

EC 111: Principles of Microeconomics

Lecture Notes, Chapter 6: Supply, Demand, and Government Policies

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Fall 2026

6 Supply, Demand, and Government Policies

Chapters 4 and 5 left markets alone. Supply and demand set the price and the quantity, and elasticity told us how far each one moves when something changes. In this chapter the government steps in. It can set the price directly, with a legal maximum or a legal minimum, or it can tax the good and let the market set the price around the tax. Both happen all the time. Massachusetts has a minimum wage of \$15.00 an hour; the federal minimum has been \$7.25 since 2009. Rent control was banned statewide by a 1994 ballot question and is back in the debate. Gasoline, cigarettes, hotel rooms and Red Sox tickets are all taxed. For each policy we ask the same three questions: who gains, who loses, and does the policy do what it promises?

6.1 Price controls

Definition 6.1 (Price ceiling). A **price ceiling** is a legal maximum on the price at which a good can be sold. Examples: rent control, the controls on gasoline prices in 1973–79, price-gouging laws after a hurricane.

Definition 6.2 (Price floor). A **price floor** is a legal minimum on the price at which a good can be sold. Examples: the minimum wage, farm price supports.

Buyers lobby for ceilings and sellers lobby for floors. Whether a control does anything depends on where it sits relative to the equilibrium price.

Key point

A ceiling *above* the equilibrium price, or a floor *below* it, is **not binding**: the market price is already legal and nothing changes. A ceiling *below* the equilibrium price, or a floor *above* it, is **binding**: the price cannot move to where the market clears.

6.1.1 The market we will use

All the numbers in this chapter come from one market:

$$Q_d = 400 - P, \quad Q_s = 3P.$$

Setting them equal, $400 - P = 3P$, so $P^* = 100$ and $Q^* = 300$. Every policy below starts from this point.

6.1.2 A price ceiling

Suppose the government sets a ceiling of \$120. The market price, \$100, is already below it, so the ceiling is not binding: the price stays at \$100 and 300 units are sold (Figure 1, left).

Now set the ceiling at \$80. Sellers may not charge more than \$80, and at \$80

$$Q_s = 3 \times 80 = 240, \quad Q_d = 400 - 80 = 320.$$

Buyers want 320 units and sellers offer 240: a **shortage** of 80 units (Figure 1, right). In a free market the shortage would push the price up until it disappeared. Here the price is not allowed to rise, so the shortage stays. The number of units actually sold is the smaller of the two quantities, 240. It is not 300 and it is not 320.

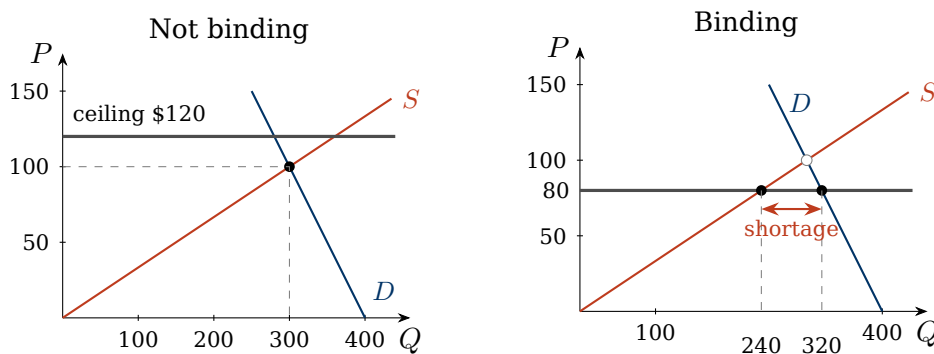


Figure 1: Price ceilings in the market $Q_d = 400 - P$, $Q_s = 3P$. Left: a ceiling at \$120 lies above the equilibrium price of \$100 and changes nothing. Right: a ceiling at \$80 holds the price below equilibrium; buyers want 320 units, sellers offer 240, and only 240 are sold.

6.1.3 Who gets the good?

With 320 buyers who want a unit and 240 units, something other than the price has to decide who gets one. Whatever does the rationing, it is rarely what the policy intended.

- **Lines.** People wait. During the gasoline price controls of 1973 and 1979, drivers waited hours at gas stations. The time spent waiting is a cost the ceiling does not show.

- **The seller's choice.** The seller picks: friends, relatives, tenants who look like no trouble ("no pets, no kids").
- **Side payments.** Buyers pay extra off the books: "key money" to get an apartment, black markets.
- **Lower quality.** With a waiting list of buyers, a landlord has no reason to fix the heating. Quality falls until the low legal price is closer to what the good is worth.

Key point

A binding ceiling helps the buyers who get the good at the lower price. It does nothing for the 80 buyers who wanted the good at \$80 and could not get it, and 60 units that would have been traded at \$100 ($300 - 240$) are never produced. A binding price control always reduces the number of trades.

6.1.4 Rent control: the short run and the long run

Rent control is a price ceiling on apartments. Its effects depend on the time horizon, through the elasticities of Chapter 5 (Figure 2).

In the short run, both curves are steep. The number of apartments is fixed by the buildings that exist, and tenants cannot quickly change where they live. A ceiling below the market rent creates only a small shortage. Over years, both curves become flatter. Landlords stop building new rental units, convert old ones to condos, and stop maintaining the ones they have; more people want their own apartment at the low rent instead of sharing. The same ceiling then produces a much larger shortage.

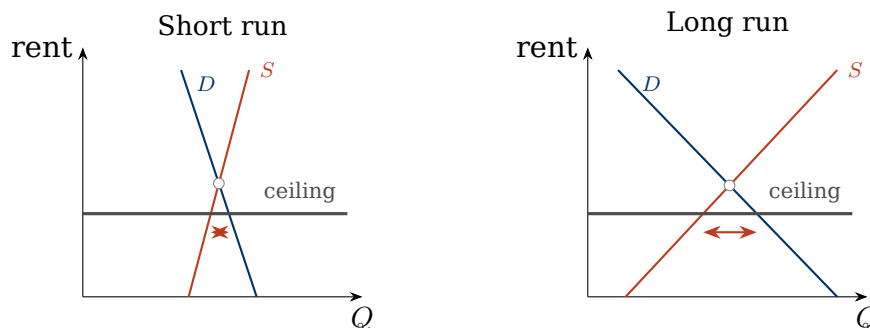


Figure 2: The same rent ceiling. In the short run supply and demand are inelastic and the shortage (arrow) is small. In the long run both are more elastic and the shortage is large.

Two studies of real cities fit this picture.

- **Cambridge, Massachusetts.** Rent control ended in 1995 after the 1994 statewide ballot question. Autor, Palmer and Pathak (*Journal of Political Economy*, 2014) find that buildings released from control rose in value, and so did nearby buildings that had never been controlled. Controlled buildings had been run down and had pulled down the value of their neighborhoods.

- **San Francisco.** In 1994 the city extended rent control to small buildings built before 1980. Diamond, McQuade and Qian (*American Economic Review*, 2019) find that covered tenants stayed in their apartments longer, as intended. Landlords responded by converting units to condos and owner-occupied housing: the supply of rental housing in the affected buildings fell by about 15 percent, which pushed up rents across the city.

Today's tenants gain. Tomorrow's renters pay, through fewer apartments and higher rents in the uncontrolled part of the market.

6.1.5 A price floor

Go back to the market $Q_d = 400 - P$, $Q_s = 3P$, and set a floor of \$120, above the equilibrium price. At \$120,

$$Q_d = 400 - 120 = 280, \quad Q_s = 3 \times 120 = 360.$$

Sellers want to sell 360 units and buyers take only 280: a **surplus** of 80 (Figure 3). Again the number sold is the smaller quantity, here the quantity demanded, 280. A floor at \$80 would not be binding, because the market price of \$100 is already above it.

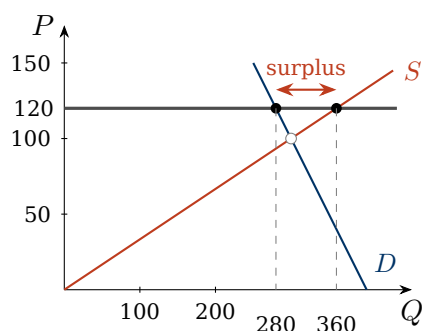


Figure 3: A price floor at \$120. Sellers offer 360 units, buyers take 280, and 280 are sold.

6.1.6 The minimum wage

The most important price floor is the minimum wage. In the labor market the price is the **wage**, firms are the buyers (they demand labor), and workers are the sellers (they supply it). A minimum wage above the market wage is a binding floor: more people want jobs at that wage than firms want to hire. The surplus of labor is **unemployment** (Figure 4).

For most workers the market wage is far above any minimum, so the floor does not bind. It binds for young and low-skilled workers, whose market wage is low. How many jobs it costs depends on the *elasticity of labor demand*: if firms can easily replace workers with machines or simply sell less, demand is elastic and the job losses are large; if not, they are small.

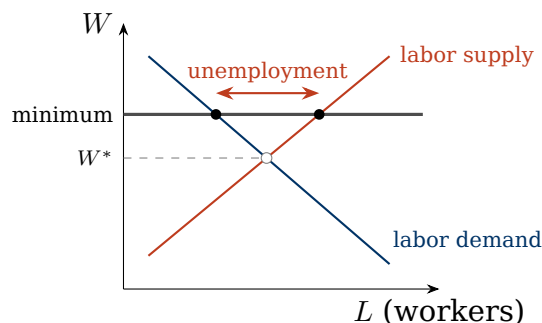


Figure 4: A binding minimum wage. Firms hire fewer workers than at W^* ; more workers want jobs. The gap is unemployment.

The minimum wage has two sides. Workers who keep their jobs are paid more. Workers who lose their jobs, or are never hired, get nothing. The size of the second group is the empirical question.

- Card and Krueger (*American Economic Review*, 1994) compared fast-food restaurants in New Jersey, which raised its minimum wage in 1992, with restaurants across the border in Pennsylvania, which did not. They found no fall in employment in New Jersey. Later work generally finds small employment effects for modest increases.
- For large increases the estimates are larger. In 2019 the Congressional Budget Office studied a federal minimum of \$15 by 2025. Its estimates: pay would rise for 17 million workers, 1.3 million people would be lifted out of poverty, and 1.3 million jobs would be lost (median estimate; the range was from zero to 3.7 million).

A worker who already has a job and a 17-year-old looking for a first one can see the same policy very differently.

6.1.7 Evaluating price controls

The goals of price controls are usually fair ones: cheaper housing for poor families, a living wage. The tool is blunt. Chapter 4 showed that prices do two jobs: they ration the good among buyers, and they signal to sellers what to produce. Fix the price and both jobs are left undone. The result is a shortage or a surplus, rationing by something other than price, and fewer trades.

Economists usually prefer policies that help the same people without fixing the price.

- **Housing vouchers instead of rent control.** The government pays part of a low-income family's rent. The voucher raises demand for apartments, so the market rent rises somewhat and landlords supply more units. Tenants with vouchers pay less out of pocket than before, there is no shortage, and the number of apartments goes up instead of down.
- **The Earned Income Tax Credit instead of a higher minimum wage.** The government adds to the earnings of low-wage workers. Working pays more, so

labor supply rises and the market wage that employers pay falls somewhat; what workers take home, the wage plus the credit, still rises, and employment goes up instead of down.

In both cases the cost moves from landlords and employers to taxpayers, and the market still clears.

In class

Same market: $Q_d = 400 - P$, $Q_s = 3P$.

- (a) A price ceiling at \$60. Is it binding? Is there a shortage or a surplus, and how large? How many units are sold?
- (b) A price floor at \$110. Same questions.
- (c) A price ceiling at \$150. Same questions.

Answers. (a) Binding, since \$60 is below \$100. $Q_s = 180$ and $Q_d = 340$: a shortage of 160, and 180 units are sold. (b) Binding, since \$110 is above \$100. $Q_d = 290$ and $Q_s = 330$: a surplus of 40, and 290 units are sold. (c) Not binding: the market price of \$100 is already legal, so $P = 100$ and $Q = 300$.

Common mistake

“Ceiling” and “floor” describe the law, not the picture. A ceiling drawn *above* the equilibrium looks like it should matter, but it does nothing; a ceiling matters only when it is *below* the equilibrium price. Check where the control sits before you compute anything. And when a control binds, the quantity sold is the *smaller* of Q_d and Q_s : no one can be made to buy or sell more than they want at the legal price.

6.2 Taxes

Governments tax goods to raise revenue and to discourage their use. Gasoline, cigarettes, alcohol, hotel rooms and Red Sox tickets are all taxed. A tax law says who sends the check to the government. The market decides who actually pays.

Definition 6.3 (Tax incidence). **Tax incidence** is the way the burden of a tax is shared among the people in a market, here between buyers and sellers.

For any tax we ask three questions. What happens to the quantity sold? What price do buyers pay, and what price do sellers keep? Does it matter which side the law taxes?

6.2.1 A tax on sellers

Take the same market and impose a tax of \$40 per unit, paid by sellers. Before the tax, sellers supplied 300 units at \$100. Now they owe \$40 on each unit, so to be

willing to supply the same 300 units they need \$140 from the buyer. The same is true at every quantity: the supply curve shifts **up by \$40**. Sellers' supply now depends on the price they keep, $P - 40$:

$$Q_s = 3(P - 40) = 3P - 120.$$

At \$140, buyers want only 260 units, so the price cannot stay there. Setting demand equal to the new supply,

$$400 - P = 3P - 120 \Rightarrow P = 130, \quad Q = 400 - 130 = 270.$$

Buyers pay \$130. Sellers receive \$130, send \$40 to the government, and keep \$90 (Figure 5, left).

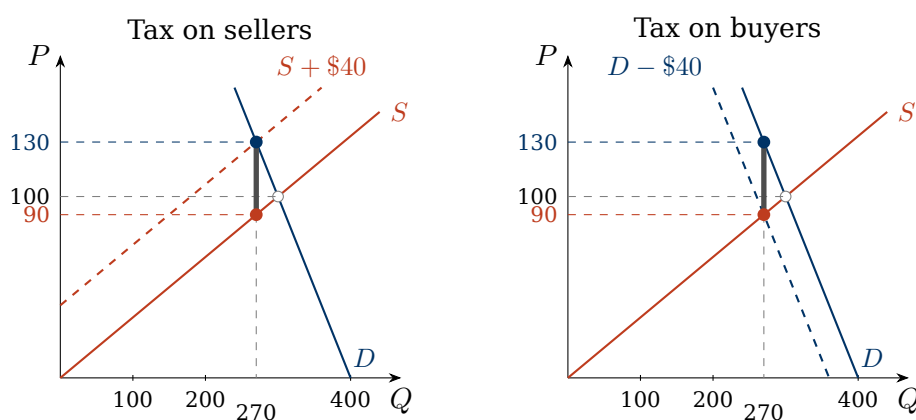


Figure 5: A \$40 tax in the market $Q_d = 400 - P$, $Q_s = 3P$. Left: the tax is levied on sellers and supply shifts up by \$40. Right: it is levied on buyers and demand shifts down by \$40. Either way buyers pay \$130 (blue), sellers keep \$90 (red), and 270 units are sold. The black bar is the tax wedge.

	Before the tax	After the tax	Change
Price buyers pay	\$100	\$130	+30
Price sellers keep	\$100	\$90	-10
Quantity	300	270	-30

Table 1: Who paid the \$40 tax.

The law taxed sellers, but buyers carry \$30 of the \$40 and sellers \$10 (Table 1). The government collects $\$40 \times 270 = \$10,800$.

Key point

Three results hold for every tax. (1) Buyers pay more and sellers keep less: *both* share the burden. (2) The market shrinks: here 30 trades that used to happen no longer do. (3) The tax drives a **wedge** between the price buyers pay and the price sellers keep, and the wedge equals the tax: $130 - 90 = 40$.

6.2.2 A tax on buyers

Now levy the same \$40 on buyers instead. Before the tax, buyers would pay \$100 for the 300th unit. Now each unit costs them the price plus \$40, so they are willing to pay sellers only \$60 for it. The demand curve shifts **down by \$40**: buyers' demand depends on what they pay in total, $P + 40$, where P is the price sellers receive:

$$Q_d = 400 - (P + 40) = 360 - P.$$

Setting this equal to supply, $360 - P = 3P$, so $P = 90$ and $Q = 270$. Sellers keep \$90; buyers pay \$90 to the seller and \$40 to the government, \$130 in all (Figure 5, right). The outcome is exactly the same as when the law taxed sellers.

Key point

A tax on buyers and a tax on sellers are equivalent. The only difference is who hands the money to the government. The law can decide that; it cannot decide who bears the burden.

Common mistake

A tax on sellers shifts supply *up* by the tax: the new supply curve is the old one plus \$40 at every quantity. Do not shift it to the right, and do not shift demand. Read the answer off the graph carefully: the price buyers pay is where the *shifted* curve meets the curve that did not move; the price sellers keep is \$40 below that, on the original supply curve.

6.2.3 Can Congress split the payroll tax?

Social Security and Medicare are paid for by a payroll tax of 15.3 percent of wages. By law, 7.65 percent comes out of the worker's paycheck and 7.65 percent is paid by the employer. Does the worker really pay half?

No law can decide that. The equivalence we just found says that it does not matter which side the law taxes; it is the same wedge between what the employer pays and what the worker takes home. The employer's share is part of what a worker costs, and it comes out of wages. Who bears the 15.3 percent depends on the elasticities of labor supply and demand, and labor supply is fairly inelastic: most people work full time whatever the wage. So workers carry most of the whole tax, not just the half deducted from their paychecks.

6.2.4 Elasticity and tax incidence

Why did buyers carry three-quarters of the \$40? Figure 6 shows two markets with the same tax. When supply is elastic and demand is inelastic (left), the price buyers pay rises by most of the tax and the price sellers keep barely moves: buyers bear most of the burden. When supply is inelastic and demand is elastic (right), the reverse holds: sellers bear most of it.

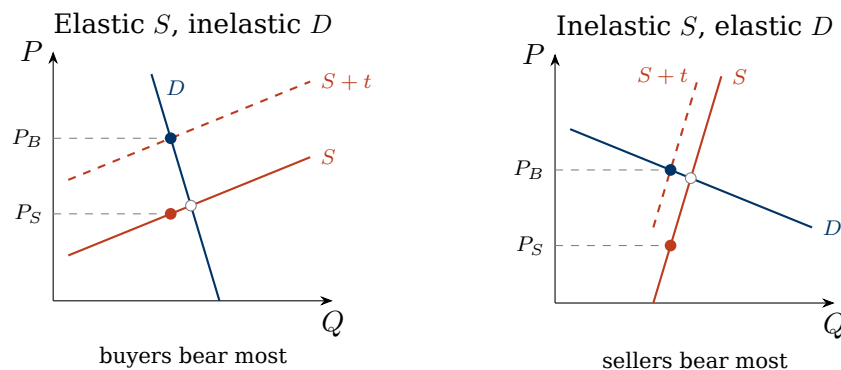


Figure 6: The same tax t in two markets. P_B is the price buyers pay and P_S the price sellers keep; the open circle is the equilibrium before the tax. The burden falls mostly on the less elastic side.

Key point

The burden of a tax falls more heavily on the side of the market that is **less elastic**. Elasticity measures how easily buyers or sellers can walk away when the price turns against them. The side that cannot walk away pays.

Check this on our \$40 tax. At $P = 100$, $Q = 300$, quantity demanded changes by 1 unit per \$1 and quantity supplied by 3 units per \$1, so (using the point version of the Chapter 5 formula, percentage change in Q over percentage change in P)

$$E_d \approx \frac{1 \times 100}{300} = \frac{1}{3}, \quad E_s \approx \frac{3 \times 100}{300} = 1.$$

Demand is the less elastic side, and buyers carried more of the tax: \$30 against \$10, a 3-to-1 split. That is the ratio $E_s : E_d = 1 : \frac{1}{3}$. In general, the buyers' share of the tax is approximately

$$\frac{E_s}{E_s + E_d} = \frac{1}{1 + 1/3} = \frac{3}{4}, \quad \frac{3}{4} \times \$40 = \$30.$$

You will not need this formula on the exam. You will need the direction: the less elastic side pays more.

6.2.5 An extreme case: Fenway Park

Example 6.1 (A ticket tax at Fenway). Fenway Park has 25,000 seats. Demand for tickets, in thousands, is $Q_d = 100 - 1.25P$. Supply is the stadium: 25,000 seats whatever the price, a vertical line at $Q = 25$. The equilibrium price solves $25 = 100 - 1.25P$, so $P = \$60$.

Now Boston adds a tax of \$10 per ticket, paid by the buyer. Demand shifts down by \$10: $Q_d = 100 - 1.25(P + 10)$. Supply has not moved, so 25,000 tickets are still sold, and $25 = 100 - 1.25(P + 10)$ gives $P = \$50$ to the Red Sox. Fans pay $50 + 10 = \$60$, exactly what they paid before. The city collects $10 \times 25,000 = \$250,000$ per game, all of it out of the Red Sox's revenue (Figure 7).

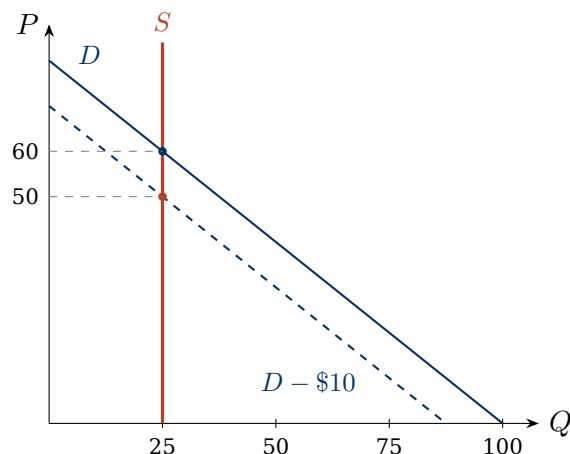


Figure 7: Fenway Park, quantities in thousands of tickets. Supply is fixed at 25,000 seats. A \$10 tax on fans shifts demand down by \$10; the price the Red Sox receive falls from \$60 to \$50, and fans still pay \$60 in all.

With perfectly inelastic supply, the sellers bear the entire tax. The Red Sox cannot add seats or take them away in response to the price, so they cannot pass any of it on.

6.2.6 Application: the 1990 luxury tax

In 1990 Congress passed a tax on yachts, private planes, furs, jewelry and expensive cars. The aim was to tax the rich, who buy these goods. Who actually bore the tax on yachts?

Demand for yachts is elastic. A rich family that finds yachts more expensive can buy a bigger house, take a long trip, or buy a boat abroad. Supply is inelastic in the short run: a boatyard and its skilled workers cannot easily switch to building something else. So the burden fell mostly on the sellers, the boatbuilders and their workers, and not on the rich buyers it was aimed at. Most of the luxury tax was repealed in 1993.

In class

For each tax, which side bears most of the burden, and why?

- (a) A tax on cigarettes, over the next month.
- (b) A tax on parking in a downtown garage whose 500 spaces cannot change.
- (c) A tax on Coca-Cola only, with Pepsi untaxed.

Answers. (a) Smokers: demand for cigarettes is inelastic, especially in the short run, while supply is elastic. (b) The garage owner: supply is fixed, like the seats at Fenway, so the price drivers pay does not change. (c) Coca-Cola: with Pepsi as a close substitute, demand for Coke is very elastic, and Coke cannot raise its price much without losing its buyers.

6.3 Summary

- A price ceiling is a legal maximum; a price floor is a legal minimum. A ceiling binds only if it is below the equilibrium price; a floor binds only if it is above it.
- A binding ceiling causes a shortage, and something other than the price rations the good: lines, the seller's choice, side payments, lower quality. A binding floor causes a surplus. Either way, fewer units are traded: the quantity sold is the smaller of Q_d and Q_s .
- Rent control causes small shortages in the short run and large ones in the long run, as supply and demand become more elastic. The minimum wage raises pay for workers who keep their jobs and costs jobs for others, more so when labor demand is elastic.
- Housing vouchers and the Earned Income Tax Credit help the same people without fixing the price; the cost moves to taxpayers and the market still clears.
- A tax drives a wedge between the price buyers pay and the price sellers keep, equal to the tax, and the quantity sold falls.
- A tax on sellers shifts supply up by the tax; a tax on buyers shifts demand down by the tax. The outcome is the same: the law cannot decide who bears the burden.
- The less elastic side of the market bears more of the burden of a tax. With perfectly inelastic supply, sellers bear all of it.

Exercises

Exercise 6.1. In a market, $Q_d = 600 - 2P$ and $Q_s = 4P - 120$.

- Find the equilibrium price and quantity.
- The government imposes a price ceiling of \$100. Is it binding? Is there a shortage or a surplus, and how large? How many units are sold?
- Answer the same questions for a price ceiling of \$140, and then for a price floor of \$150.

Exercise 6.2. Same market as Exercise 6.1. The government imposes a tax of \$30 per unit on sellers.

- Write the new supply equation, and find the price buyers pay, the price sellers keep, and the quantity sold.
- How much of the \$30 do buyers bear, and how much do sellers bear? How much revenue does the government collect?
- Now levy the \$30 on buyers instead. Write the new demand equation and show that the answers to (a) do not change.
- Compute the elasticities of demand and supply at the original equilibrium, as the text does for the \$40 tax. Is the split in (b) what the rule "the less elastic side pays more" predicts?

Exercise 6.3. In the market for unskilled labor (quantities in thousands of workers, wages in dollars an hour), labor demand is $L_d = 1,000 - 50W$ and labor supply is $L_s = 100W - 500$.

- (a) Find the equilibrium wage and employment.
- (b) A minimum wage of \$12 is introduced. How many workers are employed? How many are unemployed? How many jobs are lost compared with (a)?
- (c) By how much does the hourly pay of the workers who keep their jobs rise in total? Who loses?
- (d) Would a minimum wage of \$9 change anything? Why or why not?

Exercise 6.4. A concert hall has 2,000 seats. Demand for tickets to a show is $Q_d = 5,000 - 50P$.

- (a) Find the equilibrium ticket price.
- (b) The city caps ticket prices at \$40. Is there a shortage? How large? Name two ways the tickets might end up being rationed.
- (c) Instead of the cap, the city taxes each ticket \$5, paid by the buyer. What price does the hall receive, what do fans pay in total, and who bears the tax? Draw the diagram.

Exercise 6.5. For each tax, say which side of the market bears most of the burden and explain using elasticities.

- (a) A tax on gasoline, over the next week.
- (b) A tax on restaurant meals in one small town, when the towns next door have no such tax.
- (c) A tax on insulin.
- (d) A tax on hand-built wooden sailboats, in the first year after the tax.

Exercise 6.6. The payroll tax is 15.3 percent of wages: by law, half comes out of the worker's paycheck and half is paid by the employer.

- (a) A politician proposes to "help workers" by moving the whole tax onto employers. Using what you know about taxes on buyers and sellers, explain what would happen to workers' take-home pay.
- (b) If labor supply were perfectly inelastic, who would bear the whole tax? Draw the diagram.

Exercise 6.7. A city with rent-controlled apartments is considering replacing rent control with housing vouchers for low-income tenants.

- (a) Use a diagram to show the effect of rent control on the number of apartments rented, in the short run and in the long run.
- (b) Use a diagram to show the effect of a voucher program on the market rent and the number of apartments rented.
- (c) Who bears the cost of each policy?

Answers to exercises

Exercise 6.1. (a) $600 - 2P = 4P - 120$, so $6P = 720$, $P^* = 120$, and $Q^* = 600 - 240 = 360$.
(b) Binding, since \$100 is below \$120. $Q_d = 600 - 200 = 400$ and $Q_s = 400 - 120 = 280$: a

shortage of 120, and 280 units are sold. (c) A ceiling of \$140 is above the equilibrium price and is not binding: $P = 120$, $Q = 360$. A floor of \$150 is above the equilibrium price and binds: $Q_d = 600 - 300 = 300$ and $Q_s = 600 - 120 = 480$, a surplus of 180, and 300 units are sold.

Exercise 6.2. (a) Sellers keep $P - 30$, so $Q_s = 4(P - 30) - 120 = 4P - 240$. Then $600 - 2P = 4P - 240$ gives $P = 140$: buyers pay \$140, sellers keep \$110, and $Q = 600 - 280 = 320$. (b) Buyers pay \$20 more than before ($140 - 120$), sellers keep \$10 less ($120 - 110$). Revenue is $30 \times 320 = \$9,600$. (c) Buyers pay $P + 30$, so $Q_d = 600 - 2(P + 30) = 540 - 2P$. Then $540 - 2P = 4P - 120$ gives $P = 110$, the price sellers receive; buyers pay $110 + 30 = 140$, and $Q = 4 \times 110 - 120 = 320$. Same answers. (d) At $P = 120$, $Q = 360$: $E_d \approx 2 \times 120/360 = 0.67$ and $E_s \approx 4 \times 120/360 = 1.33$. Demand is less elastic, so buyers should bear more, and they do: \$20 of \$30, which is $E_s/(E_s + E_d) = 1.33/2 = 2/3$ of the tax.

Exercise 6.3. (a) $1,000 - 50W = 100W - 500$, so $150W = 1,500$, $W^* = \$10$, and employment is $1,000 - 500 = 500$ thousand. (b) At \$12, firms hire $L_d = 1,000 - 600 = 400$ thousand workers, and $L_s = 1,200 - 500 = 700$ thousand want to work. Employment is 400 thousand, unemployment is $700 - 400 = 300$ thousand, and 100 thousand jobs are lost. (Unemployment is larger than the jobs lost because 200 thousand more people now want to work at the higher wage.) (c) The 400 thousand workers who keep their jobs each earn \$2 more an hour: \$800,000 an hour in total. The 100 thousand who lose their jobs lose, and so do employers, who pay more and hire fewer. (d) No. \$9 is below the market wage of \$10, so the floor is not binding.

Exercise 6.4. (a) $2,000 = 5,000 - 50P$, so $P = \$60$. (b) At \$40, $Q_d = 5,000 - 2,000 = 3,000$ and only 2,000 seats exist: a shortage of 1,000. The tickets go to whoever lines up earliest or logs on first, to the hall's friends and regular customers, or to resellers who resell them at a higher price off the books. (c) Demand shifts down by \$5: $2,000 = 5,000 - 50(P + 5)$, so the hall receives \$55. Fans pay $55 + 5 = \$60$, the same as before. With supply fixed at 2,000 seats, the hall bears the whole tax, \$10,000 per show, just as at Fenway.

Exercise 6.5. (a) Buyers. Over a week, drivers cannot change their cars or commutes, so demand is very inelastic; supply from refineries and other regions is more elastic. (b) Restaurants. Diners can eat in the next town, so demand for meals in this town is very elastic; restaurants, with their buildings and staff in place, cannot easily leave in the short run. (c) Buyers. Demand for insulin is close to perfectly inelastic: patients cannot do without it. (d) Sellers. As with the 1990 luxury tax, buyers of sailboats have many other ways to spend their money, while boatbuilders and their skills cannot switch to another product within a year.

Exercise 6.6. (a) Nothing would change. A tax on employers and a tax on workers drive the same wedge between what employers pay and what workers keep. With the whole tax on employers, the wage employers are willing to pay before the tax falls by the extra amount they now owe, and workers' take-home pay ends up where it was. Who sends the check does not decide who bears the tax. (b) The workers. With a vertical labor supply curve, the number of workers does not change with the wage, so employers can pass the entire tax back to workers through lower wages, exactly as the Red Sox absorbed the whole ticket tax at Fenway.

Exercise 6.7. (a) Draw a ceiling below the equilibrium rent. In the short run, with

steep curves, the number of apartments rented falls only a little below the equilibrium and the shortage is small. In the long run, with flatter curves, landlords supply far fewer apartments at the controlled rent, so the number rented falls much more and the shortage is large (Figure 2). (b) A voucher increases what low-income tenants can pay, so demand shifts right. The market rent rises and the number of apartments rented rises; there is no shortage. Tenants with vouchers pay less out of pocket than the market rent because the voucher covers part of it. (c) Under rent control, landlords bear the cost through lower rents, and future renters bear it through fewer apartments. Under vouchers, taxpayers bear the cost through the government budget.