

# Coordinating Smart Choices

## Demand and Supply

### Learning Objectives

1. Describe what a market is and the necessary rules for voluntary exchange.
2. Explain how shortages and surpluses affect prices.
3. Identify how market-clearing or equilibrium prices equalize quantity demanded and quantity supplied.
4. Predict how changes in demand and supply affect equilibrium prices and quantities.
5. Explain the efficiency of markets using the concepts of consumer surplus and producer surplus.

### Lecture Narrative

This chapter combines the demand and supply material from Chapters 2-3 to describe what happens in markets. Markets require property rights as the rules of the game. Interactions between buyers and sellers combine competition (between buyers and between sellers) and cooperation (voluntary exchange between buyers and sellers). Prices are the outcome of competing bids (from buyers) and offers (from sellers).

The best way to understand how prices are set is to look at what happens when price is set too low or too high. When price is too low, buyers are frustrated. Shortages create pressure for prices to rise from competition between buyers. As price rises, quantity demanded decreases and quantity supplied increases, until the shortage is eliminated. When price is too high, sellers are frustrated. Surpluses create pressure for prices to fall from competition between sellers. As price falls, quantity demanded increases and quantity supplied decreases, until the shortage is eliminated.

At the market-clearing (equilibrium) price, quantity demanded equals quantity supplied, and the forces of competition and cooperation are balanced. There is no tendency for change. Price signals coordinate self-interest through Adam Smith's Invisible Hand of competition. The result is the miracle of markets (a synonym for economic efficiency) — the continuous, ever-changing production of the products and services we want, without the government doing anything beyond setting the rules of the game.

Equilibrium prices assume that all 5 factors behind the demand curve do not change, and all 6 factors behind the supply curve do not change. I then show what happens to equilibrium prices and quantities when demand and/or supply change. I emphasize the bread-and-butter technique that economists use to explain changes in prices and quantities – comparative statics. Comparative statics is at the heart of what it means to think like a microeconomist.

The final section explains the economic efficiency of an equilibrium market outcome in terms of maximum consumer and producer surplus. The emphasis is on reading demand and supply curves as marginal benefit and marginal costs curves, and showing how any quantity other than the equilibrium quantity has a mismatch between marginal benefit and marginal cost, setting in motions the forces of self-interest that push toward the equilibrium quantity and price.

### Graphs, Tables and Illustrations

Key:

G - Graph(s)

For titles in blue, Narrated Dynamic Graph videos are available online on each Chapter Resources page.

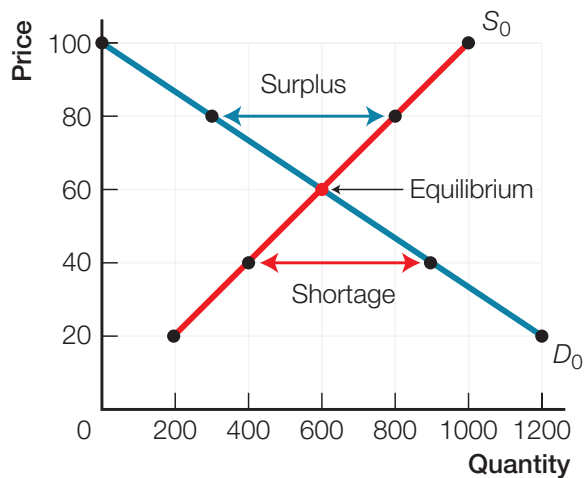
T - Table

Graphs follow on the next page.

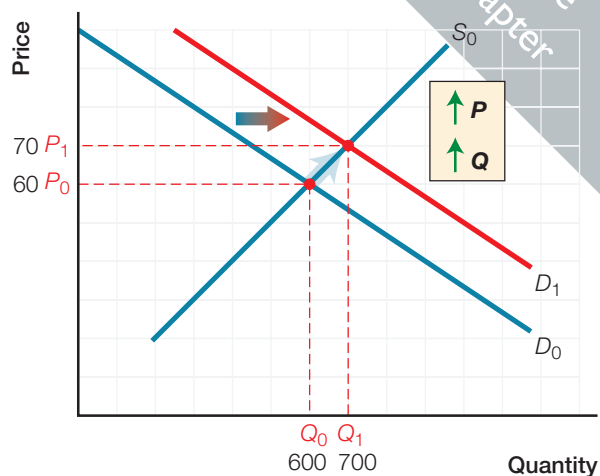
Narrated Dynamic Graphs are identified with a blue video button. To access them, log into the Pearson course website ([pearsonmylab.com](http://pearsonmylab.com)), click on Chapter Resources, and then Chapter 4.

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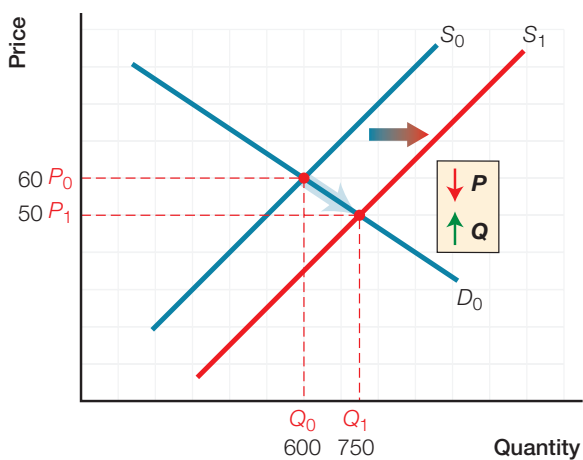
#### 4.1 Market Demand and Supply for Piercings



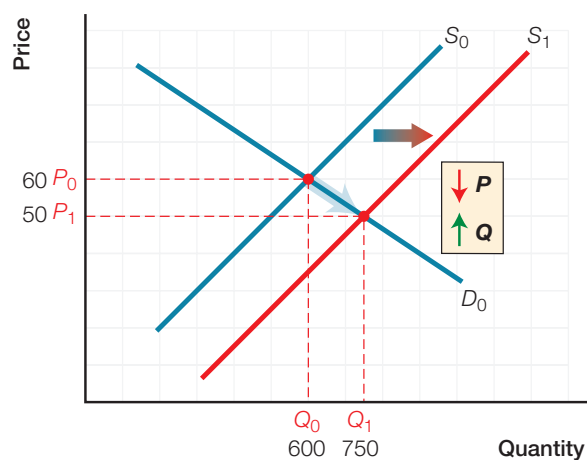
#### 4.2 Increase in Demand



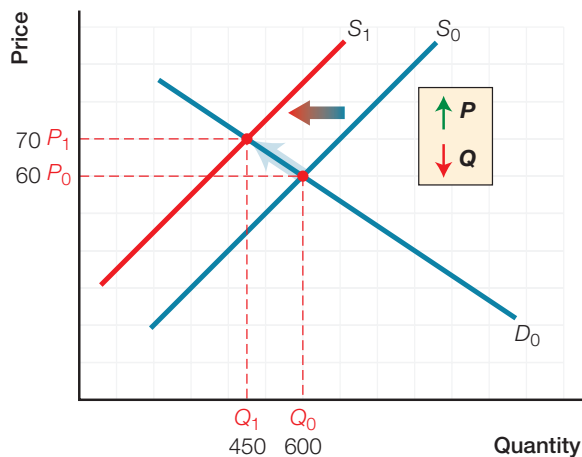
#### 4.3 Decrease in Demand



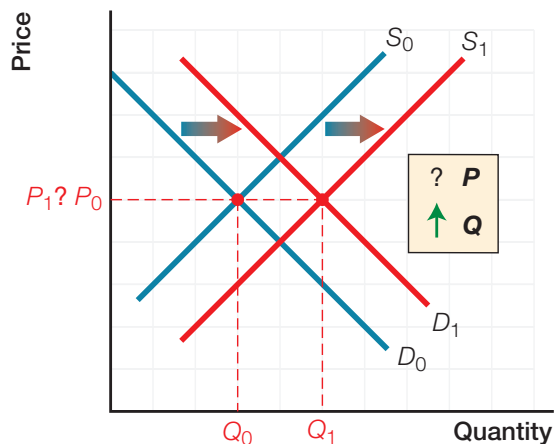
#### 4.4 Increase in Supply



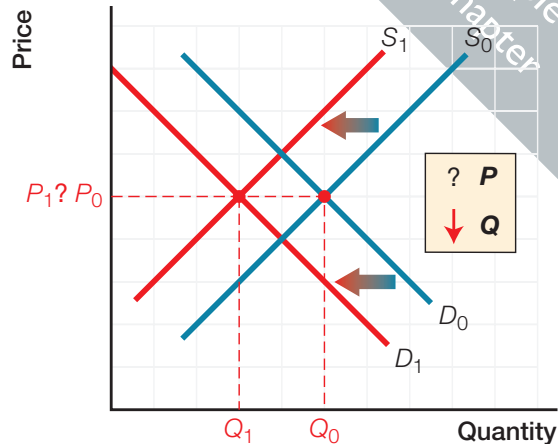
#### 4.5 Decrease in Supply



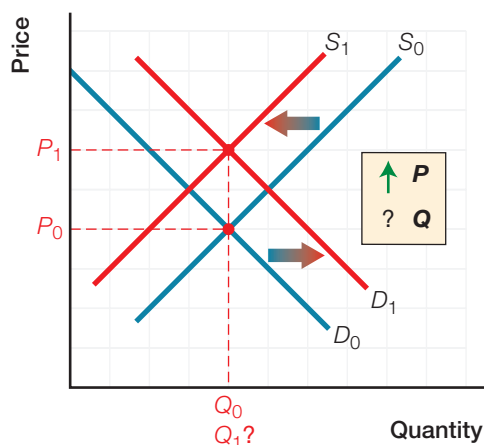
#### 4.6a Increase in Both Demand and Supply



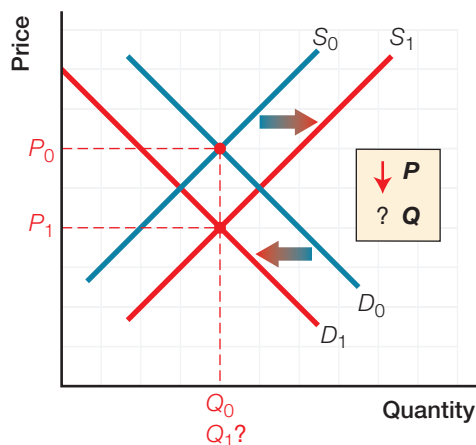
#### 4.6b Decrease in Both Demand and Supply



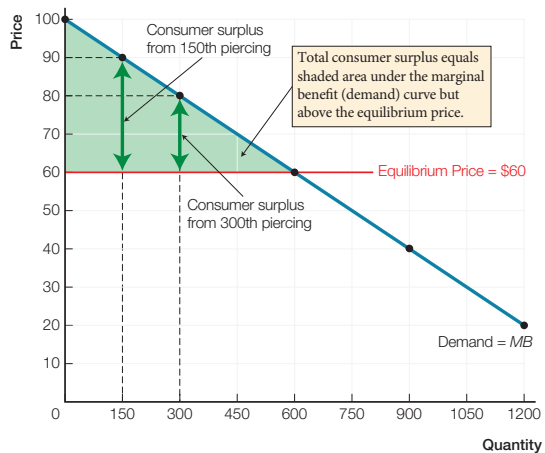
#### 4.6c Increase in Demand and Decrease in Supply



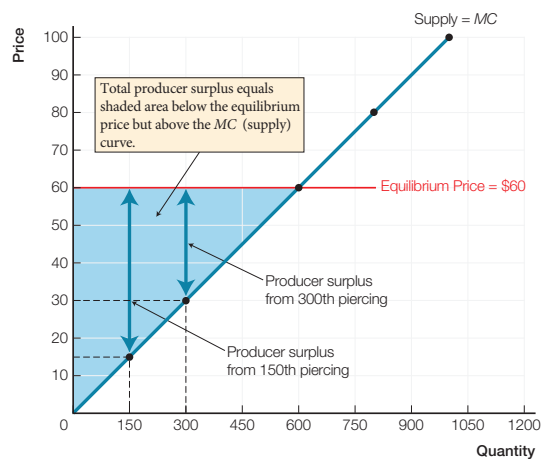
#### 4.6d Decrease in Demand and Increase in Supply



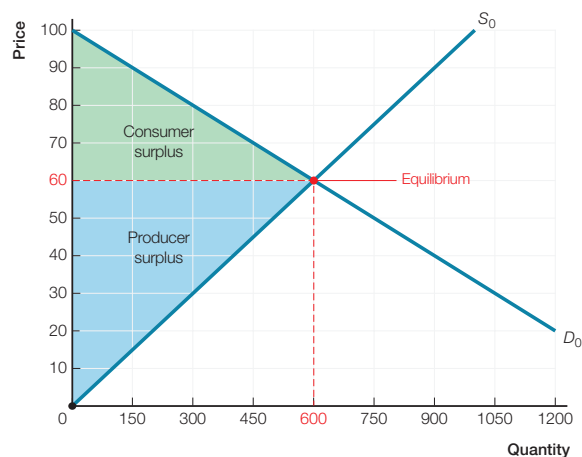
#### 4.8 Marginal Benefit and Consumer Surplus



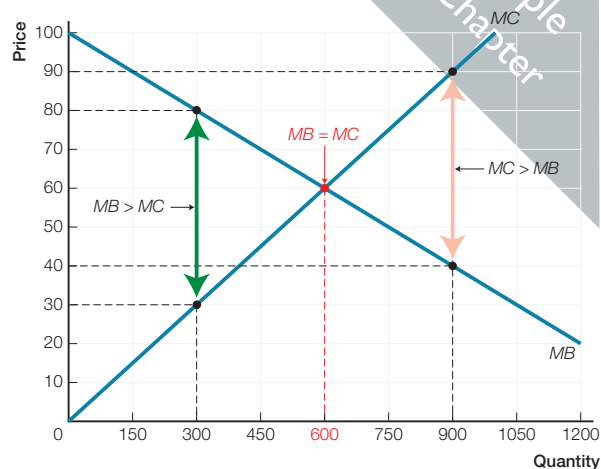
#### 4.9 Marginal Cost and Producer Surplus



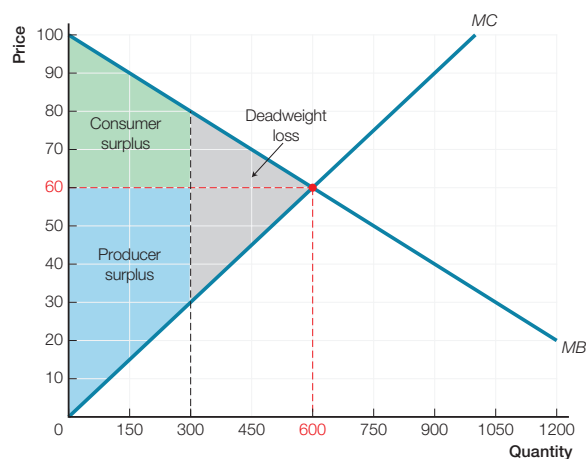
#### 4.10a Maximum Total Surplus for an Efficient Market



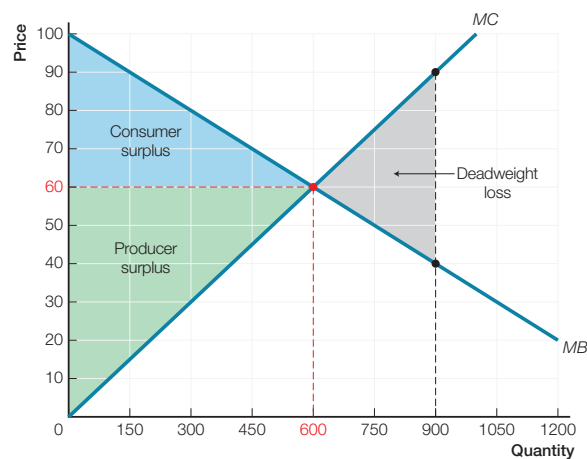
#### 4.10b Inefficiency When MB Not Equal to MC



#### 4.11a Inefficiency of Producing Too Little



#### 4.11b Inefficiency of Producing Too Much



## Active Learning Suggestions

### Top Choice

My top suggestion is based on an entertaining SourceFed YouTube video about rising bacon prices caused by a drought that increased the price of pig feed. See: [www.youtube.com/watch?v=1azA5kcrXb8](http://www.youtube.com/watch?v=1azA5kcrXb8).



This exercise works for any class size, and helps the students “get” how to use the demand and supply model to make sense of real world events, and overcome the impression that economics is about boring graphs. Do this after you have presented the textbook once-over shifts of demand and of supply (Figures 4.2 – 4.5). I have used this video many times, and it always generates laughs, interest, and lots of discussion.

Play the video and ask students to analyze the story using a demand and supply graph. Start with just the price and quantity axes on the board. Ask students to identify the market (bacon or pork), and describe what happens starting from an initial equilibrium. Besides the decrease in supply due to an increase in input prices, there is also a segment – to analyze separately – about how the show *Epic Mealttime* may have increased preferences for bacon, increasing demand.

You can do this for the class as a whole, or break the students into small (3-5) groups and have each group work out the analysis and report back. While in a large class, you can’t have every group report back, ask for volunteers and have a few groups report back, presenting at the front of the class. This activity changes the dynamics of a large class, as students are talking with each other, with permission.

### Economic Experiments

See the [Market Experiment](http://media.pearsoncmg.com/aw/aw_myeconlab/experiments/instructor/expinstr.html) ([http://media.pearsoncmg.com/aw/aw\\_myeconlab/experiments/instructor/expinstr.html](http://media.pearsoncmg.com/aw/aw_myeconlab/experiments/instructor/expinstr.html))

Students learn that the willingness to pay (WTP) and cost values used in the experiment form curves that can be labeled as demand and supply. As buyers and sellers interact, market forces determine an equilibrium price that can be seen theoretically as the intersection between the demand and supply curves.

### Dynamic Study Modules

The online [Dynamic Study Modules](http://media.pearsoncmg.com/intl/pec/mylab/2016c/cohen2ce/micro/mmnd_html/dynamic_study_modules.html) ([http://media.pearsoncmg.com/intl/pec/mylab/2016c/cohen2ce/micro/mmnd\\_html/dynamic\\_study\\_modules.html](http://media.pearsoncmg.com/intl/pec/mylab/2016c/cohen2ce/micro/mmnd_html/dynamic_study_modules.html)) are created generically for any Canadian economics text. Modules students can work through with some (not all) content related to Chapter 4:

- The Market Forces of Supply and Demand
- Consumer and Producer Surplus
- Efficiency

### Teaching Blog

Check out [economicsforlife.ca](http://economicsforlife.ca) for new media stories, related discussion questions, and other active learning ideas. All posts are tagged by textbook chapters and topics.

## Learning Objective

Describe what a market is and the necessary rules for voluntary exchange.

## Main Point

**Markets connect competition between buyers, competition between sellers, and cooperation between buyers and sellers. Government guarantees of property rights allow markets to function.**

## Key Terms

**Market**

the interactions between buyers and sellers

**Property rights**

legally enforceable guarantees of ownership of physical, financial, and intellectual property

## Discussion or Homework Q&amp;A

1. Q. Why do city parks usually have more litter than private golf clubs? Do people who use parks care less about neatness than golfers? How might you explain the difference in litter in terms of incentives and property rights?  
 A. There might be personality differences between park-users and golfers, but we can also explain the litter difference using incentives. The property rights to the park belong to the city, and indirectly to the people in the city. But no individual has any sense that the park is his or her “property” to look after, as individuals would look after houses that they truly own. Private golf clubs are owned by the limited number of members, who have a much more direct incentive to take care of their property. In addition, littering in city parks is largely anonymous – few individuals feel personally responsible to keep the park tidy for thousands of “others.” In private golf clubs, individuals in the smaller community better know each other, and feel more responsible to keep the club tidy.
2. Q. Since the rise of online evaluation services like Trip Advisor and Yelp, customer service has improved dramatically. There has also been a rise in the number of fake positive reviews. Explain the connections.  
 A. Online evaluations dramatically increase the incentives/rewards for good customer service. The disincentives/penalties for poor customer services also dramatically increase. Good reviews bring more business, and bad reviews drive away business to competitors. The online reviewing system creates incentives for business owners to “produce” fake positive reviews, because the rewards are great.

## Refresh Q&amp;A

- 4.1.1 Q. In your own words, define what a market is.  
 A. A market is not a place (physical or virtual) or a thing: it's a process — the interactions between buyers and sellers.
- 4.1.2 Q. You are negotiating over the price of a new car with a car dealer. Explain how this process contains both cooperation and competition.  
 A. In negotiating to buy a car, the process contains cooperation between you as buyer and the dealer as seller. If you come to an agreement, it is voluntary — at the negotiated price, you choose to buy and the dealer chooses to sell, because the deal makes you both better off.  
 There is competition because you compete with other potential buyers to get the car. The dealer competes with other dealers, and with anyone else selling a car (used cars, online sales).
- 4.1.3 Q. The Recording Industry Association of America's (RIAA) mission is “to foster a business and legal climate that supports and promotes our members' ... intellectual property rights worldwide.” Have you ever downloaded music? Write a short argument (three or four sentences) defending people's right to download music for free. Now, write a short argument against that position including the concept of property rights. Which do you agree with? Explain why.  
 A. Almost everyone downloads music. Arguments differ, but common arguments against the defence of property rights include
  - the record labels already make enough money
  - the prices are too high
  - there is no cost to the record label or artist of your single download
  - the artists will benefit eventually from the exposure
  - you cannot afford to pay the prices charged for legal sales of music
 Arguments against downloading are mostly based on the ideas property rights and incentives. Without property rights, there are no incentives to produce any product or service for exchange. Customers can take/steal your output for free, so why would you, as a business trying to make money, continue to produce? The important purpose of this question is to think more carefully about the role of property rights for a well-functioning market economy.

# Where Do Prices Come From?

## Price Signals from Combining Demand and Supply

### Learning Objective

Explain how shortages and surpluses affect prices.

### Main Point

When there are shortages, competition between buyers drives prices up. When there are surpluses, competition between sellers drives prices down.

### Key Terms

**Shortage, or excess demand**

quantity demanded exceeds quantity supplied

**Surplus, or excess supply**

quantity supplied exceeds quantity demanded

### Discussion or Homework Q & A

1. Q. Apu wants to set the market equilibrium price, so he surveys all three families on his street in order to determine how many cappuccinos per day they are willing to buy at different prices. He gives them four price options. Their answers can be summarized on the following table.

- a. What is the market quantity demanded for each price? Fill in the table.

Price per Iced Capuccino	Flanders Family Quantity Demanded	Van Houten Family Quantity Demanded	Simpson Family Quantity Demanded	Market Quantity Demanded
\$1	2	5	5	
\$2	1	3	4	
\$3	0	1	3	
\$4	0	0	2	

Apu also estimates his costs and determines how many iced cappuccinos he is willing to sell. Apu's supply is summarized in the following table:

Price per Iced Capuccino	Apu's Quantity Supplied
\$1	7
\$2	8
\$3	9
\$4	10

- b. What is the market-clearing price? Explain.
- c. If Apu sets the price higher than the market-clearing price,
- Will there be a shortage or surplus in the market?
  - Will there be pressure for the price to rise or fall? Explain.
- d. If Apu sets the price lower than the market-clearing price,
- Will there be a shortage or surplus in the market?
  - Will there be pressure for the price to rise or fall? Explain.

*More questions follow on the next page.*

## Discussion or Homework Q&amp;A (continued)

1. A. a. The market quantity demanded is in the middle column in the table below.

Price per Iced Capuccino	Market Quantity Demanded	Apu's Quantity Supplied
\$1	12	7
\$2	8	8
\$3	4	9
\$4	2	10

- b. The market-clearing price is \$2, since this is the price for which there is no shortage or surplus.
- c. i) At any price higher than \$2, quantity supplied is greater than quantity demanded, so there is a surplus.  
ii) Apu has excess inventory, which creates pressure for the price to fall, as he wants to get rid of his supplies before the milk goes sour.
- d. i) At any price lower than \$2, quantity supplied is less than quantity demanded, so there is a shortage.  
ii) There aren't enough cappuccinos to satisfy demand, which creates pressure for the price to rise.  
Customers bid up the price of the scarce cappuccinos, hoping that they will get one when someone else will not.
2. Q. Billions of dollars will be invested in energy-related projects across Alberta over the next 20 years, prompting Albertans to ask where the workers for these projects will come from. In 2007, the Alberta government warned that it is facing a shortfall of 100 000 workers, with at least 40 000 of those positions in the oil and gas sector. "It's in the whole economy . . . whether it's the Tim Hortons or a new restaurant that can't find people to serve coffee and food because there's not enough people to keep the restaurants or coffee shops open."
- a. A union proposal calls for 14.5-percent wage increases over two years, barely above Alberta's nation-leading inflation rate of 6.5 percent per year. Explain why unions are asking for such high wage increases for their workers.
- b. The skilled labour shortage is prompting many companies to look overseas for employees. If companies can hire many temporary foreign workers, how might this affect the wages that workers in Alberta receive?
- A. a. In a shortage, workers are in scarce supply and have a bargaining advantage.  
b. The use of temporary foreign workers reduces the size of the shortage in Canada, which lowers the price (wage) offered to workers.

## Refresh Q&amp;A

- 4.2.1 Q. In your own words, define what a shortage is. Explain who competes and what happens to prices when there is a shortage.
- A. A shortage is a situation of excess demand where quantity demanded exceeds quantity supplied. Shortages encourage competition among buyers, who bid against each other in attempting to get the scarce product or service and not be left empty-handed. Shortages create pressure for prices to rise.
- 4.2.2 Q. Old Navy decides to price a new line of jeans at \$95, which covers all marginal opportunity costs as well as a healthy profit margin. If Old Navy has priced the jeans too high, what signals will the company receive? What actions might Old Navy take next?
- A. If Old Navy has priced the jeans too high, the signals are unsold jeans sitting on shelves, or rising inventories in warehouses. This is a situation of a surplus, or excess supply. In response, Old Navy might cut prices, advertise more heavily, or offer other incentives (free t-shirt with purchase of jeans) to get customers to buy. Surpluses create pressure for prices to fall.
- 4.2.3 Q. Most provincial parks charge a fixed price for a camping permit, and allow you to reserve specific campsites in advance. By the time the summer holiday weekends arrive, all the permits are usually taken. There is excess demand but no price adjustment. Suggest a pricing system for provincial parks that allows them to take advantage of the higher demand for campsites on holiday weekends. Your system should explain who is competing and who is cooperating.
- A. If all camping permits are taken, and you and others still want more, that is a situation of excess demand. Because the price is fixed, there is no price response to the shortage. Instead of bidding up prices, competition between consumers/campers for the scarce permits takes the form of trying to be the first in line to buy a permit as soon as permits go on sale for the next season. An alternative pricing system would set higher prices for holiday weekends than for other times. If campers voluntarily pay the prices set, there is cooperation between consumers/camper and the parks.



# 4.3

## When Prices Sit Still: Market Clearing or Equilibrium Prices

### Learning Objective

Identify how market-clearing or equilibrium prices equalize quantity demanded and quantity supplied.

### Main Point

Market-clearing or equilibrium prices balance quantity demanded and quantity supplied, coordinating the smart choices of consumers and businesses.

### Key Terms

**Market-clearing price**

the price that equalizes quantity demanded and quantity supplied

**Equilibrium price**

the price that balances forces of competition and cooperation, so that there is no tendency for change

### Discussion or Homework Q&A

1. Q. The price set in a market is much more than a number. What functions does a price perform for the buyers and sellers? And what is so special about the “market-clearing price”?
  - A. The market price performs a communication function between buyers and sellers. A rise in price communicates to suppliers that more must be produced and brought to the market, while a fall in price communicates to the suppliers that they should produce less. The market-clearing price is the price at which no shortages or surpluses occur and no signals are sent to businesses and consumers to change their smart choices.
2. Q. Due to labour shortages, employers are allowed to hire temporary foreign workers (TFWs) once the employer proves the Canadian labour pool is exhausted. Between 1996 and 2005, the number of TFWs doubled in Canada. If the Government of Canada eliminates this program, what happens to the wages of Canadian workers who were previously competing with TFWs for jobs?
  - A. It reduces the available supply of TFWs and put upward pressure on the price (wage) offered to Canadian workers.

### Refresh Q&A

- 4.3.1 Q. List and define the two other names for “prices that sit still”?
  - A. “Prices that sit still” are called both market-clearing prices and equilibrium prices. The market-clearing price is the price that equalizes quantity demanded and quantity supplied. At the market-clearing price, there are no frustrated buyers or sellers. There is a match for every buyer and seller, and all go home happy. The equilibrium price balances the forces of competition and cooperation, so that there is no tendency for change. The equilibrium price coordinates the smart choices of consumers and businesses — there is no incentive for anyone to change their own, self-interested, smart decisions.
- 4.3.2 Q. In an attempt to promote the social good of energy conservation, Toronto Hydro introduced the Peaksaver Program. Participating households received a \$25 reward for allowing a “peaksaver” switch to be installed on their central air conditioners, which briefly turns off the air conditioner during peak demand times on hot summer days. Do you think the program would work without the \$25 reward? Why or why not?
  - A. The Peaksaver energy-saving program would not work as well without the \$25 reward to households who participate. With the Peaksaver switch installed, households will experience some discomfort from having their air conditioning turned off (even briefly) on hot summer days. To get households to agree to this discomfort, it helps to appeal to self-interest by paying households to participate. This is the principle behind the invisible hand — by acting in their own self-interest (\$25), households also promote the good of society (environmental/ energy savings). If all households cared deeply enough about the environment to experience the discomfort of the Peaksaver Program without a reward, then the program would not be necessary.
- 4.3.3 Q. Explain the idea of Adam Smith’s “invisible hand.” Your explanation should illustrate the balance between the forces of competition and cooperation at “prices that sit still.” (I can’t give away the answer to question 1, can I?)
  - A. At market-clearing prices, smart choices are coordinated. The forces of competition (between consumers, and between businesses) are balanced with the forces of cooperation (voluntary, mutually beneficial exchanges between consumers and businesses). The key to this outcome is that price signals in markets create incentives so that while each person acts only in her own self-interest, the unintended consequence is the production of all the products and services we want.

# Moving Targets: What Happens When Demand & Supply Changes?

## Learning Objective

Identify how market-clearing or equilibrium prices equalize quantity demanded and quantity supplied.

## Main Point

When demand or supply change, equilibrium prices and quantities change. The price changes cause businesses and consumers to adjust their smart choices. Well-functioning markets supply the changed products and services demanded.

## Key Term

**Comparative statics**

comparing two equilibrium outcomes to isolate the effect of changing one factor at a time

## Discussion or Homework Q&A

1. Q. Rising housing prices in Alberta during the Oil boom lead some Albertans to move to Saskatchewan. Housing prices in Saskatchewan rose to record levels. Using a demand and supply framework, explain the higher prices in Saskatchewan's housing market.
  - A. The demand for houses in Saskatchewan increased because more Albertans moved to Saskatchewan (more consumers in the Saskatchewan housing market). This increase in demand (rightward shift of the demand curve) puts upward pressure on housing prices in Saskatchewan if the supply of housing does not change.
2. Q. Suppose the Nudist Party wins the next federal election because all the clothed citizens forgot to vote. The Nudists pass a law making it illegal to produce clothes. The shift in party power causes a shift in preference away from buying clothes.
  - a. The cost of supplying clothes is now very high given that it is illegal to do so. Assuming that the demand for clothes reduces only slightly (in comparison), how would this affect the market price for clothes?
  - b. Suppose the police don't enforce the law (where would officers pin their badges?). If the cost of supplying clothes is the same as before, what happens to the market price for clothes?
  - A.
    - a. Now that the cost of producing/selling clothes is high, the supply of clothes decreases, causing rising clothing prices. Clothing prices fall slightly due to the comparatively smaller fall in demand, so the overall effect raises prices.
    - b. If the cost of supplying clothes is unchanged, the slight fall in demand causes falling prices.

## Refresh Q&A

- 4.4.1 Q. What happens to the market-clearing price and quantity of a product or service when demand increases? When demand decreases? When supply increases? When supply decreases?
  - A. When demand increases (the demand curve shifts rightward), the market-clearing price rises, and the quantity supplied (and sold) increases. When demand decreases (the demand curve shifts leftward), the market-clearing price falls, and the quantity supplied (and sold) decreases. When supply increases (the supply curve shifts rightward), the market-clearing price falls, and the quantity demanded (and sold) increases. When supply decreases (the supply curve shifts leftward), the market-clearing price rises, and the quantity demanded (and sold) decreases.
- 4.4.2 Q. Predicting changes in market-clearing prices and quantities is harder when both demand and supply change at the same time. You run a halal butcher shop in Ottawa and expect an increase in the number of Muslims in Ottawa who prefer halal meat. Rents for retail space are also falling all over town. Predict what will happen to the market-clearing price for halal meat. Predict what will happen to the market-clearing quantity. Explain your predictions.
  - A. The increase in the number of Muslims in Ottawa causes an increase in the demand for halal meat (the demand curve shifts rightward). The falling rents, which are a fall in the price of an input, cause an increase in the supply of halal meat (the supply curve shifts rightward). These events have opposite effects on the price of halal meat. The increase in demand increases the price, but the increase in supply decreases the price. The net effect depends on the relative strength of the demand forces relative to the supply forces. It is not clear what will happen to the market-clearing price. However, there will clearly be an increase in the quantity sold. The increase in demand increases the quantity sold, and the increase in supply increases the quantity sold. The forces of demand and supply work in the same direction on the quantity sold.

*More questions follow on the next page.*

## Refresh Q&amp;A (continued)

- 4.4.3 Q. In response to the business boom in Alberta, the city of Edmonton offered \$200-per-month rent subsidies to low-income families so they could afford to live and work in the city. If you were asked to advise the city on this policy, what would you tell them about the impact it will have on rents? Will rents go up or down? Explain your reasoning to the city officials.
- A. The \$200-per-month subsidy increases income, which causes an increase in demand for normal goods like housing (the demand for housing curve shifts rightward). In general, an increase in demand causes an increase in price, and rent is the price of rental housing. This was not the intention of the subsidy, which was designed to help low-income families afford the already expensive rents in Edmonton. Unless rents increase by \$200 per month, the subsidies will help make housing more affordable as designed. But there could also be the unintended consequence of slightly higher rents.

## Learning Objective

Explain the efficiency of markets using the concepts of consumer surplus and producer surplus.

## Main Point

An efficient market outcome has the largest total surplus, prices just cover all opportunity costs of production and consumers' marginal benefit equals businesses' marginal cost.

## Key Terms

### Consumer surplus

the difference between the amount a consumer is willing and able to pay, and the price actually paid. The area under the marginal benefit curve but above the market price.

### Producer surplus

the difference between the amount a producer is willing to accept, and the price actually received. The area below the market price but above the marginal cost curve.

### Total surplus

consumer surplus plus producer surplus

### Deadweight loss

the decrease in total surplus compared to an economically efficient outcome

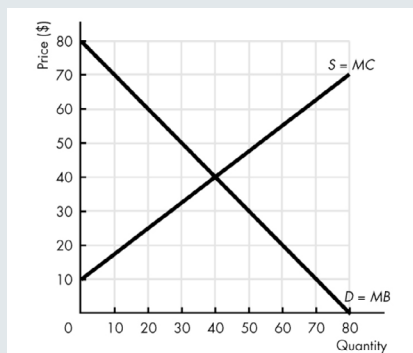
### Efficient market outcome

coordinates smart choices of businesses and consumers so

- consumers buy only products and services where marginal benefit is greater than price
- product and services are produced at lowest cost, with prices just covering all opportunity costs of production
- at the quantity of an efficient market outcome, marginal benefit equals marginal cost ( $MB = MC$ )

## Discussion or Homework Q&A

1. Q. The figure below shows the market for champagne. Note that the demand curve is also a marginal benefit curve, and the supply curve is also a marginal cost curve. Use this figure to answer questions 1 and 2.



The champagne market is in equilibrium.

- Calculate the consumer surplus.
  - Calculate the producer surplus.
  - What is the total surplus?
  - What is the condition for economic efficiency?
- A.
- Consumer surplus is the triangular area under the demand curve but above the horizontal line at the market price of \$40. The formula for the area of a triangle is  $1/2(\text{base})(\text{altitude})$ , so consumer surplus =  $1/2(40)(40) = 800$ .
  - Producer surplus is the triangular area above the supply curve but below the horizontal line at the market price of \$40. Producer surplus =  $1/2(40)(30) = 600$ .
  - Total surplus, consumer surplus plus producer surplus, is  $800 + 600 = 1,400$ .
  - Economic efficiency occurs when total surplus is largest. Is this outcome efficient? We can't be sure if 1,400 is the largest total surplus until we compare total surplus in other situations in the champagne market.

More questions follow on the next page.

## Discussion or Homework Q&amp;A (continued)

2. Q. Suppose now that there is underproduction in the champagne market and output is restricted to 20 bottles.
- Calculate the deadweight loss.
  - What is the total surplus?
  - How does total surplus compare to the answer in Question 1 above? Is the output of 20 bottles efficient?
- A.
- Deadweight loss is the decrease in consumer surplus and producer surplus that results from an inefficient level of production. It equals the triangular area between the demand and supply curves from quantity = 20 to quantity = 40.  $\text{Deadweight loss} = 1/2(35)(20) = 350$ .
  - The new total surplus is the original amount of 1,400 minus the deadweight loss:  $1,400 - 350 = 1,050$ .
  - Total surplus (1,050) is less than the equilibrium total surplus at an output of 40 bottles. Since an efficient output has the largest total surplus, the output of 20 bottles is *not* efficient.

## Refresh Q&amp;A

- 4.5.1 Q. “At the quantity of an efficient market outcome, marginal benefit equals marginal cost.” Explain this statement in your own words.

- A. The best way to explain what happens at an efficient market outcome is to look at outcomes that are not efficient, and the forces that are set in motion to move the market towards an efficient outcome. As output increases, marginal benefit decreases and marginal cost increases. So at a quantity of output less than the efficient market outcome, marginal benefit is greater than marginal cost. That means there is some consumer willing and able to pay a price (marginal benefit) that is higher than the minimum price some business needs to receive (marginal cost) to be willing to supply that unit of output. There is a mutually beneficial trade. These trades, in the self-interest of consumers and businesses, will continue until output increases to the efficient market output.

At quantities greater than the efficient market outcome, marginal cost is greater than marginal benefit. There is no consumer willing to pay the minimum price a business needs to receive to be willing to supply any quantity greater than the quantity at the efficient market outcome. No mutually beneficial trades are possible.

- 4.5.2 Q. In the market for e-readers, at the prices of \$40, \$60, \$80, \$100 and \$120, the following quantities are demanded: 2000, 1600, 1200, 800 and 600 units. The quantities supplied at those prices are: 400, 800, 1200, 1600 and 2000 units. Draw a graph of this market. For the 800th unit, what is the consumer surplus; what is the producer surplus?

- A. Draw the graph. Here is the answer in words. Consumer and producer surpluses are both measured in relation to the market price. So the first task is to find the equilibrium price in this market. That price is \$80 – the price where quantity demanded equals quantity supplied (1200 units). To find the consumer surplus of the 800th unit, take the difference between the price some consumer is willing and able to pay (\$100) and the market price of \$80. The consumer surplus of the 800th e-reader is \$20. That is the vertical distance between the demand curve and the market price at quantity = 800.

To find the producer surplus of the 800th unit, take the difference between the market price (\$80) and the \$60 minimum price some business needs to receive to be willing to supply that unit. The producer surplus of the 800th unit is \$20. That is the vertical distance between the market price and the supply curve at the quantity = 800.

- 4.5.3 Q. For the e-reader market above, explain the reduction in total surplus that happens if the quantity of output increases beyond the efficient market outcome.

- A. Look at quantities beyond the efficient market outcome of 1200 units. For example, the most some consumer is willing and able to pay for the 1600th unit is \$60. The minimum price some business needs to receive to be willing to supply the 1600th unit is \$100. No mutually beneficial trade is possible. If trades did happen beyond the efficient market outcome of 1200 units, there would be deadweight loss from trades where marginal cost is greater than marginal benefit, and total surplus (the sum of consumer and producer surplus) decrease.