads and he produces 30 salads an hour at point *B* on his *PPF.*



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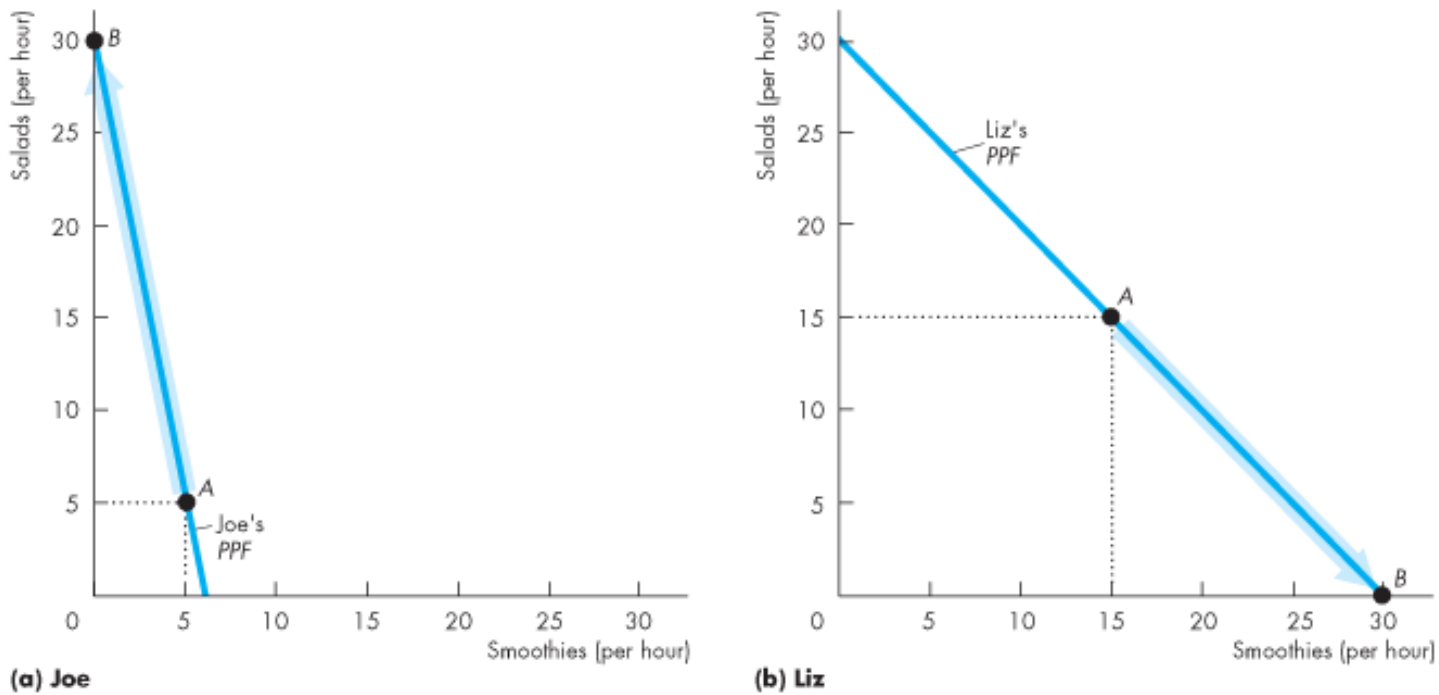
Gains from Trade

Liz specializes in producing smoothies and produces 30 smoothies an hour at point *B* on her *PPF.*



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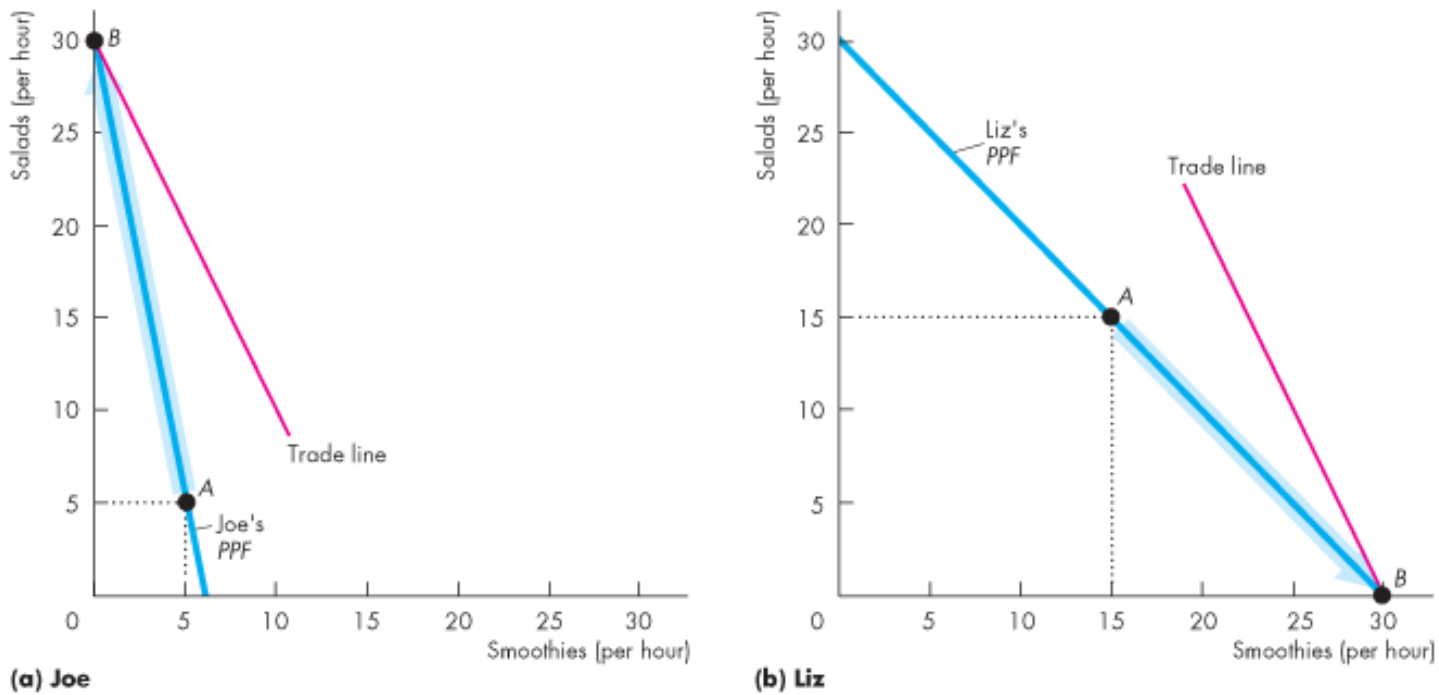
Gains from Trade

They trade salads for smoothies along the red “Trade line.”

The price of a salad is 2 smoothies or the price of a smoothie is ½ of a salad.



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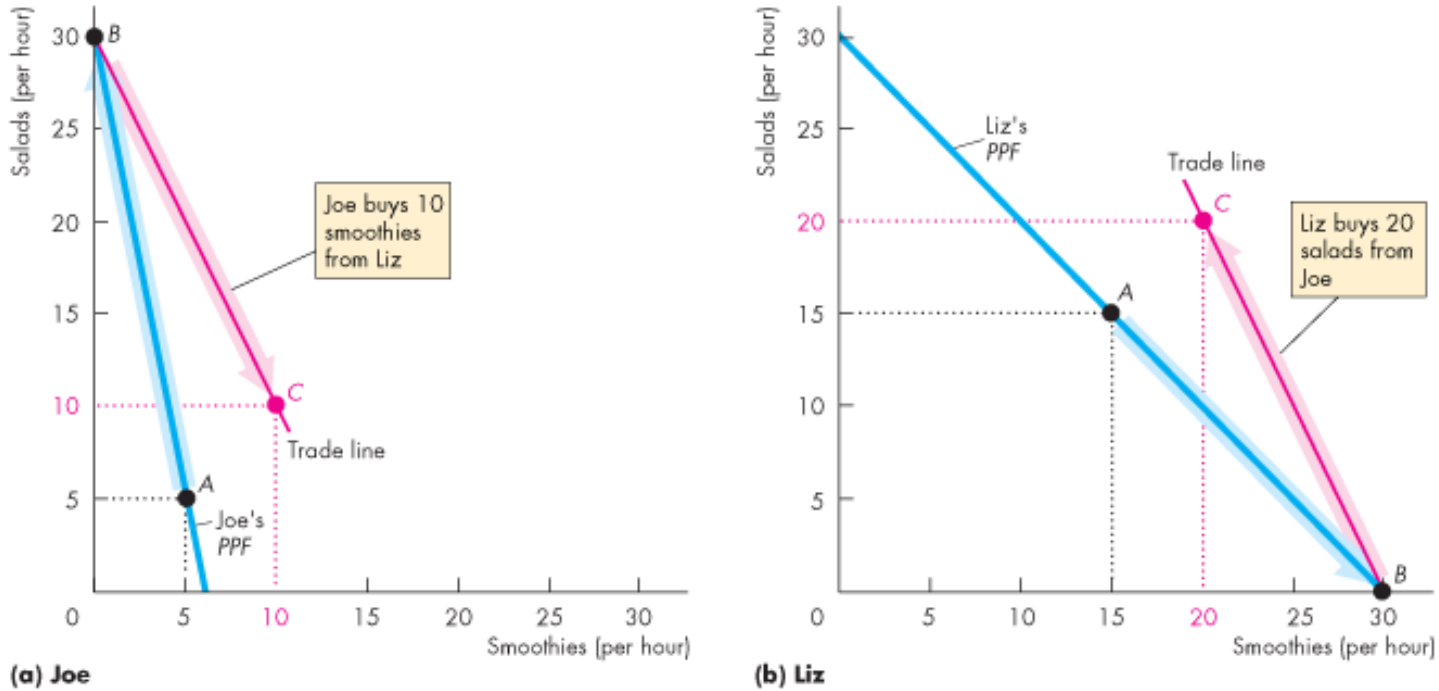
Gains from Trade

Joe buys smoothies from Liz and moves to point *C*—a point *outside* his *PPF*.

Liz buys salads from Joe and moves to point *C*—a point *outside* her *PPF*.



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Economic Coordination

To reap the gains from trade, the choices of individuals must be coordinated.

To make coordination work, four complimentary social institutions have evolved over the centuries:

- Firms
- Markets
- Property rights
- Money

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Economic Coordination

A **firm** is an economic unit that hires factors of production and organizes those factors to produce and sell goods and services.

A **market** is any arrangement that enables buyers and sellers to get information and do business with each other.

Property rights are the social arrangements that govern ownership, use, and disposal of resources, goods or services.

Money is any commodity or token that is generally acceptable as a means of payment.

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Economic Coordination

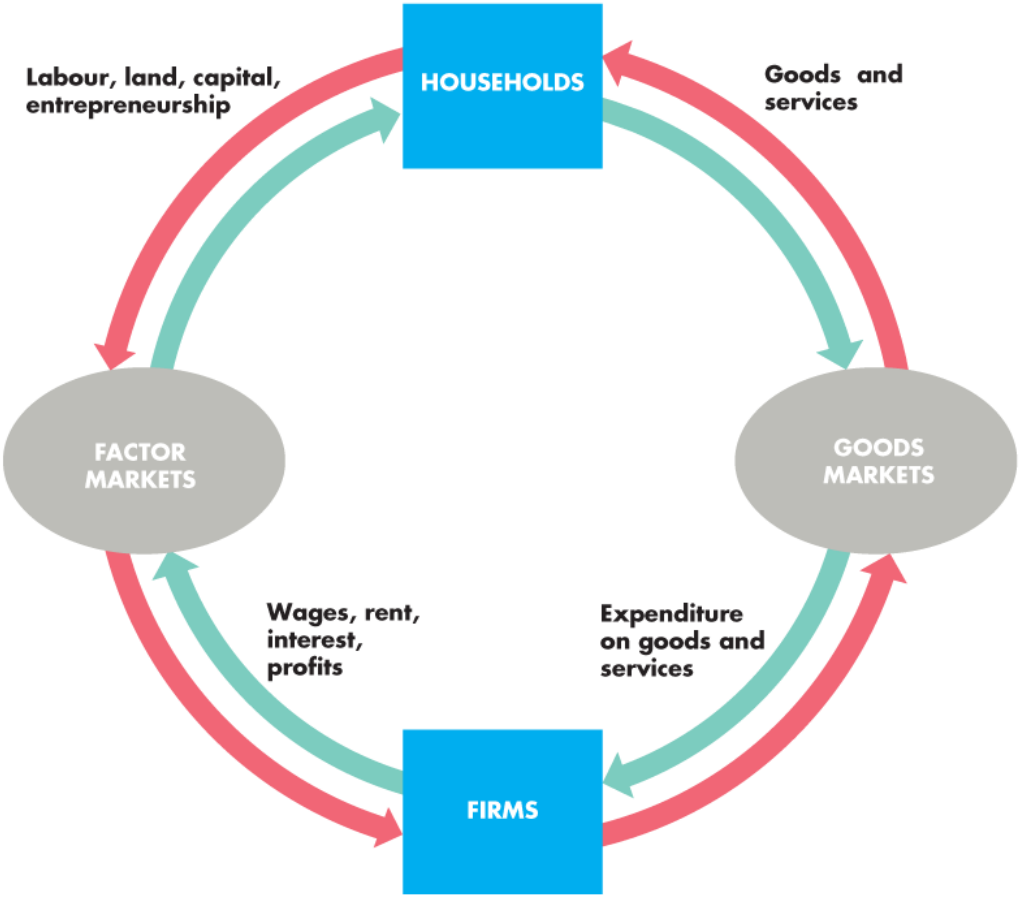
Circular Flows Through Markets

Figure 2.8 illustrates how households and firms interact in the market economy.

Factors of production, and …

goods and services flow in one direction.

Money flows in the opposite direction.



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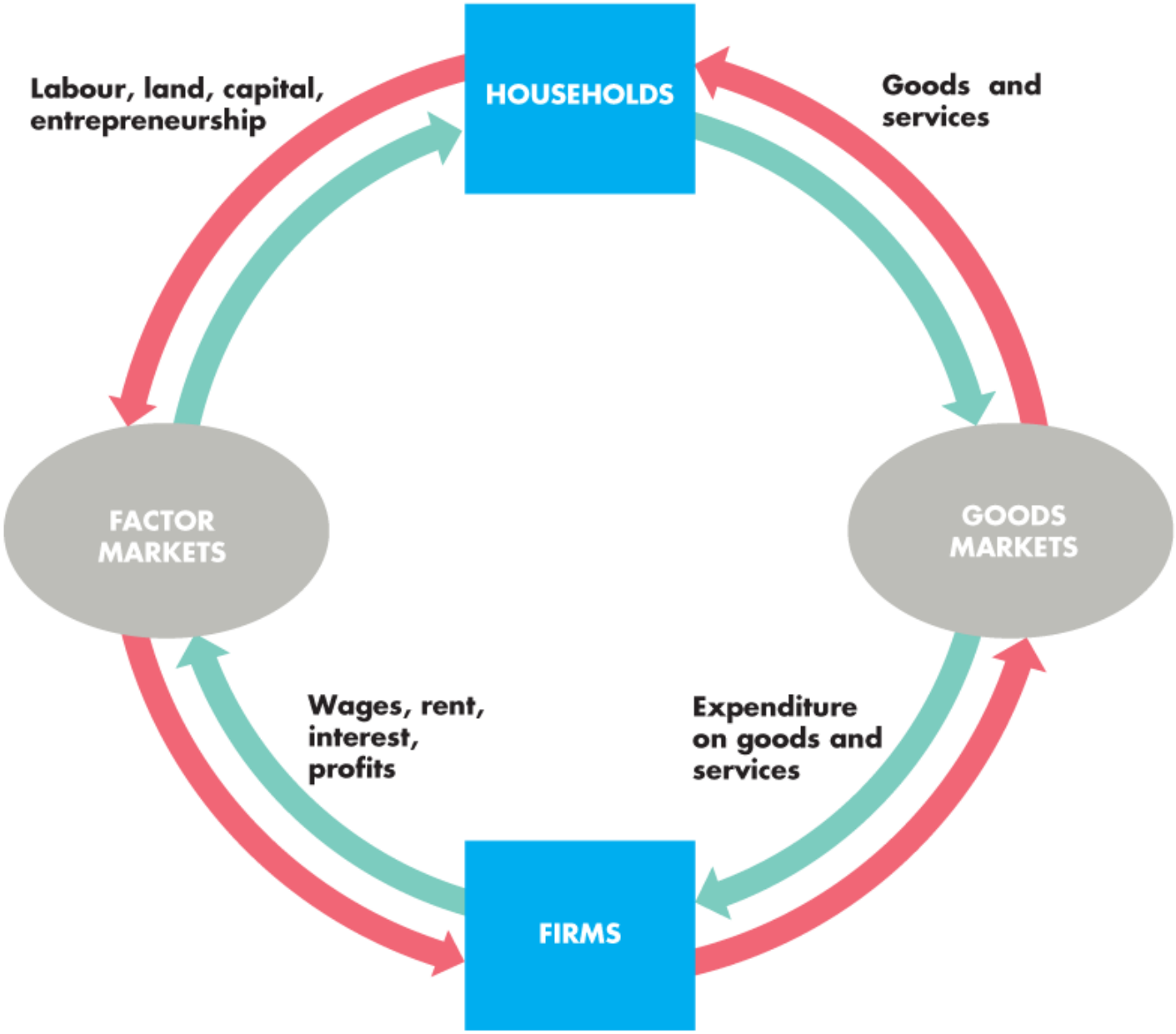

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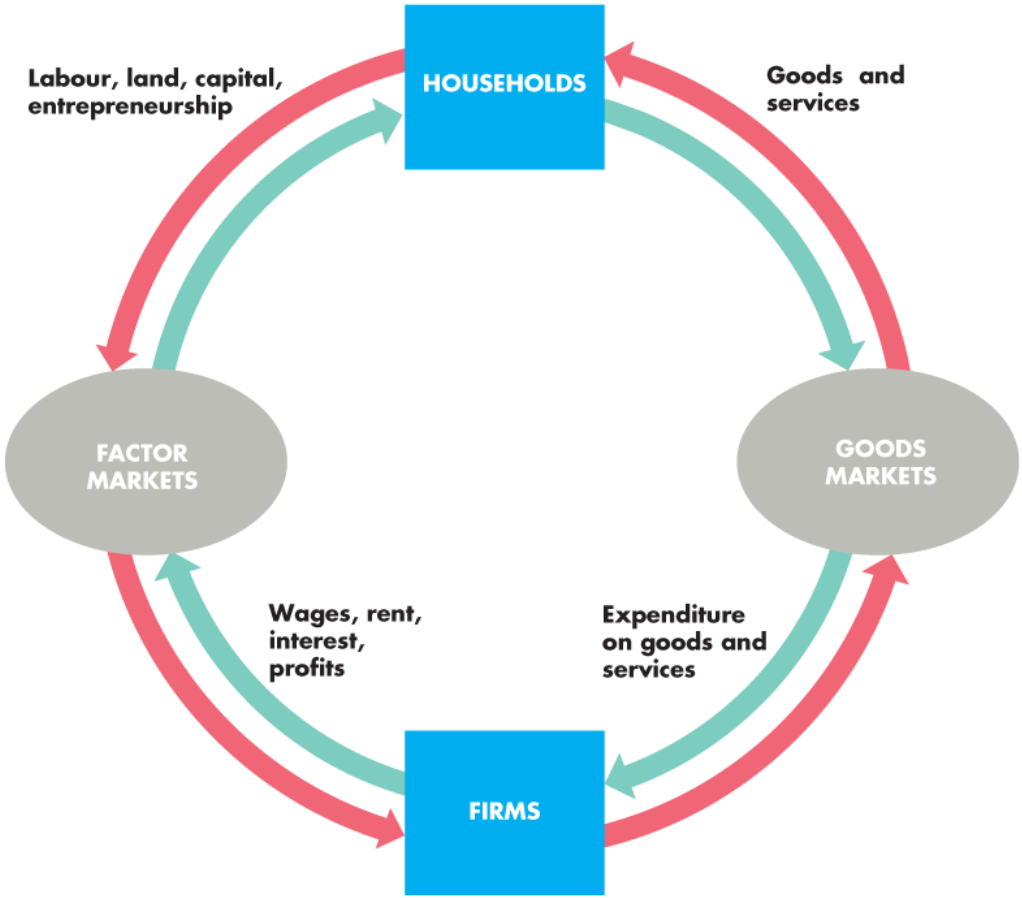
Economic Coordination

Coordinating Decisions

Markets coordinate individual decisions through price adjustments.



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ECONOMICS

CANADA IN THE GLOBAL ENVIRONMENT NINTH EDITION

PARKIN BADE

Microeconomics Canada in the Global Environment (Canadian) 9th edition Parkin Solutions Manual

2 THE ECONOMIC PROBLEM

After studying this chapter, you will be able to:

- Define the production possibilities frontier and use it to calculate opportunity cost
- Distinguish between production possibilities and preferences and describe an efficient allocation of resources
- Explain how current production choices expand future production possibilities
- Explain how specialization and trade expand production possibilities
- Describe the economic institutions that coordinate decision

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Production Possibilities and Opportunity Cost

The **production possibilities frontier** (*PPF*) is the boundary between those combinations of goods and services that can be produced and those that cannot.

To illustrate the *PPF*, we focus on two goods at a time and hold the quantities of all other goods and services constant.

That is, we look at a model economy in which everything remains the same (*ceteris paribus*) except the two goods we're considering.

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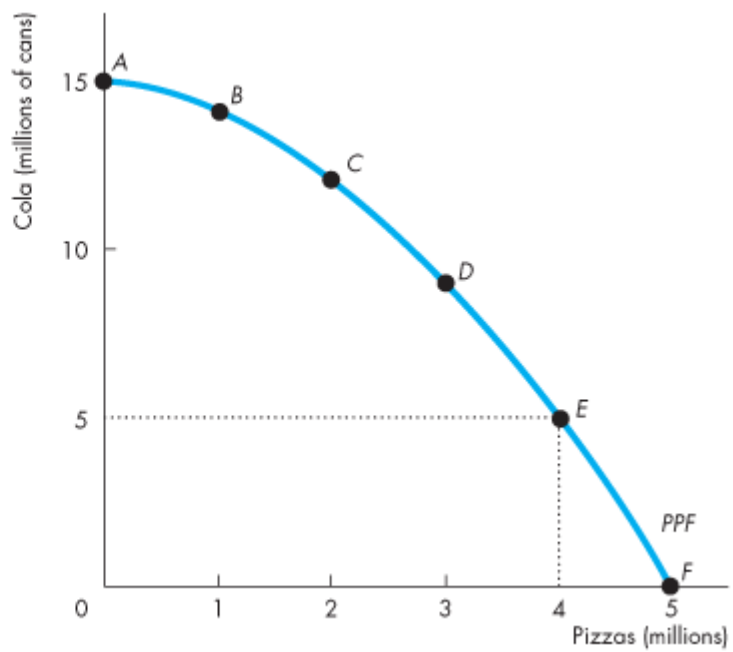
Production Possibilities and Opportunity Cost

Production Possibilities Frontier

Figure 2.1 shows the *PPF* for two goods: cola and pizzas.

Possibility	Pizzas (millions)		Cola (millions of cans)
A	0	and	15
B	1	and	14
C	2	and	12
D	3	and	9
E	4	and	5
F	5	and	0



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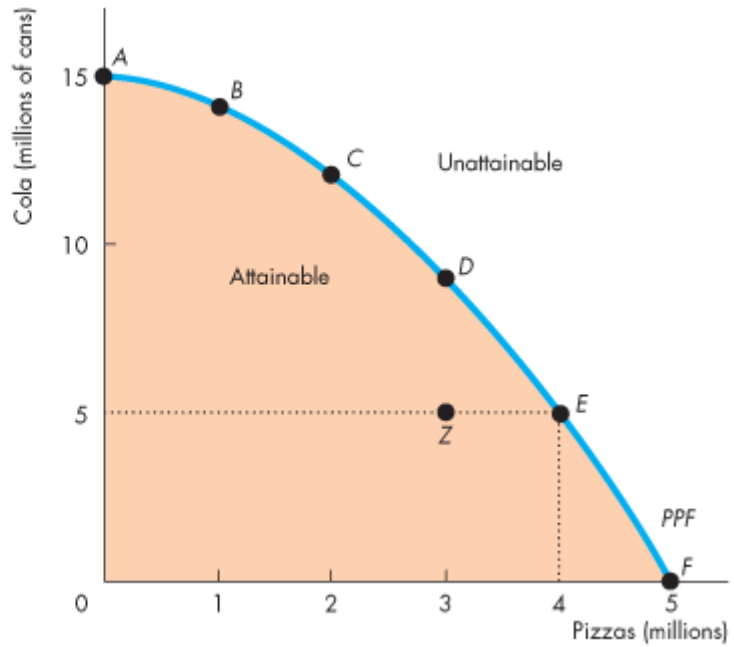
Production Possibilities and Opportunity Cost

Any point *on* the frontier such as *E* and any point *inside* the *PPF* such as *Z* are attainable.

Points outside the *PPF* are unattainable.

Possibility	Pizzas (millions)		Cola (millions of cans)
A	0	and	15
B	1	and	14
C	2	and	12
D	3	and	9
E	4	and	5
F	5	and	0



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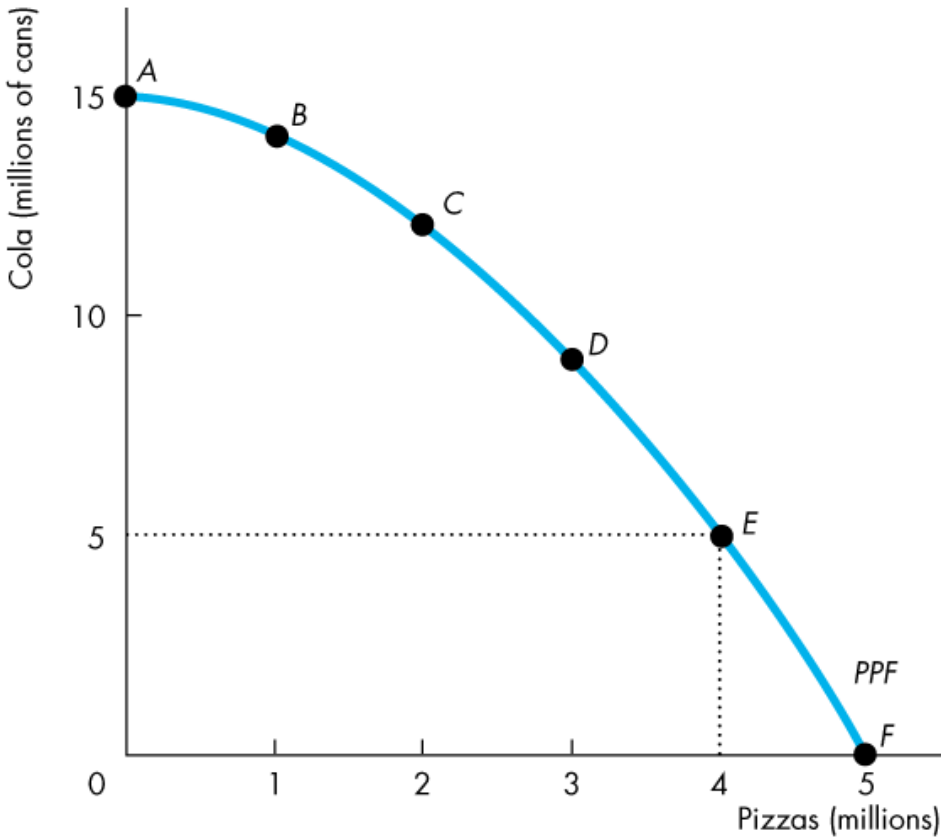
Production Possibilities and Opportunity Cost

Production Efficiency

We achieve **production efficiency** if we cannot produce more of one good without producing less of some other good.

Points on the frontier are *efficient*.



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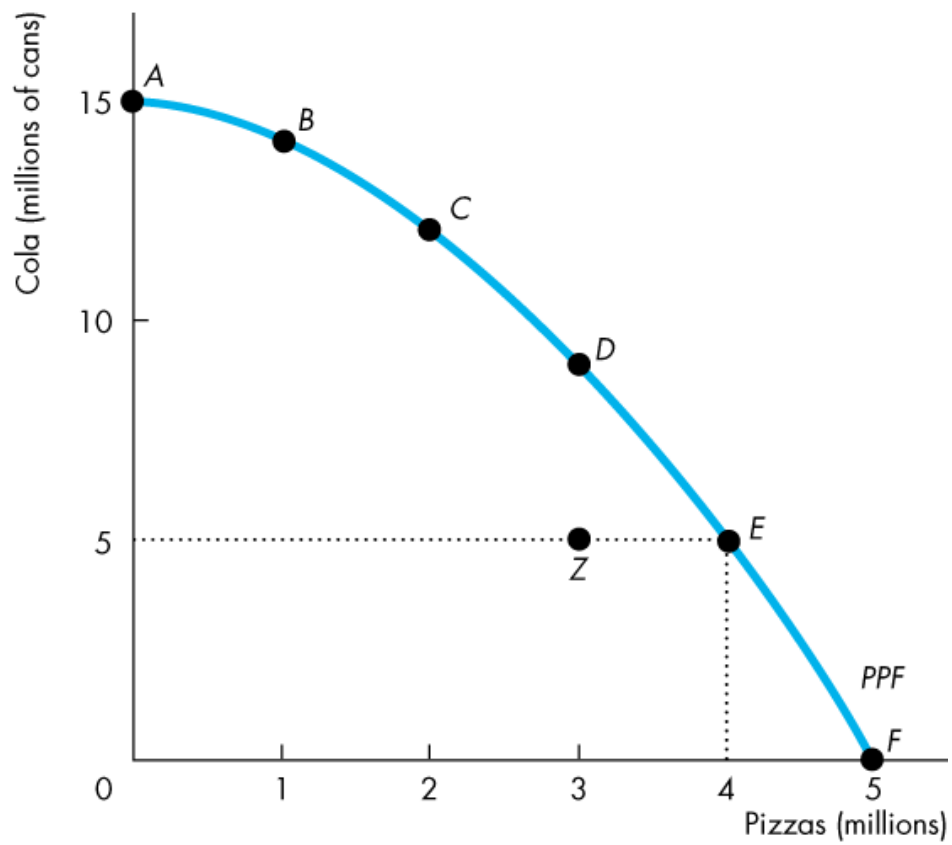
Production Possibilities and Opportunity Cost

Any point inside the frontier, such as *Z*, is *inefficient*.

At such a point, it is possible to produce more of one good without producing less of the other good.

At *Z*, resources are either unemployed or misallocated.



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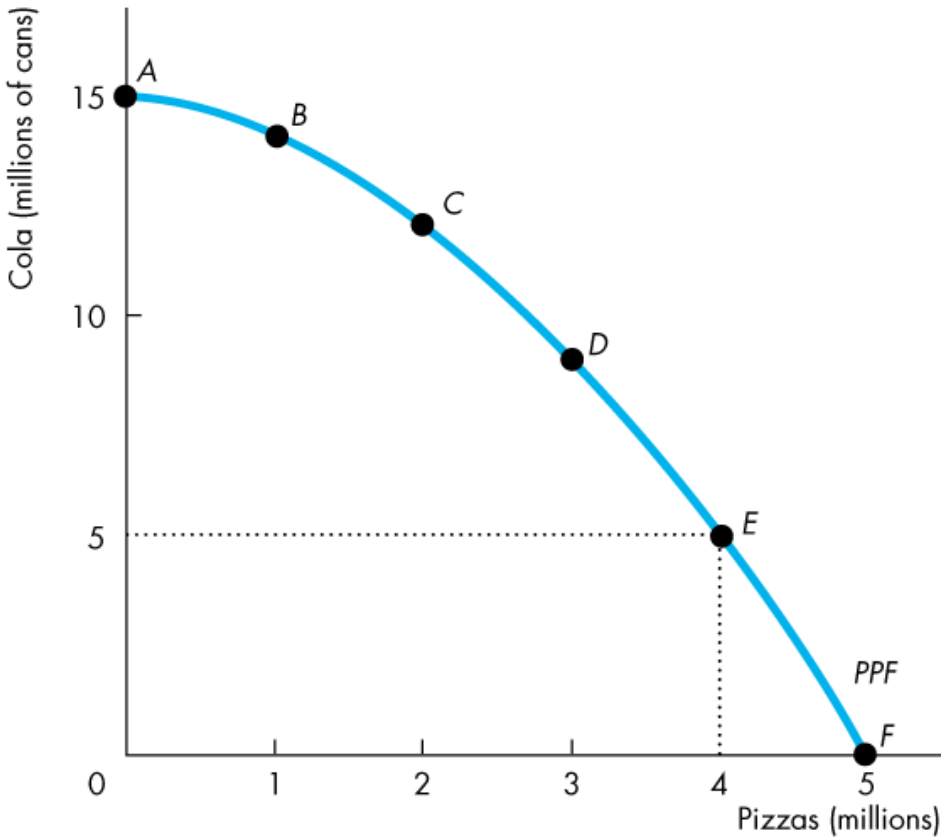
Production Possibilities and Opportunity Cost

Tradeoff Along the *PPF*

Every choice along the *PPF* involves a *tradeoff*.

On this *PPF*, we must give up some cola to get more pizzas or give up some pizzas to get more cola.



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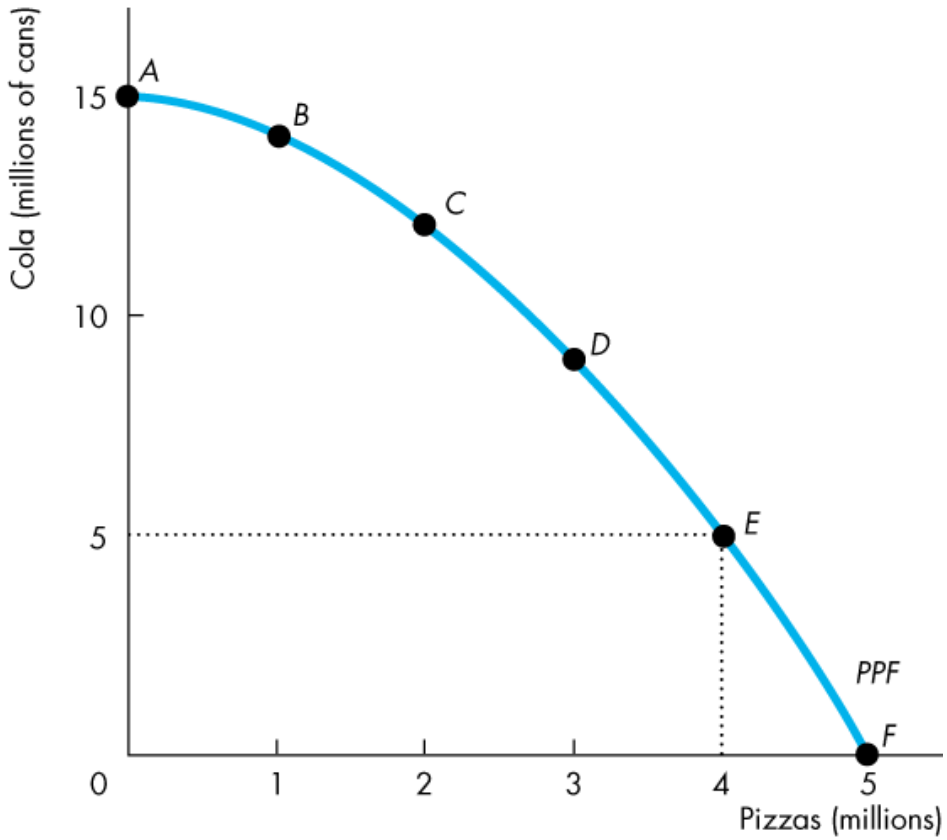
Production Possibilities and Opportunity Cost

Opportunity Cost

As we move down along the *PPF,*

we produce more pizzas, but the quantity of cola we can produce decreases.

The opportunity cost of a pizza is the cola forgone.



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Production Possibilities and Opportunity Cost

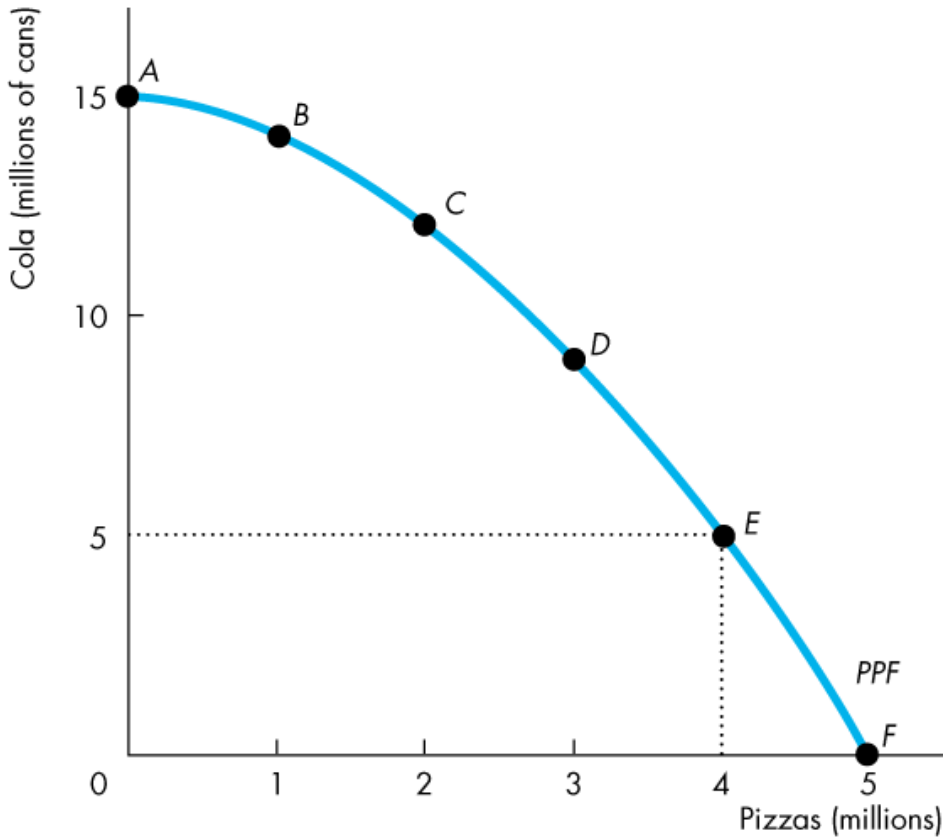
In moving from *E* to *F*:

The quantity of pizzas increases by 1 million.

The quantity of cola decreases by 5 million cans.

The opportunity cost of the fifth 1 million pizzas is 5 million cans of cola.

One of these pizzas costs 5 cans of cola.



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Production Possibilities and Opportunity Cost

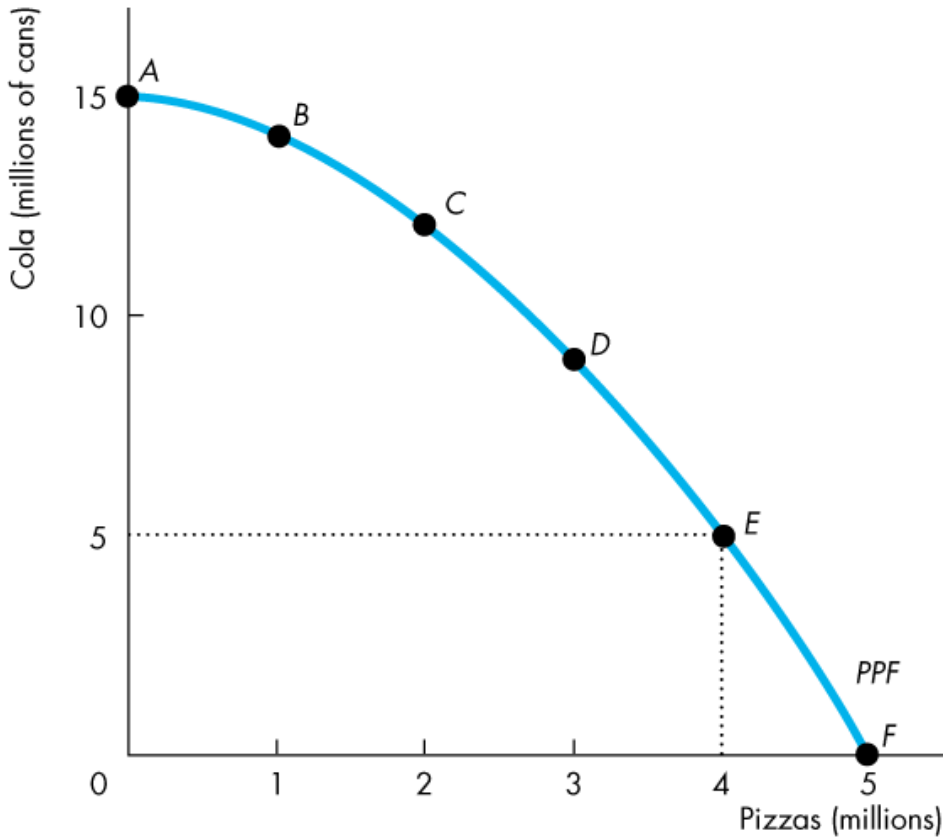
In moving from *F* to *E*:

The quantity of cola increases by 5 million cans.

The quantity of pizzas decreases by 1 million.

The opportunity cost of the first 5 million cans of cola is 1 million pizzas.

One of these cans of cola costs 1/5 of a pizza.



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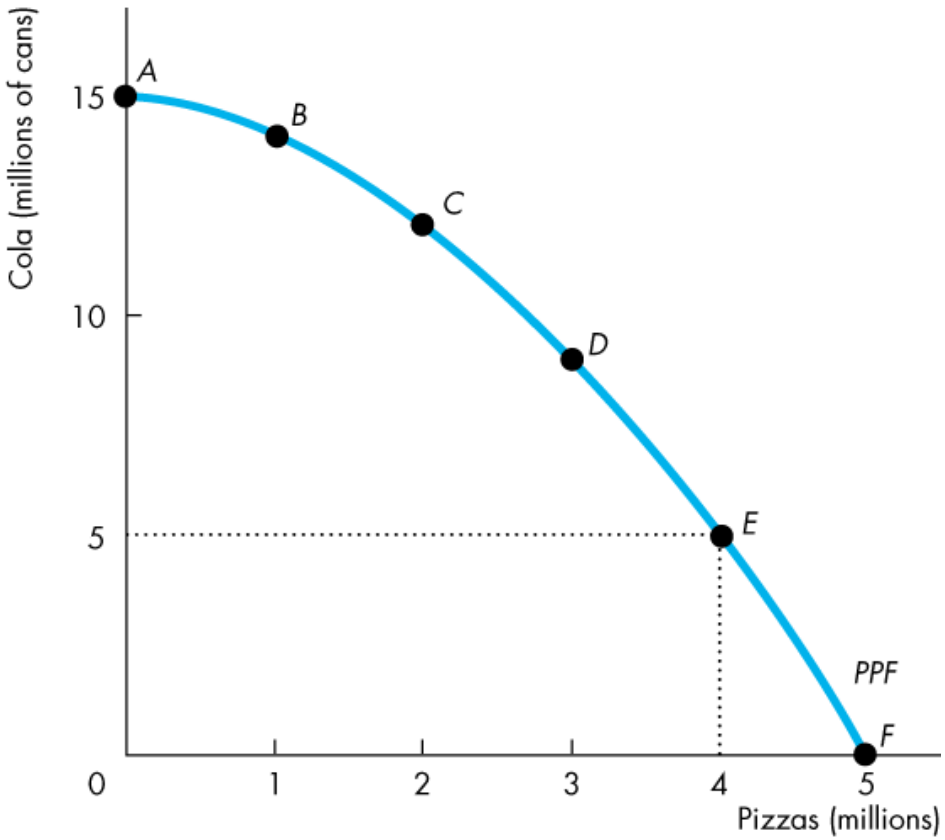
Production Possibilities and Opportunity Cost

Opportunity Cost Is a Ratio

Note that the opportunity cost of a can of cola is the *inverse* of the opportunity cost of a pizza.

One pizza costs 5 cans of cola.

One can of cola costs 1/5 of a pizza.



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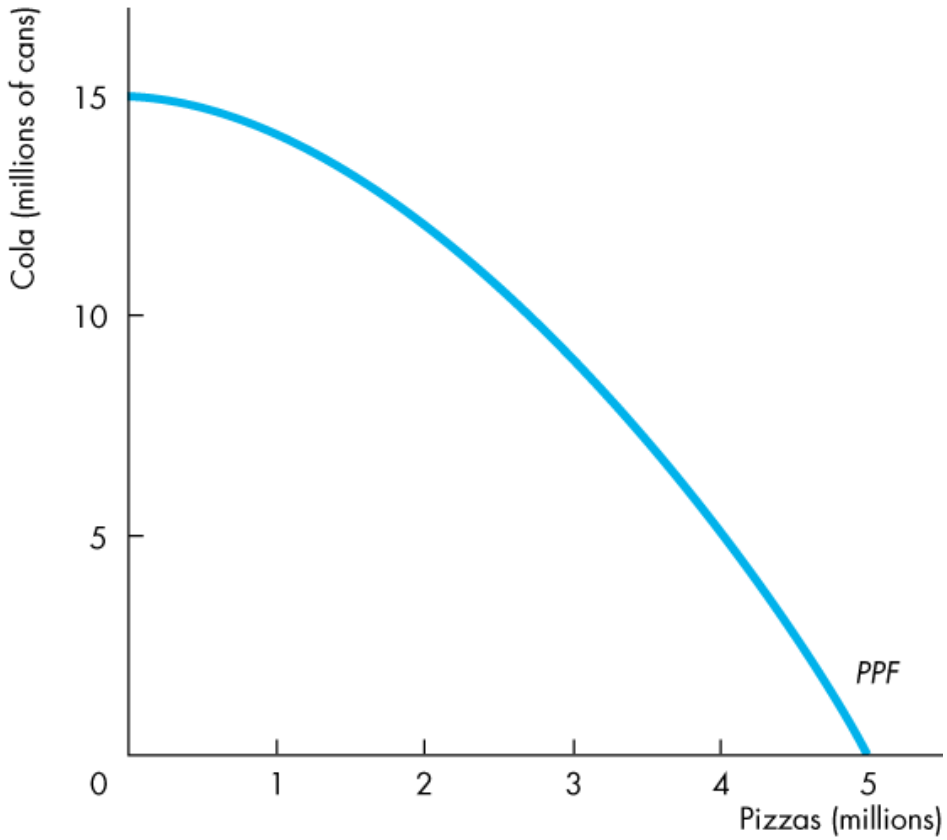
Production Possibilities and Opportunity Cost

Increasing Opportunity Cost

Because resources are not equally productive in all activities, the *PPF* bows outward.

The outward bow of the *PPF* means that as the quantity produced of each good increases, so does its opportunity cost.



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Using Resources Efficiently

All the points along the *PPF* are efficient.

To determine which of the alternative efficient quantities to produce, we compare costs and benefits.

The *PPF* and Marginal Cost

The *PPF* determines opportunity cost.

The **marginal cost** of a good or service is the opportunity cost of producing *one more unit* of it.

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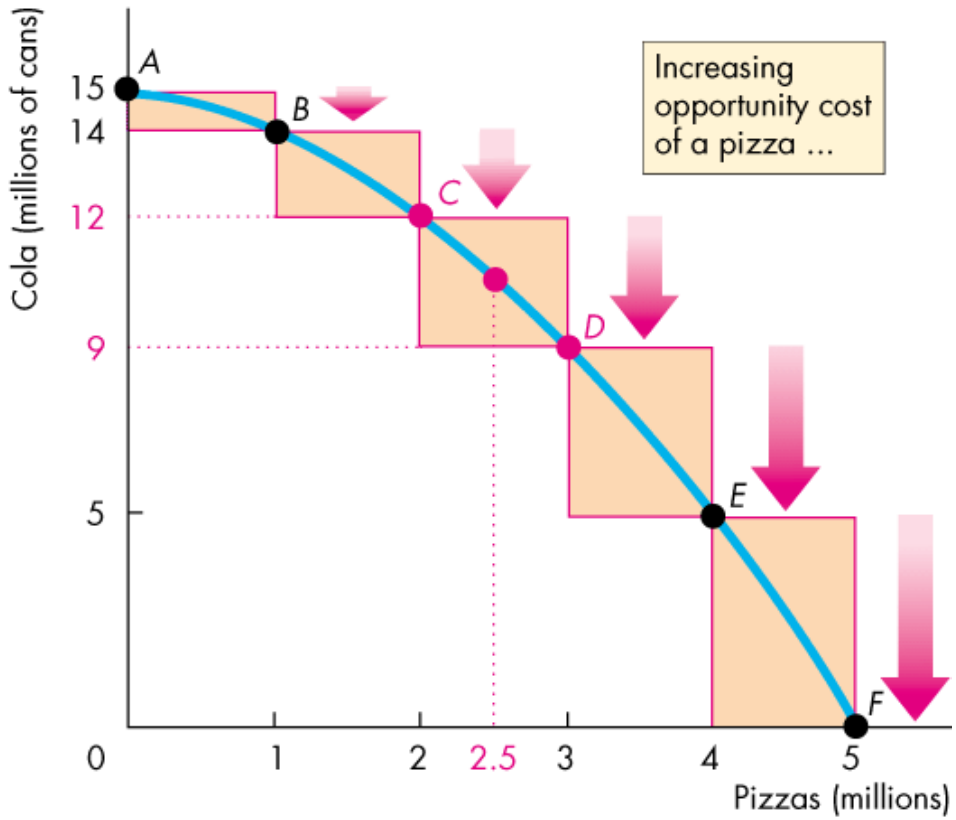
Using Resources Efficiently

Figure 2.2 illustrates the marginal cost of a pizza.

As we move along the *PPF*, the opportunity cost of a pizza increases.

The opportunity cost of producing one more pizza is the marginal cost of a pizza.



(a) *PPF* and opportunity cost

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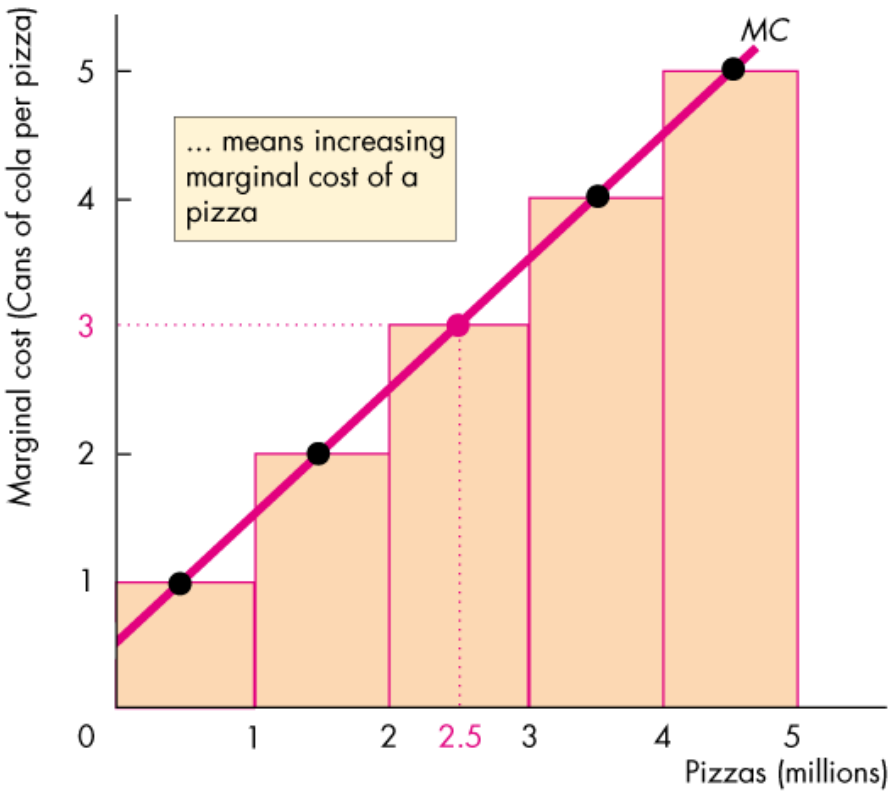
Using Resources Efficiently

In part (b) of Fig. 2.2, the bars illustrate the increasing opportunity cost of a pizza.

The black dots and the line *MC* show the marginal cost of producing a pizza.

The *MC* curve passes through the center of each bar.



(b) Marginal cost

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Using Resources Efficiently

Preferences and Marginal Benefit

Preferences are a description of a person's likes and dislikes.

To describe preferences, economists use the concepts of marginal benefit and the marginal benefit curve.

The **marginal benefit** of a good or service is the benefit received from consuming one more unit of it.

We measure marginal benefit by the amount that a person is *willing to pay* for an additional unit of a good or service.

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Using Resources Efficiently

It is a general principle that:

The more we have of any good, the smaller is its marginal benefit and …

the less we are willing to pay for an additional unit of it.

We call this general principle the *principle of decreasing marginal benefit*.

The **marginal benefit curve** shows the relationship between the marginal benefit of a good and the quantity of that good consumed.

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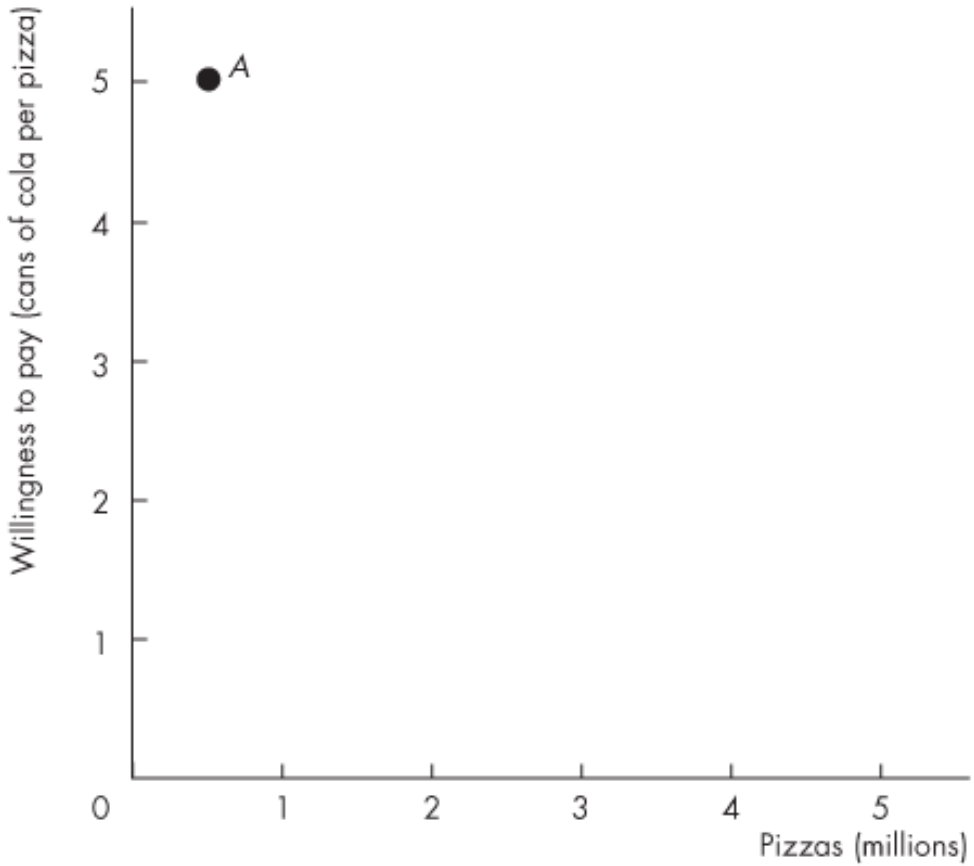
Using Resources Efficiently

At point *A*, with 0.5 million pizzas available, people are willing to pay 5 cans of cola for a pizza.

Possibility	Pizzas (millions)	Willingness to pay (cans of cola per pizza)
A	0.5	5



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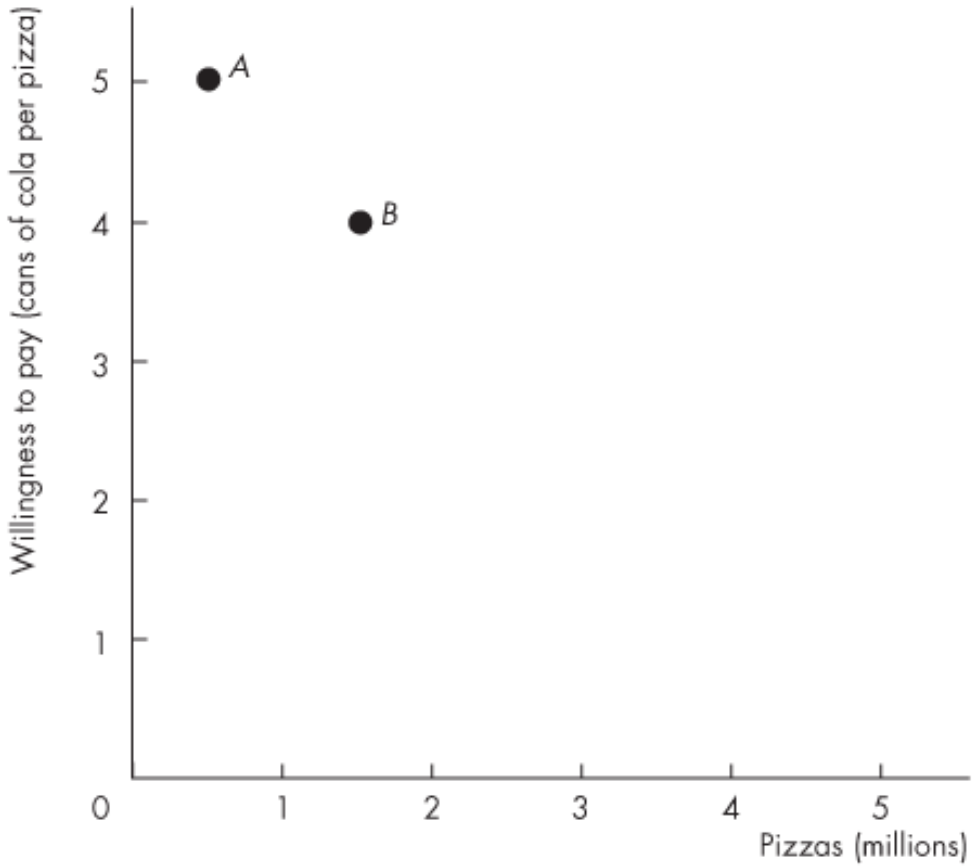
Using Resources Efficiently

At point *B*, with 1.5 million pizzas available, people are willing to pay 4 cans of cola for a pizza

Possibility	Pizzas (millions)	Willingness to pay (cans of cola per pizza)
A	0.5	5
B	1.5	4



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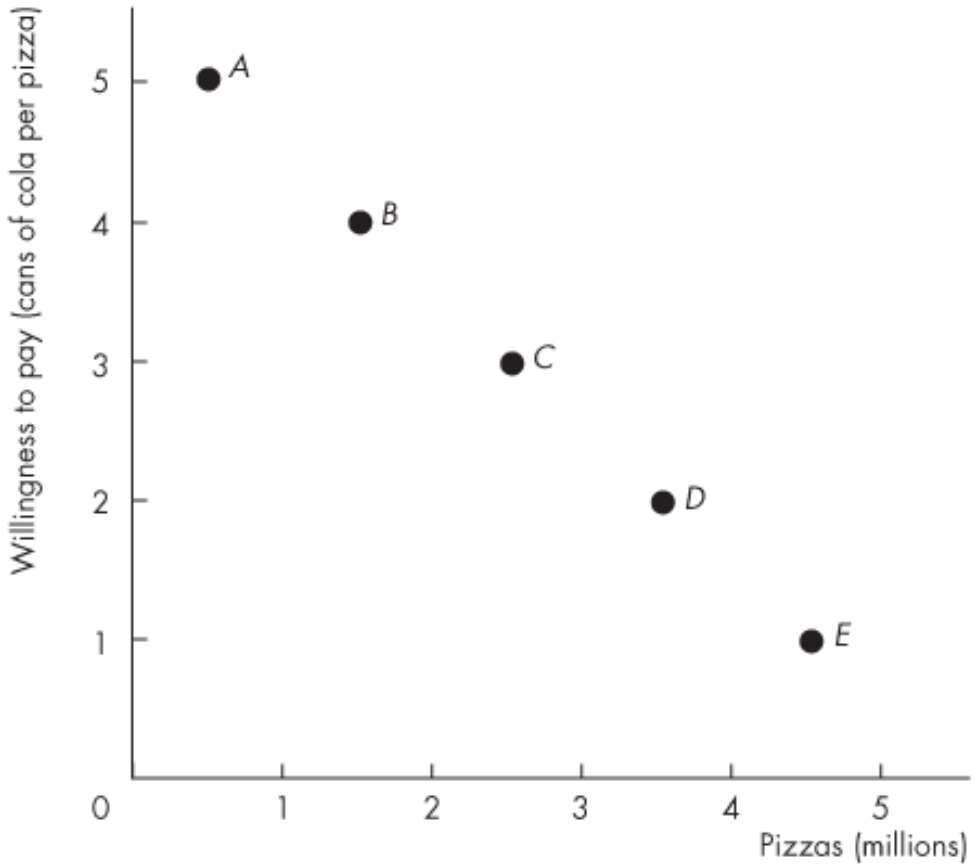
Using Resources Efficiently

At point *E*, with 4.5 million pizzas available, people are willing to pay 1 can of cola for a pizza.

Possibility	Pizzas (millions)	Willingness to pay (cans of cola per pizza)
A	0.5	5
B	1.5	4
C	2.5	3
D	3.5	2
E	4.5	1



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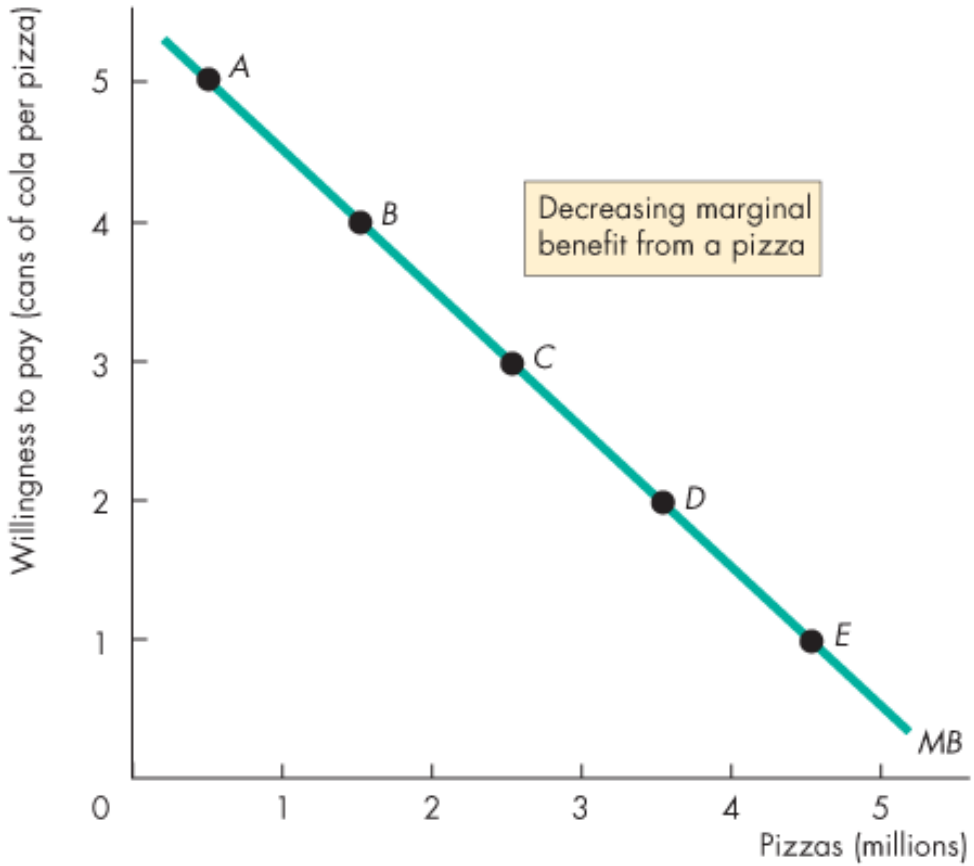
Using Resources Efficiently

The line through the points shows the marginal benefit from a pizza.

Possibility	Pizzas (millions)	Willingness to pay (cans of cola per pizza)
A	0.5	5
B	1.5	4
C	2.5	3
D	3.5	2
E	4.5	1



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Using Resources Efficiently

Allocative Efficiency

When we cannot produce more of any one good without giving up some other good, we have achieved *production efficiency.*

We are producing at a point *on* the *PPF*.

When we cannot produce more of any one good without giving up some other good *that we value more highly*, we have achieved **allocative efficiency**.

We are producing at *the* point on the *PPF* that we prefer above all other points.

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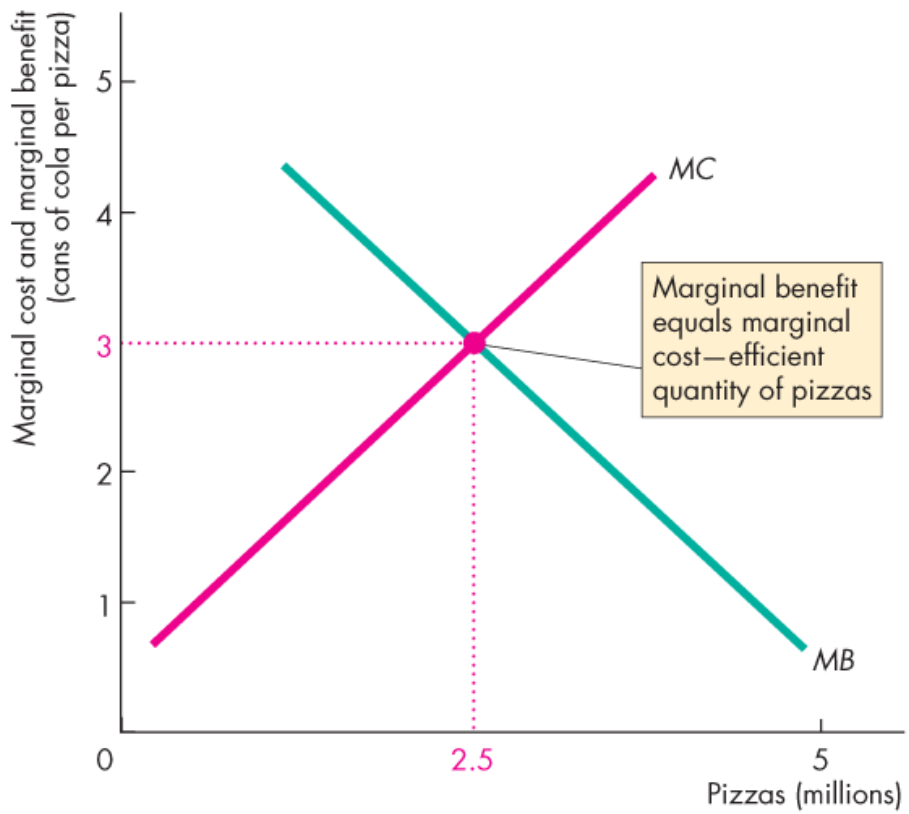
Using Resources Efficiently

Figure 2.4 illustrates allocative efficiency.

The point of allocative efficiency is the point on the *PPF* at which marginal benefit equals marginal cost.

This point is determined by the quantity at which the marginal benefit curve intersects the marginal cost curve.



(b) Marginal benefit equals marginal cost

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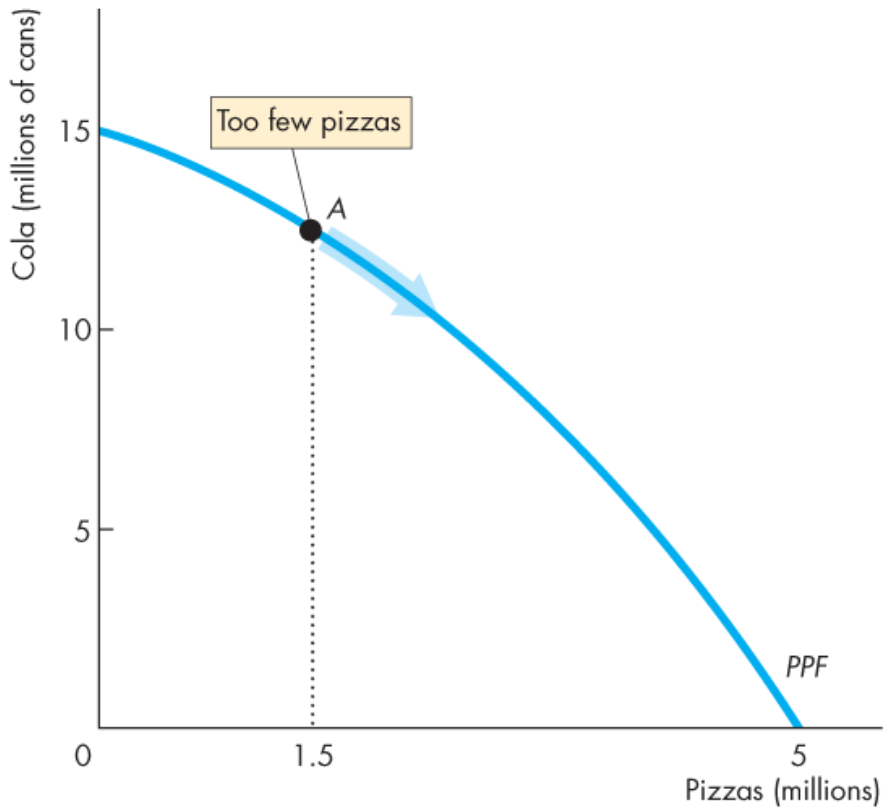
Using Resources Efficiently

If we produce fewer than 2.5 million pizzas, marginal benefit exceeds marginal cost.

We can get more value by producing more pizzas.

On the *PPF* at point *A*, we are producing 1.5 million pizzas, which is too few.

We are better off moving along the *PPF* to produce more pizzas.



(a) On the *PPF*

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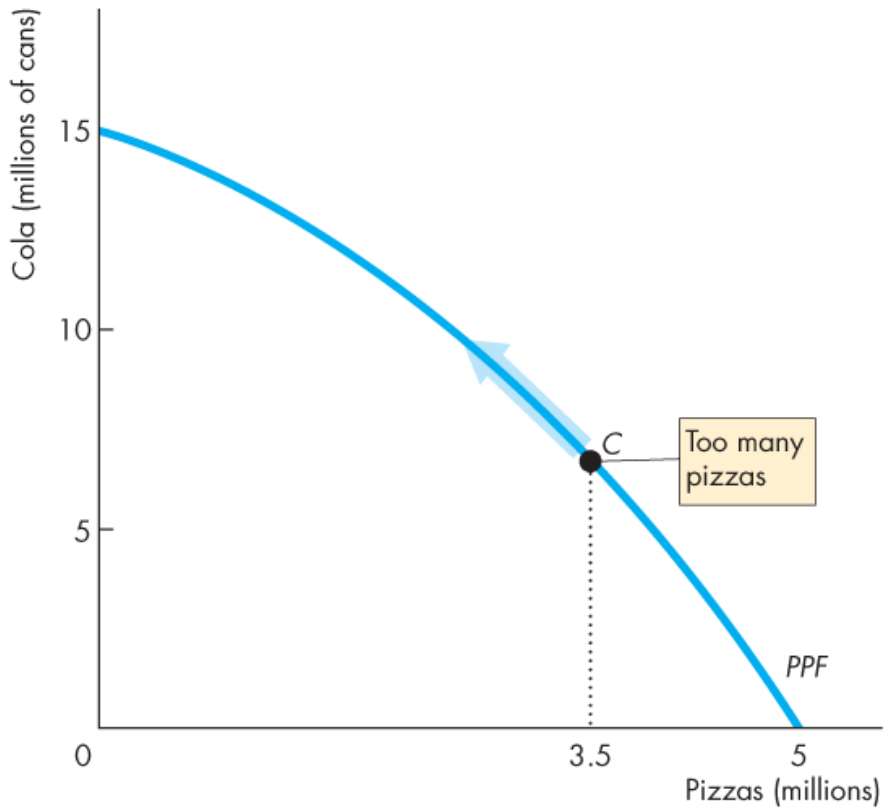
Using Resources Efficiently

If we produce more than 2.5 million pizzas, marginal cost exceeds marginal benefit.

We can get more value from our resources by producing fewer pizzas.

On the *PPF* at point *C*, we are producing 3.5 million pizzas, which is too many.

We are better off moving along the *PPF* to produce fewer pizzas.



(a) On the *PPF*

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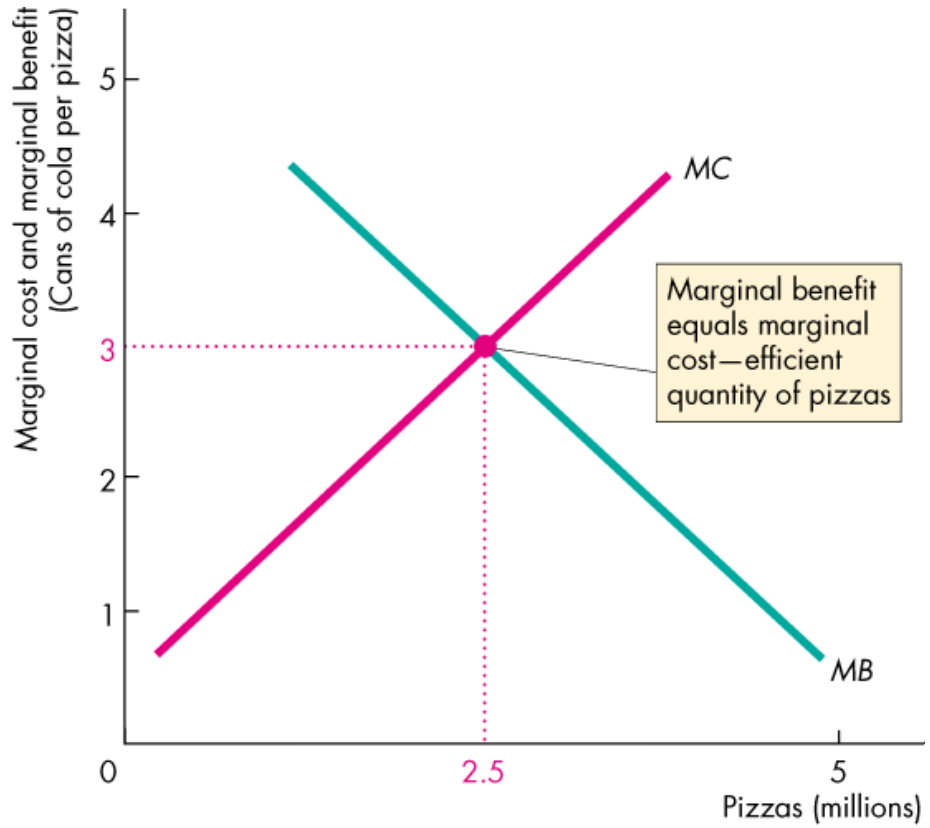
Using Resources Efficiently

On the *PPF* at point *B*, we are producing the efficient quantities of pizzas and cola.

If we produce exactly 2.5 million pizzas, marginal cost equals marginal benefit.

We cannot get more value from our resources.



(b) Marginal benefit equals marginal cost

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Economic Growth

The expansion of production possibilities—an increase in the standard of living—is called **economic growth**.

Two key factors influence economic growth:

- Technological change
- Capital accumulation

Technological change is the development of new goods and of better ways of producing goods and services.

Capital accumulation is the growth of capital resources, which includes *human capital*.

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Economic Growth

The Cost of Economic Growth

To use resources in research and development and to produce new capital, we must decrease our production of consumption goods and services.

So economic growth is not free.

The opportunity cost of economic growth is less current consumption.

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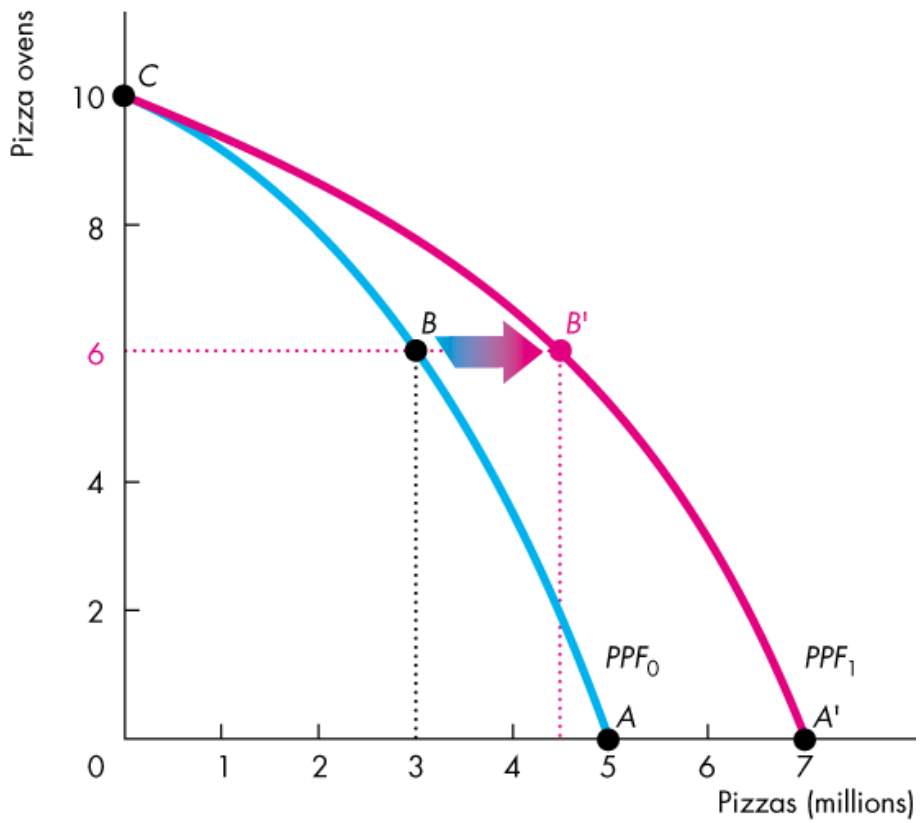
Economic Growth

Figure 2.5 illustrates the tradeoff we face.

We can produce pizzas or pizza ovens along PPF_0.

By using some resources to produce pizza ovens today, the *PPF* shifts outward in the future.



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Gains from Trade

Comparative Advantage and Absolute Advantage

A person has a **comparative advantage** in an activity if that person can perform the activity at a lower opportunity cost than anyone else.

A person has an **absolute advantage** if that person is more productive than others.

Absolute advantage involves comparing productivities while comparative advantage involves comparing opportunity costs.

Let's look at Joe and Liz who operate smoothie bars.

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Gains from Trade

Joe's Smoothie Bar

In an hour, Joe can produce 6 smoothies or 30 salads.

Joe's opportunity cost of producing 1 smoothie is 5 salads.

TABLE 2.1 Joe's Production Possibilities

Item	Minutes to produce 1	Quantity per hour
Smoothies	10	6
Salads	2	30

Joe's opportunity cost of producing 1 salad is 1/5 smoothie.

Joe spends 10 minutes making salads and 50 minutes making smoothies, so he produces 5 smoothies and 5 salads an hour.

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Gains from Trade

Liz's Smoothie Bar

In an hour, Liz can produce 30 smoothies or 30 salads.

Liz's opportunity cost of producing 1 smoothie is 1 salad.

TABLE 2.2 Liz's Production Possibilities

Item	Minutes to produce 1	Quantity per hour
Smoothies	2	30
Salads	2	30

Liz's opportunity cost of producing 1 salad is 1 smoothie.

Liz's customers buy salads and smoothies in equal number, so she produces 15 smoothies and 15 salads an hour.

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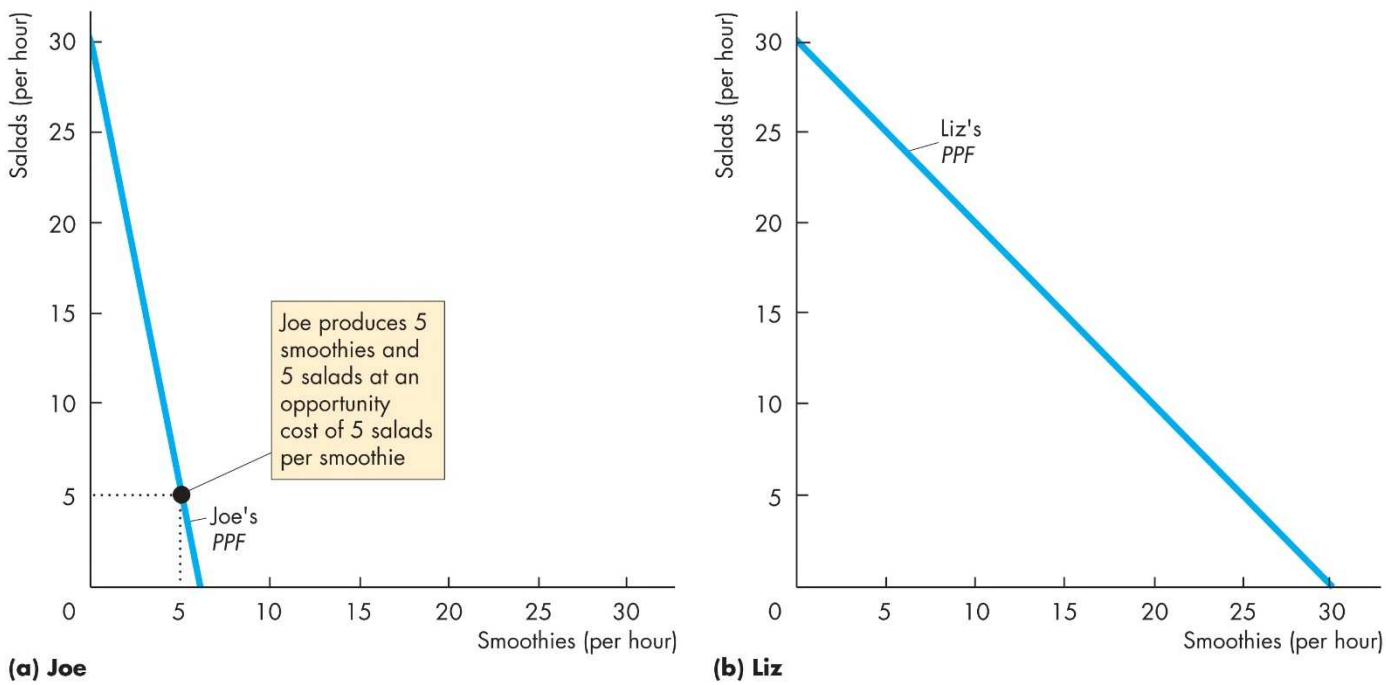
Gains from Trade

Figure 2.6 shows the production possibility frontiers.

In part (a), Joe's opportunity cost of a smoothie is 5 salads. Joe produces at point *A* on his *PPF.*



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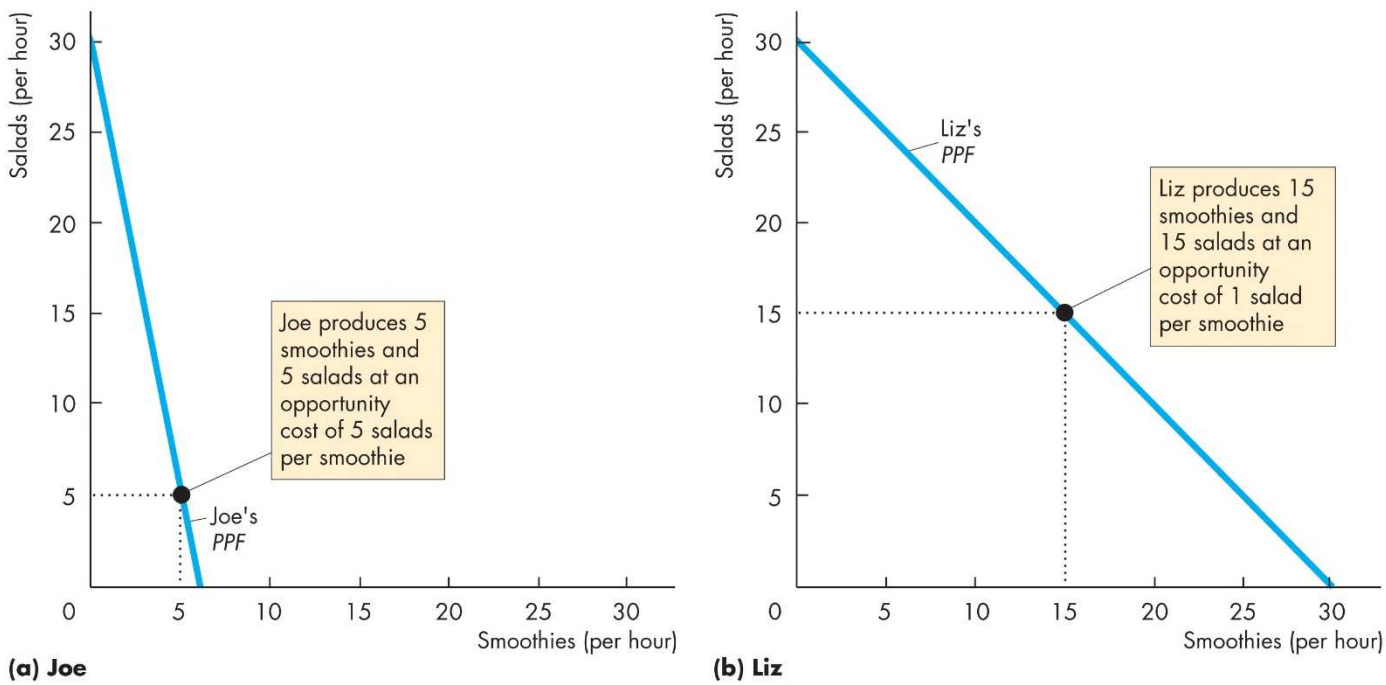
Gains from Trade

In part (b), Liz's opportunity cost of a smoothie is 1 salad. Liz produces at point *A* on her *PPF.*



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Gains from Trade

Joe's Comparative Advantage

Joe's opportunity cost of a salad is 1/5 smoothie.

Liz's opportunity cost of a salad is 1 smoothie.

Joe's opportunity cost of a salad is less than Liz's.

So Joe has a comparative advantage in producing salads.

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Gains from Trade

Liz's Comparative Advantage

Liz's opportunity cost of a smoothie is 1 salad.

Joe's opportunity cost of a smoothie is 5 salads.

Liz's opportunity cost of a smoothie is less than Joe's.

So Liz has a comparative advantage in producing smoothies.

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Gains from Trade

Achieving the Gains from Trade

Liz and Joe produce the good in which they have a comparative advantage:

- Liz produces 30 smoothies and 0 salads.
- Joe produces 30 salads and 0 smoothies.

TABLE 2.3 Liz and Joe Gain from Trade

(a) Before trade	Liz	Joe
Smoothies	15	5
Salads	15	5
(b) Specialization	**Liz**	**Joe**
Smoothies	30	0
Salads	0	30

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Gains from Trade

Liz and Joe trade:

- Liz sells Joe 10 smoothies and buys 20 salads.
- Joe sells Liz 20 salads and buys 10 smoothies.

After trade:

- Liz has 20 smoothies and 20 salads.
- Joe has 10 smoothies and 10 salads.

TABLE 2.3 Liz and Joe Gain from Trade

(a) Before trade	Liz	Joe
Smoothies	15	5
Salads	15	5
(b) Specialization	**Liz**	**Joe**
Smoothies	30	0
Salads	0	30
(c) Trade	**Liz**	**Joe**
Smoothies	sell 10	buy 10
Salads	buy 20	sell 20
(d) After trade	**Liz**	**Joe**
Smoothies	20	10
Salads	20	10

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Gains from Trade

Gains from trade:

- Liz gains 5 smoothies and 5 salads an hour
- Joe gains 5 smoothies and 5 salads an hour

TABLE 2.3 Liz and Joe Gain from Trade

(a) Before trade	Liz	Joe
Smoothies	15	5
Salads	15	5
(b) Specialization	**Liz**	**Joe**
Smoothies	30	0
Salads	0	30
(c) Trade	**Liz**	**Joe**
Smoothies	sell 10	buy 10
Salads	buy 20	sell 20
(d) After trade	**Liz**	**Joe**
Smoothies	20	10
Salads	20	10
(e) Gains from trade	**Liz**	**Joe**
Smoothies	+5	+5
Salads	+5	+5

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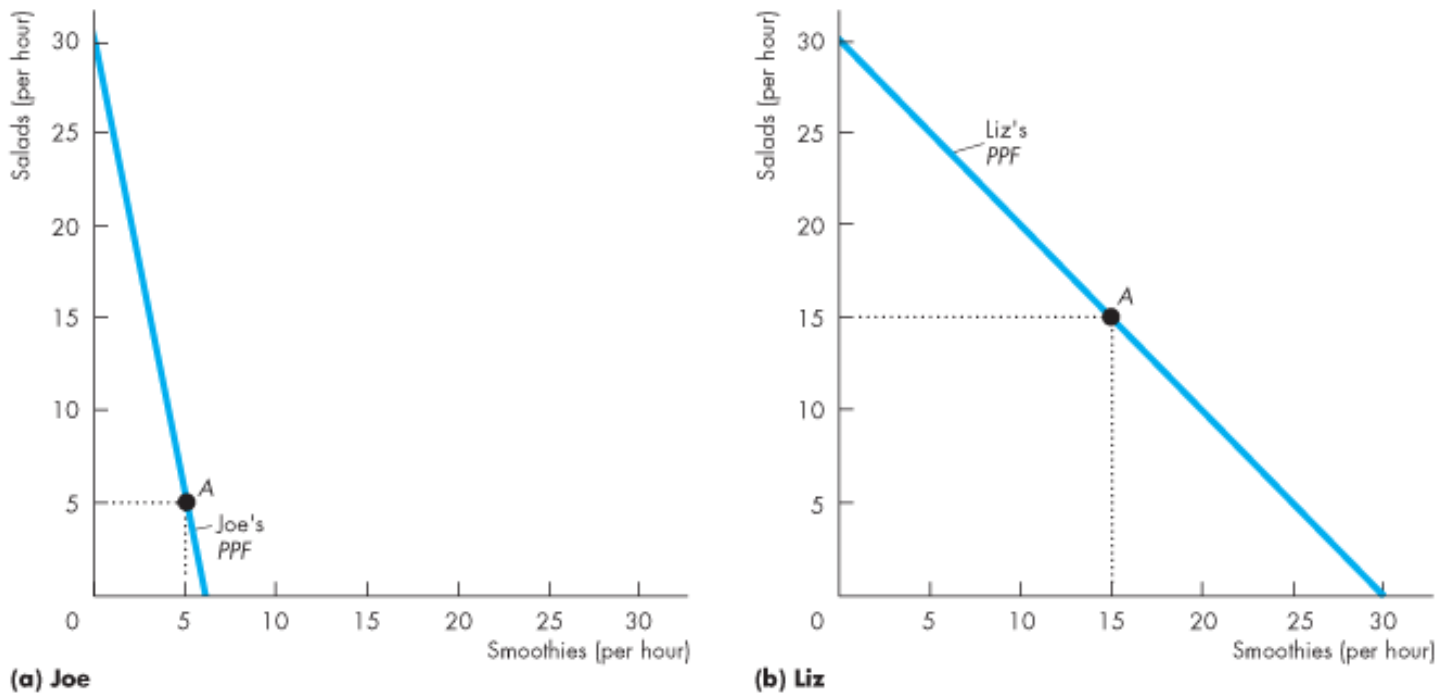
Gains from Trade

Figure 2.7 shows the gains from trade.

Joe's opportunity cost of producing a salad is less than Liz's.

So Joe has a comparative advantage in producing salads.



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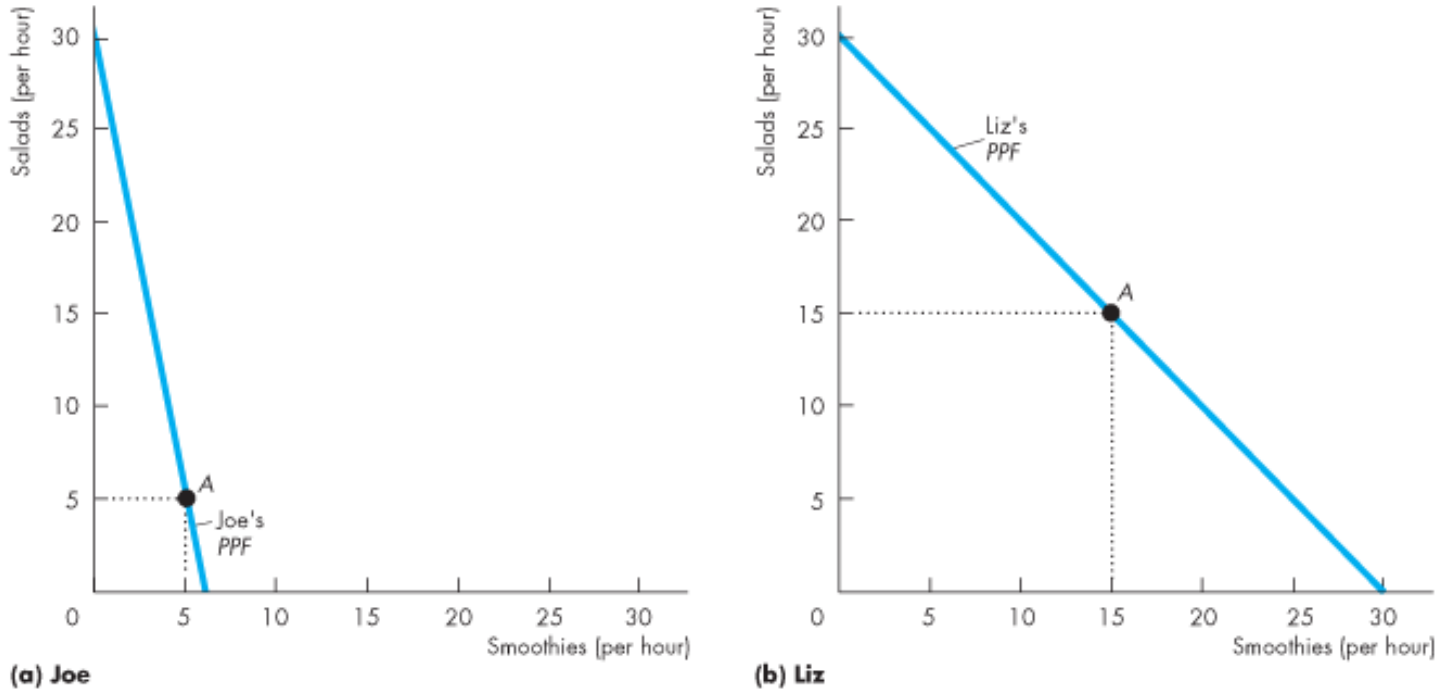
Gains from Trade

Liz's opportunity cost of producing a smoothie is less than Joe's.

So Liz has a comparative advantage in producing smoothies.



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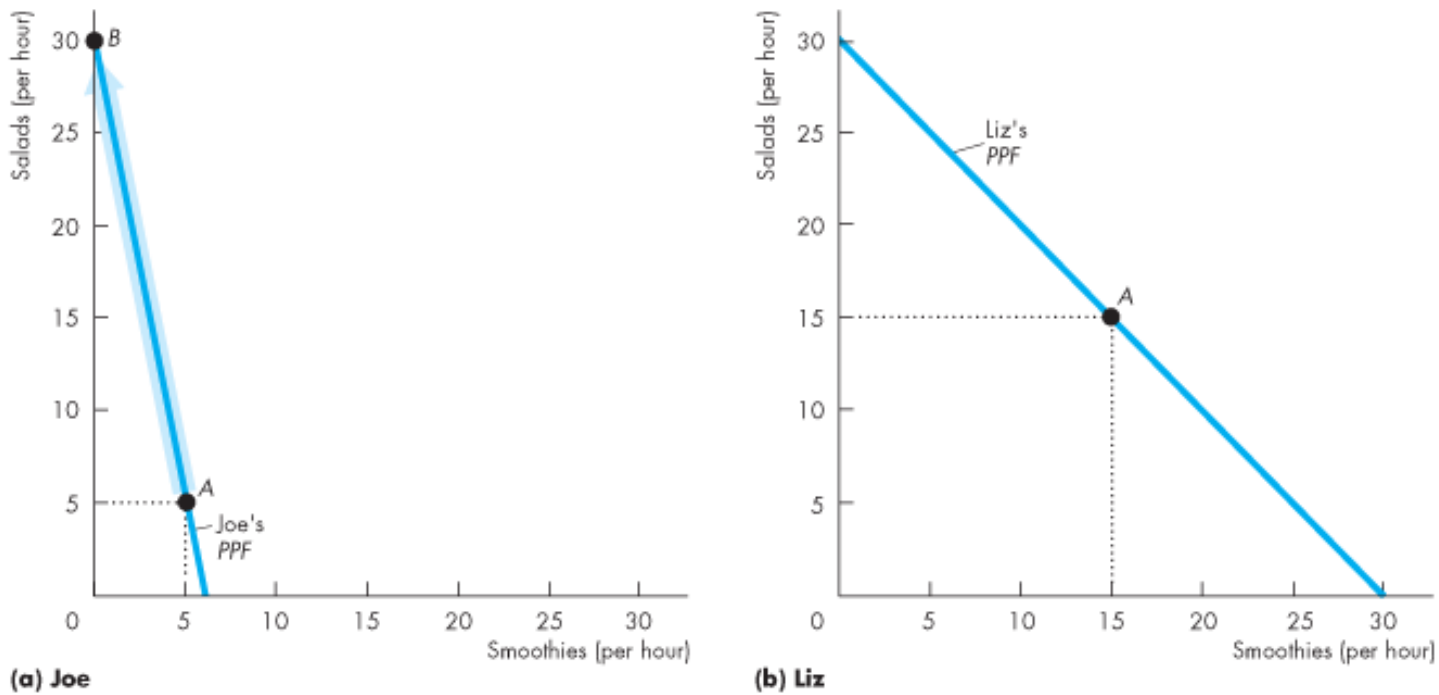
Gains from Trade

Joe specializes in producing salads and he produces 30 salads an hour at point *B* on his *PPF.*



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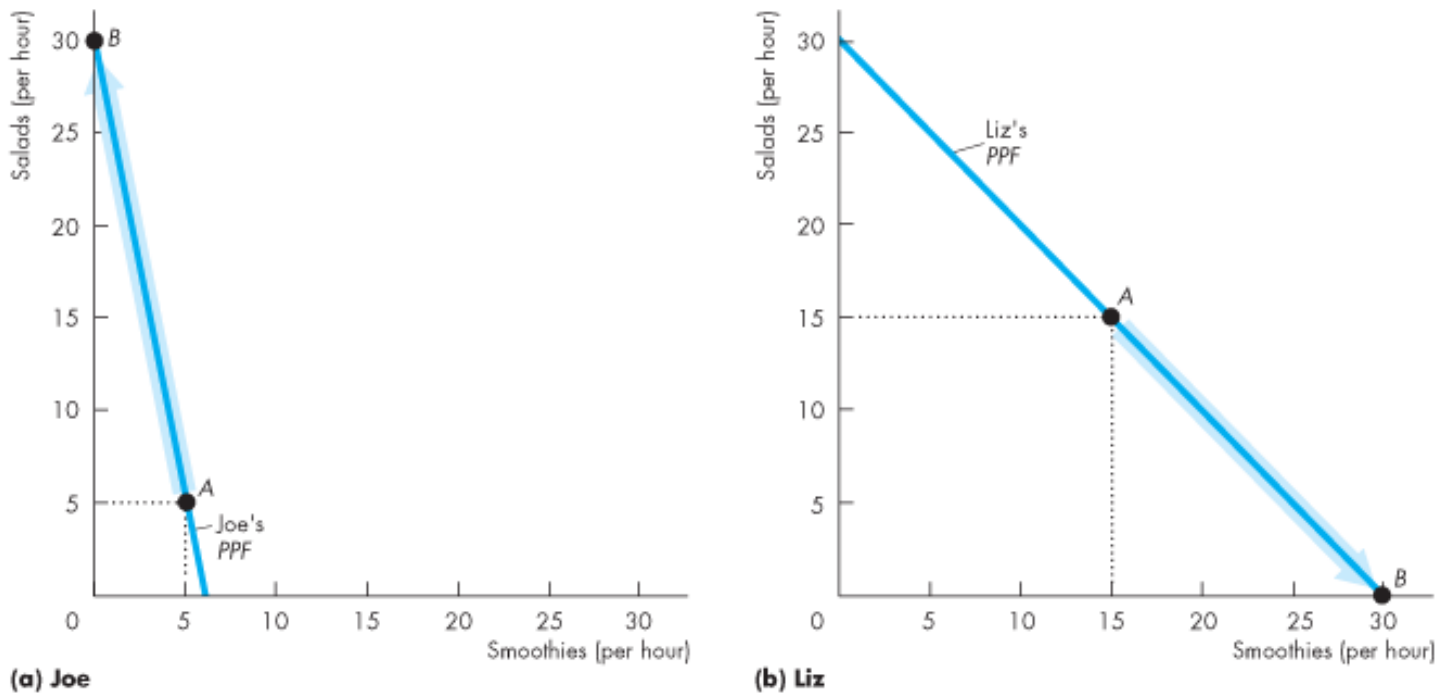
Gains from Trade

Liz specializes in producing smoothies and produces 30 smoothies an hour at point *B* on her *PPF.*



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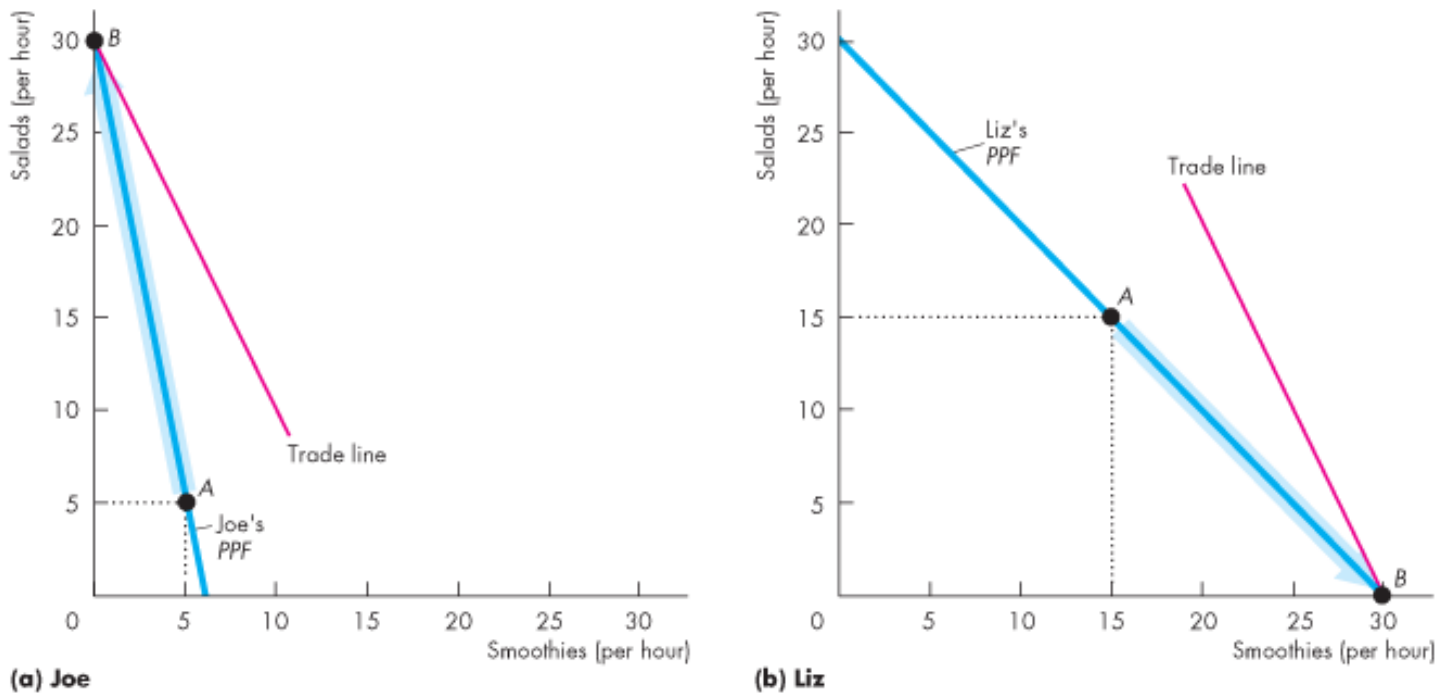
Gains from Trade

They trade salads for smoothies along the red “Trade line.”

The price of a salad is 2 smoothies or the price of a smoothie is ½ of a salad.



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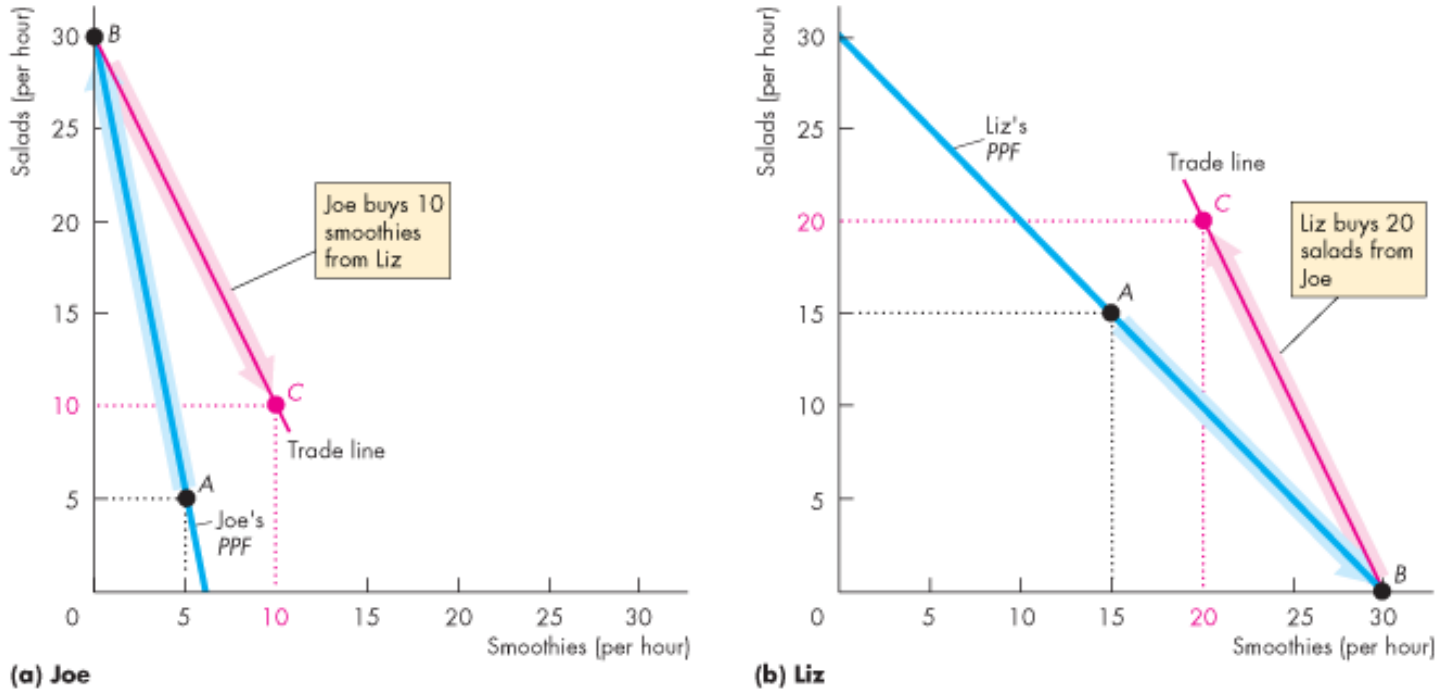
Gains from Trade

Joe buys smoothies from Liz and moves to point *C*—a point *outside* his *PPF*.

Liz buys salads from Joe and moves to point *C*—a point *outside* her *PPF*.



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Economic Coordination

To reap the gains from trade, the choices of individuals must be coordinated.

To make coordination work, four complimentary social institutions have evolved over the centuries:

- Firms
- Markets
- Property rights
- Money

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Economic Coordination

A **firm** is an economic unit that hires factors of production and organizes those factors to produce and sell goods and services.

A **market** is any arrangement that enables buyers and sellers to get information and do business with each other.

Property rights are the social arrangements that govern ownership, use, and disposal of resources, goods or services.

Money is any commodity or token that is generally acceptable as a means of payment.

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Economic Coordination

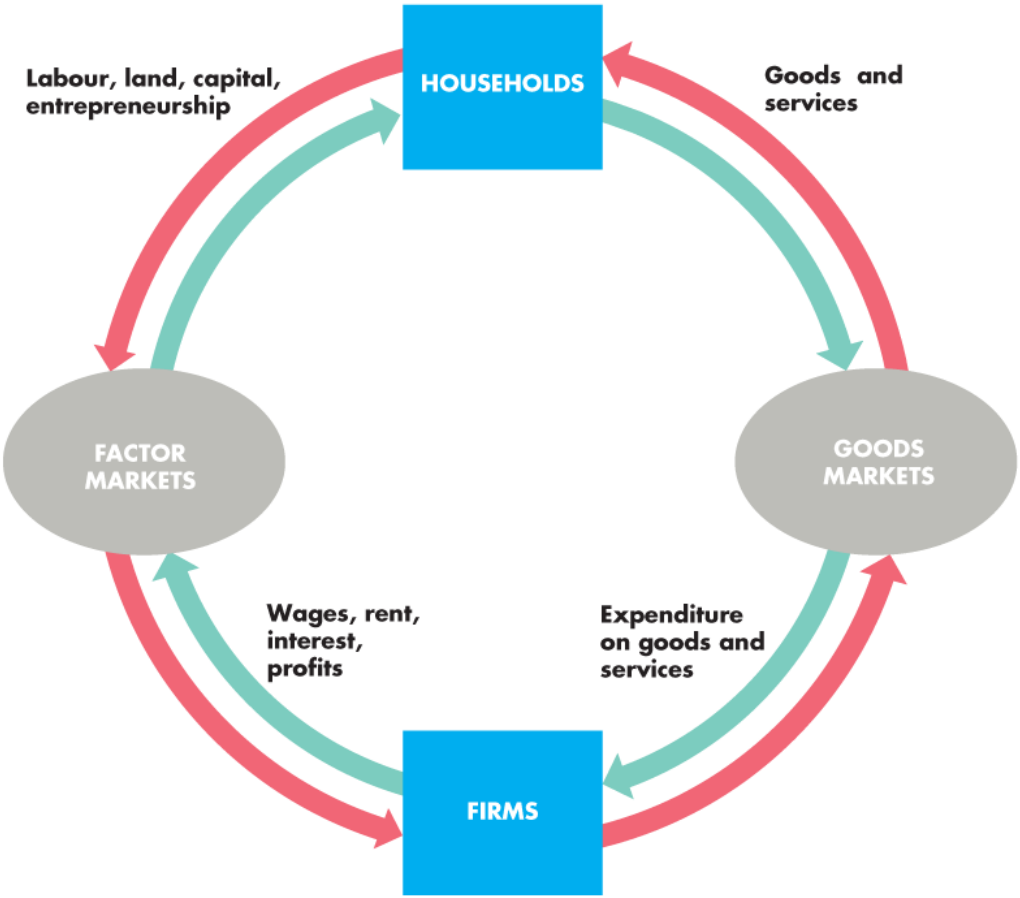
Circular Flows Through Markets

Figure 2.8 illustrates how households and firms interact in the market economy.

Factors of production, and …

goods and services flow in one direction.

Money flows in the opposite direction.



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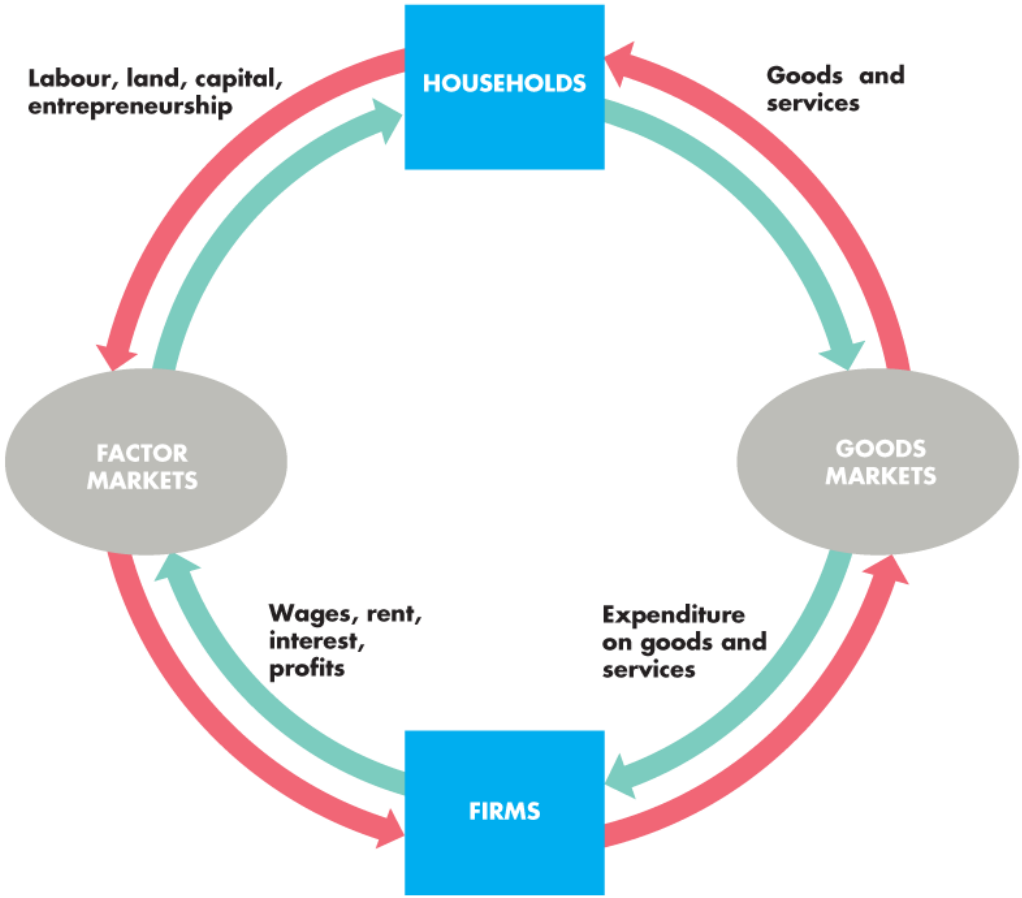
Economic Coordination

Coordinating Decisions

Markets coordinate individual decisions through price adjustments.



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