



# The Economic Problem

# Chapter 3

## ANSWERS TO CHAPTER CHECKPOINTS

### Study Plan Problems and Applications

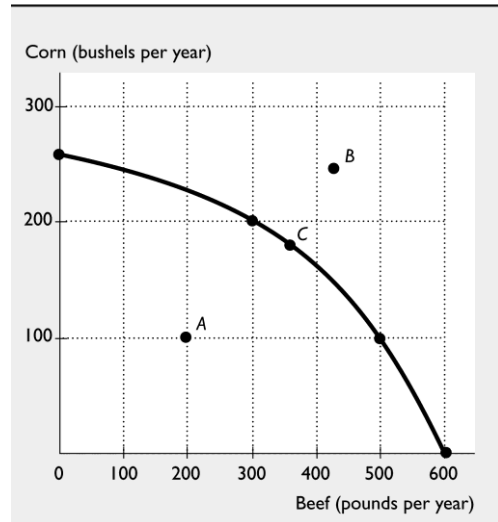
- The table shows the quantities of corn and beef that a farm can produce in a year. Draw a graph of the farm's *PPF*. Mark on the graph:

Corn (bushels)	and	Beef (pounds)
250	and	0
200	and	300
100	and	500
0	and	600

- An inefficient combination of corn and beef—label this point *A*.
- An unattainable combination of corn and beef—label this point *B*.
- An efficient combination of corn and beef—label this point *C*.

The production possibilities frontier is illustrated in Figure 3.1. Any production point in the interior of the *PPF*, such as the point marked *A*, is an inefficient combination of corn and beef. Any production point beyond the *PPF*, such as the point marked *B*, is an unattainable combination of corn and beef. Any production point *on* the *PPF*, such as the point marked *C* is a production efficient combination of corn and beef.

**FIGURE 3.1**  
Chapter Checkpoint Study Plan Problem 1



Use the following information to work Problems 2 and 3.

The people of Leisure Island have 50 hours of labor a day that can be used to produce entertainment and good food. The table shows the maximum quantity of *either* entertainment *or* good food that Leisure Island can produce with different quantities of labor.

Labor	Entertainment (units)		Good food (units)
0	0	or	0
10	20	or	30
20	40	or	50
30	60	or	60
40	80	or	65
50	100	or	67

2. Is an output of 50 units of entertainment and 50 units of good food attainable and efficient? With a production of 50 units of entertainment and 50 units of good food, do the people of Leisure Island face a tradeoff?

Producing 50 units of good food and 50 units of entertainment is attainable. However, at this production point, Leisure Island’s resources are not fully employed or are misallocated. They are producing within their *PPF*. As a result, the people of Leisure Island do not face a tradeoff—they can produce more entertainment or good food at no opportunity cost.

3. What is the opportunity cost of producing an additional unit of entertainment? Explain how the opportunity cost of producing a unit of entertainment changes as more entertainment is produced.

If production is initially within the *PPF*, the opportunity cost of an additional unit of entertainment is zero. If production is on the *PPF* there is an opportunity cost of producing a unit of entertainment because good food must be forgone. At that point, the opportunity cost while moving along the *PPF* equals the loss in good food produced divided by the gain in entertainment produced. Once on the *PPF*, as more entertainment is produced, the opportunity cost of an additional unit increases.

Use the following information to work Problems 4 and 5.

**Malaria can be controlled**

The World Health Organization’s malaria chief says that it is too costly to try to fully eradicate the disease. He says that by using nets, medicine, and DDT it is possible to eliminate 90 percent of malaria cases. But to eliminate 100 percent of cases would be extremely costly.

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

4. Make a graph of the production possibilities frontier with malaria control on the *x*-axis and other goods and services on the *y*-axis.

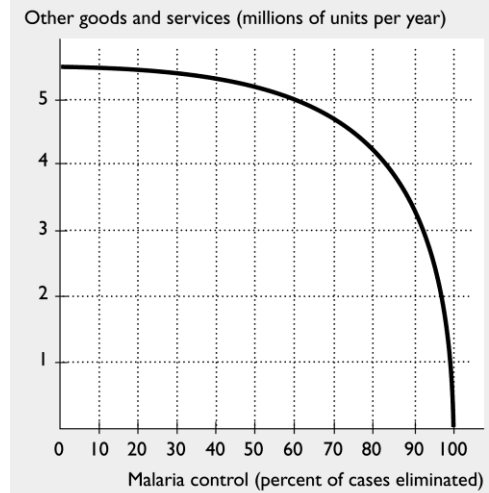
Figure 3.2 (on the next page) shows the *PPF*.

5. Describe how the opportunity cost of controlling malaria changes as more resources are used to reduce the number of malaria cases.

As more resources are used to control malaria, the opportunity cost increases. Indeed, the malaria chief indicated that the opportunity cost of eliminating the last 10 percent of malaria would have an extremely high

opportunity cost. This conclusion is shown in the *PPF* diagram by the very steep *PPF* between 90 percent elimination and 100 percent elimination.

**FIGURE 3.2**  
Chapter Checkpoint Study Plan Problem 4



6. Explain how the following events influence U.S. production possibilities:

- **Some retail workers are re-employed building dams and wind farms.**  
When these former retail workers are re-employed at their new occupations, more dams and wind farms are produced and fewer retail services are produced. The opportunity cost of the increased numbers of dams and wind farms is the forgone production of retail services. There is a movement along the *PPF*.
- **More people take early retirement.**  
As more people retire, the quantity of labor available in the economy shrinks. As a result, the nation's *PPF* shifts inward.
- **Drought devastates California's economy.**  
The nation's *PPF* shifts inward as a result of the drought. The drought decreases the amount of productive land, thereby decreasing production of agricultural products and shifting the *PPF* inward.

Use the following information to work Problems 7 and 8.

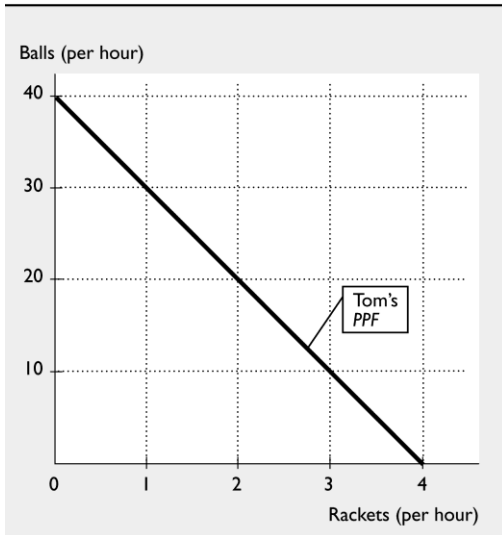
Figure 3.3 (on the next page) shows Tom's production possibilities and Figure 3.4 (on the next page) shows Abby's production possibilities. Tom uses all his

resources and produces 2 rackets and 20 balls an hour. Abby uses all her resources and produces 2 rackets and 40 balls an hour.

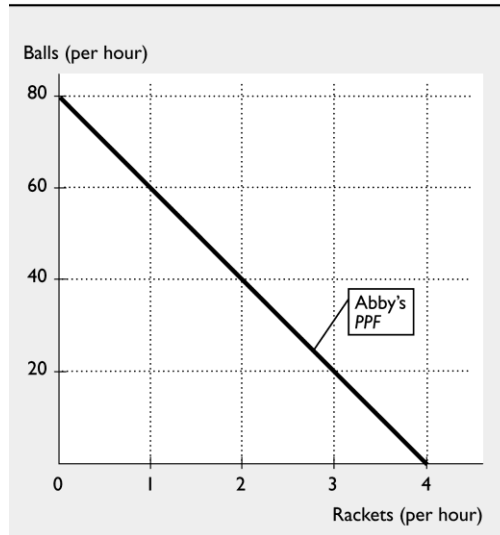
7. What is Tom's opportunity cost of producing a racket? What is Abby's opportunity cost of a racket? Who has a comparative advantage in producing rackets? Who has a comparative advantage in producing balls?

If Tom increases his production by 1 racket, he forgoes 10 balls. So his opportunity cost of 1 racket is  $10 \text{ balls} \div 1 \text{ racket}$ , or 10 balls per racket.

**FIGURE 3.3**  
Chapter Checkpoint Study Plan Problem 7



**FIGURE 3.4**  
Chapter Checkpoint Study Plan Problem 7



If Abby increases her production by 1 racket, she forgoes 20 balls. So her opportunity cost of 1 racket is  $20 \text{ balls} \div 1 \text{ racket}$ , or 20 balls per racket.

Tom has the comparative advantage in producing rackets. Tom's opportunity cost of a racket is 10 balls per racket and Abby's opportunity cost of a racket is 20 balls per racket. Abby has the comparative advantage in producing balls. Tom's opportunity cost of a ball is 0.10 rackets per ball and Abby's opportunity cost of a ball is 0.05 rackets per ball.

8. If Tom and Abby specialize and trade 15 balls for 1 racket, what are the gains from trade?

Both Tom and Abby gain from their specialization and trade. Tom could produce 4 rackets and then trade 2 of the rackets for 30 balls. Tom would wind up with 2 rackets and 30 balls, 10 more balls than he had without the specialization and trade. Abby could produce 80 balls and then trade 30 of them for 2 rackets. Abby would wind up with 2 rackets and 50 balls, also 10 more balls than she had without the specialization and trade.

9. **Read *Eye on the Environment* on p. 68 and describe a tradeoff faced when deciding how to generate electricity and whether to use wind power.**

Using wind power to generate electricity requires that the wind turbines be located in areas with wind which often are not near population centers. Long transmission lines are required which means transmissions losses are large. If other sources are used to generate power, long transmission lines are not necessary and smaller generating facilities are required because transmissions losses are less. If wind power is used to generate power, more resources are used and fewer other goods can be produced.

## ■ Instructor Assignable Problems and Applications

Use the following information to work Problems 1 to 4.

Representatives Waxman of California and Markey of Massachusetts proposed a law to limit greenhouse gas emissions from electricity generation and require electricity producers to generate a minimum percentage of power using renewable fuels, with some emission rights to be auctioned. The Congressional Budget Office estimated that the government would receive \$846 billion from auctions and would spend \$821 billion on incentive programs and compensation for higher energy prices. Electricity producers would spend \$208 million a year to comply with the new rules. (Think of these dollar amounts as dollars' worth of other goods and services.)

**1. Would the Waxman-Markey law achieve production efficiency?**

Production efficiency requires producing on the *PPF*. Use a *PPF* showing the tradeoff between electricity and clean air. Production efficiency requires producing on the *PPF* so that gaining more clean air means giving up some electricity. Before the new law, production might have been on the *PPF* if the producers had used the most efficient technologies and taken account of the pollution they created. After the law is in place, production might be within the *PPF* if the law requires more production of energy from renewable sources than is production efficient.

**2. Is the \$846 billion that electricity producers would pay for the right to emit greenhouse gasses part of the opportunity cost of producing electricity?**

To the extent that the \$846 billion pays for the cost that greenhouse gasses impose on society (by way of forgone production of other goods and services), the \$846 billion is part of the opportunity cost of generating electricity.

**3. Is the \$821 billion that the government would spend on incentive programs and compensation for higher energy prices part of the opportunity cost of producing electricity?**

The incentive programs change what electricity providers buy in order to produce electricity with lower emissions. The goods and services forgone are the opportunity cost of these programs. Compensation for higher energy prices is a transfer payment from taxpayers to consumers. Nothing is forgone and so it is not an opportunity cost.

**4. Is the \$208 million that electricity producers will spend to comply with the new rules part of the opportunity cost of producing electricity?**

The \$208 million is part of the opportunity cost of producing electricity because it represents the purchase of goods and services necessary to produce electricity.

5. The people of Foodland have 40 hours of labor a day to bake pizza and bread. The table shows the maximum quantity of *either* pizza or bread that Foodland can bake with different quantities of labor.

Labor	Pizzas	or	Bread (loaves)
0	0	or	0
10	30	or	10
20	50	or	20
30	60	or	30
40	65	or	40

Can Foodland produce 30 pizzas and 30 loaves of bread a day? If it can, is this output efficient, do the people of Foodland face a tradeoff, and what is the opportunity cost of producing an additional pizza?

Producing 30 pizzas and 30 loaves of bread is attainable and efficient. There is a tradeoff because the nation is operating on its production possibilities frontier. As a result, if the production of pizza increases, less bread can be produced and if the production of bread increases, less pizza can be produced. For the nation to produce 20 more pizzas requires 10 more hours of labor devoted to making pizza, which means 10 fewer hours devoted to making bread. Foodland gives up 10 loaves of bread. The opportunity cost of another pizza equals the loaves of bread forgone, 10 loaves, divided by the pizzas obtained, 20 pizzas, or 10 loaves of bread ÷ 20 pizzas, or 1/2 of a loaf of bread per pizza.

Use the table, which shows a farm’s production possibilities, to work Problems 6 and 7.

Soybean (bushels per year)	and	Chicken (pounds per year)
500	and	0
400	and	300
200	and	500
0	and	550

6. If the farm uses its resources efficiently, what is the opportunity cost of an increase in chicken production from 300 pounds to 500 pounds a year? Explain your answer.

If the farm expands chicken production from 300 pounds to 500 pounds, soybean production decreases from 400 to 200 bushels. The opportunity cost of the additional 200 pounds of chicken is 200 bushels of soybean, or 1 bushel of soybeans per pound of chicken.

7. If the farm adopted a new technology, which allows it to use fewer resources to fatten chickens, explain how the farm’s production possibilities will change. Explain how the opportunity cost of producing a bushel of soybean will be affected.

The farm’s PPF rotates outward; the maximum quantity of soybeans (500 bushels) does not change but the maximum quantity of chicken increases. The opportunity cost of a bushel of soybeans increases because more chicken must be given up to produce additional soybeans.

8. In an hour, Sue can produce 40 caps or 4 jackets and Tessa can produce 80 caps or 4 jackets. Who has a comparative advantage in producing caps? If Sue and Tessa specialize and trade, who will gain?

Sue forgoes 4 jackets to produce 40 caps, so Sue's opportunity cost of producing one cap is  $(4 \text{ jackets}) \div (40 \text{ caps})$  or 0.1 jackets per cap. Tessa forgoes 4 jackets to produce 80 caps, so Tessa's opportunity cost of producing one cap is  $(4 \text{ jackets}) \div (80 \text{ caps})$  or 0.05 jackets per cap. Tessa's opportunity cost of a cap is lower than Sue's opportunity cost, so Tessa has a comparative advantage in producing caps.

If Tessa specializes in caps and Sue specializes in jackets, both Sue and Tessa gain from trade. For instance, suppose they settle upon a price of 1 jacket for 15 caps. Sue gains because she can obtain caps from Tessa at a cost of  $(1 \text{ jacket}) \div (15 \text{ caps})$ , which is 0.067 jacket 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 jacket per cap, which is higher than her cost of producing a cap.

**Use the following opinion to work Problems 9 to 11.**

**Free Internet?**

**Everyone should have free Internet access to education, news, jobs, and more.**

**Source: Internet.org by Facebook, May 4, 2015**

- 9. Explain how Internet access has changed the production possibilities and the opportunity cost of producing education and news.**

Internet access is a technological advance that has increased the production possibilities of all goods and services. The opportunity cost of producing more education and news is the quantity of other goods and services that must be given up to get an additional unit of education and news. With more education and news placed on the Internet, Internet access means that for the same quantity of resources used before widespread Internet access, the production of these services has increased. The opportunity cost of education and news has decreased.



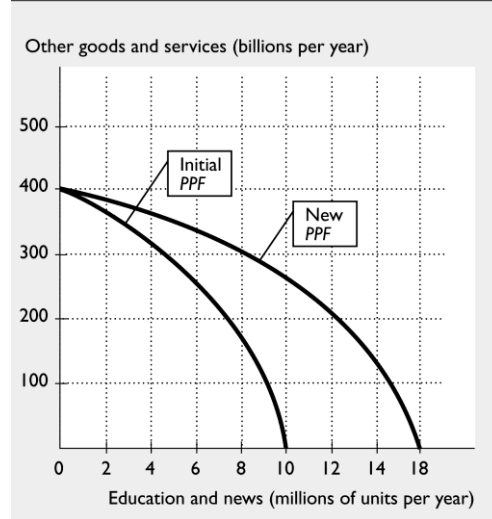
10. Sketch a *PPF* with education and news on the *x*-axis and other goods and services on the *y*-axis before and after the Internet.

The *PPFs* in Figure 3.5 have the conventional outward bowed shape. The figure shows that the introduction of the Internet shifted the production possibilities frontier outward from the *PPF* labeled “Initial *PPF*,” to the *PPF* labelled “New *PPF*.” The illustrated *PPF* assumes that effect on education and news is larger than the effect on other goods and services.

11. Explain why it is not possible for everyone to have free Internet access to education, news, jobs, and more.

Providing Internet access is not free because it takes resources. But the opportunity cost of Internet service increases as more people gain access, so the opportunity cost of giving everyone “free” access to the Internet would be extremely high, probably much higher than society is willing to pay.

**FIGURE 3.5**  
Chapter Checkpoint Assignable Problem 10



## Multiple Choice Quiz

1. The table shows the *PPF* of an island community. Choose the best statement.

Possibility	Fish (pounds)	and	Berries (pounds)
A	0	and	40
B	1	and	36
C	2	and	30
D	3	and	22
E	4	and	12
F	5	and	0

- A. This community has enough resources to produce 2 pounds of fish and 36 pounds of berries.
- B. This community cannot produce 2 pounds of fish and 36 pounds of berries because this combination is inefficient.
- C. This community will waste resources if it produces 2 pounds of fish and 22 pounds of berries.
- D. This community can produce 2 pounds of fish and 30 pounds of berries but this combination is inefficient.

**Answer: C** The production point is inside the *PPF* and so is inefficient.

2. The table above shows the *PPF* of an island community. Choose the best statement.

- A. Suppose that this community produces 3 pounds of fish and 20 pounds of berries. If it decides to gather more berries, it faces a tradeoff.
- B. When this community produces 4 pounds of fish and 12 pounds of berries it faces a tradeoff, but it is inefficient.
- C. Suppose that this community produces 5 pounds of fish and 0 pounds of berries. If it decides to gather some berries, it will get a free lunch.
- D. If this community produces 3 pounds of fish and 22 pounds of berries, production is efficient but to produce more fish it faces a tradeoff.

**Answer: D** The production point is on the *PPF* so production is efficient and there is a tradeoff when more fish are produced.

3. The table above shows the *PPF* of an island community. This community's opportunity cost of producing 1 pound of fish \_\_\_\_\_.

- A. is the increase in the quantity of berries gathered as the quantity of fish increases by 1 pound
- B. increases as the quantity of berries gathered increases
- C. is 10 pounds of berries if the quantity of fish increases from 2 to 3 pounds
- D. increases as the quantity of fish caught increases

**Answer: D** Page 68 discusses why opportunity increases as production of the good increases.

4. The table above shows the *PPF* of an island community. Choose the best statement.
- A. When a drought hits the island, its *PPF* shifts outward.
  - B. When the islanders discover a better way of catching fish, the island's *PPF* shifts outward.
  - C. When islanders reduce the time they spend gathering berries, the *PPF* shifts inward.
  - D. If the islanders decide to spend more time gathering berries but continue to spend the same amount of time fishing, they face a tradeoff.

**Answer: B**      Page 70 shows that technological progress, such as exemplified in answer B, shifts the *PPF* outward.

5. Mary makes 10 pies and 20 cakes a day and her opportunity cost of producing a cake is 2 pies. Tim makes 20 pies and 10 cakes a day and his opportunity cost of producing a cake is 4 pies. If Mary and Tim specialize in the good in which they have a comparative advantage \_\_\_\_\_.
- A. Mary produces only pies
  - B. Tim produces both pies and cakes
  - C. Mary produces only cakes while Tim produces only pies
  - D. Tim produces only cakes while Mary produces only pies

**Answer: C**      Answer C is correct because Mary has the lower opportunity cost of making a cake.