chapter 4

>>The Market Strikes Back

BIG CITY, NOT-SO-BRIGHT IDEAS

NEW YORK CITY IS A PLACE WHERE YOU can find almost anything—that is, almost anything, except a taxicab when you need one or a decent apartment at a rent you can afford. You might think that New York's notorious shortages of cabs and apartments are the inevitable price of big-city living. However, they are largely the product of government policies—specifically, of government policies that have, one way or another, tried to prevail over the market forces of supply and demand.

In the previous chapter, we learned the principle that a market moves to equilibrium—that the market price rises or falls to the level at which the quantity of a good that people are willing to supply is equal to the quantity that other people want to buy. But sometimes governments try to defy that principle. When they do, the market strikes back in predictable ways. And our ability to predict what will happen when governments try to defy supply and demand shows the power and usefulness of supply and demand analysis itself.

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New York City: An empty taxi is hard to find.

The shortages of apartments and taxicabs in New York are particular examples that illuminate what happens when the logic of the market is defied. New York's housing shortage is the result of *rent control*, a law that prevents landlords from raising rents except when specifically given permission. Rent control was introduced during World War II to protect the interests of tenants, and it still remains in force. Many other American cities have had rent control at one time or another, but with the notable exceptions of New York and San Francisco, these controls have largely been done away with. Similarly, New York's limited supply of taxis is the result of a licensing system introduced in the 1930s. New York taxi licenses are known as "medallions," and only taxis with medallions are allowed to pick up passengers. And although this system was originally intended to protect the interests of both drivers and customers, it has generated a shortage of taxis in the city. The number of medallions remained fixed from 1937 until 1995, and only a handful of additional licenses have been issued since then.

What you will learn in this chapter:

- The meaning of **price controls** and **quantity controls,** two kinds of government intervention in markets
- How price and quantity controls create problems and make a market **inefficient**
- Why economists are often deeply skeptical of attempts to intervene in markets
- Who benefits and who loses from market interventions, and why they are used despite their well-known problems
- What an **excise tax** is and why its effect is similar to a quantity control
- Why the **deadweight loss** of a tax means that its true cost is more than the amount of tax revenue collected

In this chapter, we begin by examining what happens when governments try to control prices in a competitive market, keeping the price in a market either below its equilibrium level—a *price ceiling* such as rent control—or above it—a *price floor*. We then turn to schemes such as taxi medallions that attempt to dictate the quantity of a good bought or sold. Finally, we consider the effects of taxes on sales or purchases.

Why Governments Control Prices

You learned in Chapter 3 that a market moves to equilibrium—that is, the market price moves to the level at which the quantity supplied equals the quantity demanded. But this equilibrium price does not necessarily please either buyers or sellers.

After all, buyers would always like to pay less if they could, and sometimes they can make a strong moral or political case that they should pay lower prices. For example, what if the equilibrium between supply and demand for apartments in a major city leads to rental rates that an average working person can't afford? In that case, a government might well be under pressure to impose limits on the rents landlords can charge.

Sellers, however, would always like to get more money for what they sell, and sometimes they can make a strong moral or political case that they should receive higher prices. For example, consider the labor market: the price for an hour of a worker's time is the wage rate. What if the equilibrium between supply and demand for less-skilled workers leads to wage rates that are below the poverty level? In that case, a government might well find itself pressured to require employers to pay a rate no lower than some specified minimum wage.

In other words, there is often a strong political demand for governments to intervene in markets. When a government intervenes to regulate prices, we say that it imposes **price controls**. These controls typically take the form either of an upper limit, a **price ceiling**, or a lower limit, a **price floor**.

Price controls are legal restrictions on how high or low a market price may go. They can take two forms: a **price ceiling,** a maximum price sellers are allowed to charge for a good, or a **price floor,** a minimum price buyers are required to pay for a good.

Unfortunately, it's not that easy to tell a market what to do. As we will now see, when a government tries to legislate prices—whether it legislates them *down* by imposing a price ceiling or *up* by imposing a price floor—there are certain predictable and unpleasant side effects.

We should note an important caveat here: our analysis in this chapter considers only what happens when price controls are imposed on *competitive markets*, which, as you should recall from Chapter 3, are markets with many buyers and sellers in which no buyer or seller can have any influence on the price. When markets are *not* competitive—as in a monopoly, where there is only one seller—price controls don't necessarily cause the same problems. In practice, however, price controls often *are* imposed on competitive markets—like the New York apartment market. And so the analysis in this chapter applies to many important real-world situations.

Price Ceilings

Aside from rent control, there are not many price ceilings in the United States today. But at times they have been widespread. Price ceilings are typically imposed during crises—wars, harvest failures, natural disasters—because these events often lead to sudden price increases that hurt many people but produce big gains for a lucky few. The U.S. government imposed ceilings on many prices during World War II: the war sharply increased demand for raw materials, such as aluminum and steel, and price controls prevented those with access to these raw materials from earning huge profits. Price controls on oil were imposed in 1973, when an embargo by Arab oil-exporting countries seemed likely to generate huge profits for U.S. oil companies. (See

Economics in Action on page 79.) Price controls were imposed on California's wholesale electricity market in 2001, when a shortage was creating big profits for a few power-generating companies but leading to higher bills for consumers.

Rent control in New York is, believe it or not, a legacy of World War II: it was imposed because the war produced an economic boom, which increased demand for apartments at a time when the labor and raw materials that might have been used to build them were being used to win the war instead. Although most price controls were removed soon after the war ended, New York's rent limits were retained and gradually extended to buildings not previously covered, leading to some very strange situations.

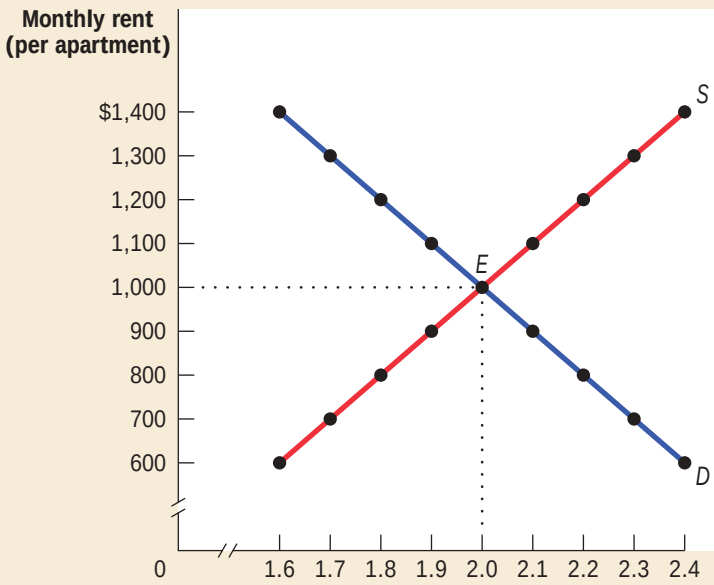
You can rent a one-bedroom apartment in Manhattan on fairly short notice—if you are able and willing to pay about $1,700 a month and live in a less-than-desirable area. Yet some people pay only a small fraction of this for comparable apartments and others pay hardly more for bigger apartments in better locations.

Aside from producing great deals for some renters, however, what are the broader consequences of New York's rent control system? To answer this question, we turn to the model we developed in Chapter 3 on supply and demand.

Modeling a Price Ceiling

To see what can go wrong when a government imposes a price ceiling on a competitive market, consider Figure 4-1, which shows a simplified model of the market for apartments in New York. For the sake of simplicity, we imagine that all apartments are exactly the same and would therefore rent for the same price in an uncontrolled market. The table in the figure shows the demand and supply schedules; the implied demand and supply curves are shown on the left of the diagram. We show the quantity of apartments on the horizontal axis and the monthly rent per apartment on the vertical axis. You can see that in an unregulated market the equilibrium would be at point *E*: 2 million apartments would be rented for $1,000 each per month.

Figure 4-1 The Market for Apartments in the Absence of Government Controls



Monthly rent (per apartment)	Quantity of apartments (millions) Quantity demanded	Quantity supplied
$1,400	1.6	2.4
1,300	1.7	2.3
1,200	1.8	2.2
1,100	1.9	2.1
1,000	2.0	2.0
900	2.1	1.9
800	2.2	1.8
700	2.3	1.7
600	2.4	1.6

Without government intervention, the market for apartments reaches equilibrium at point *E* with a market rent of $1,000 per month and 2 million apartments rented.

Now suppose that the government imposes a price ceiling, limiting rents to a price below the equilibrium price—say no more than $800.

Figure 4-2 shows the effect of the price ceiling, represented by the line at $800. At the enforced rental rate of $800, landlords will have less incentive to offer apartments, so they won't be willing to supply as many as they would at the equilibrium rate of $1,000. So they will choose point *A* on the supply curve, offering only 1.8 million apartments for rent, 200,000 fewer than in the free-market situation. At the same time, more people will want to rent apartments at a price of $800 than at the equilibrium price of $1,000; as shown at point *B* on the demand curve, at a monthly rent of $800 the quantity of apartments demanded rises to 2.2 million, 200,000 more than in the free-market situation and 400,000 more than are actually available at the price of $800. So there is now a persistent shortage of rental housing: at that price, 400,000 more people want to rent than are able to find apartments.

Do price ceilings always cause shortages? No. If a price ceiling is set above the equilibrium price, it won't have any effect. Suppose that the equilibrium rental rate on apartments is $1,000 per month and the city government sets a ceiling of $1,200. Who cares? In this case, the price ceiling won't be binding—it won't actually constrain market behavior—and it will have no effect.

Why a Price Ceiling Causes Inefficiency

The housing shortage shown in Figure 4-2 is not merely annoying: like any shortage induced by price controls, it can be seriously harmful because it leads to *inefficiency*. We introduced the concept of *efficiency* back in Chapter 1, where we learned that an economy is efficient if there is no way to make some people better off without making others worse off and learned the basic principle that a market economy, left to itself, is usually efficient.

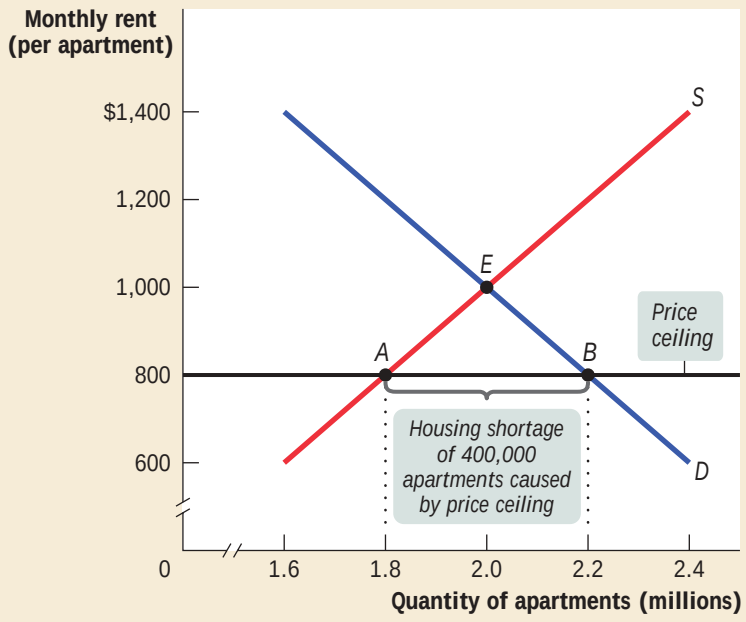
A market or an economy is **inefficient** if there are missed opportunities: some people could be made better off without making other people worse off.

A market or an economy becomes **inefficient** when there are missed opportunities—ways in which production or consumption could be rearranged that would make some people better off at no cost to anyone else.

Figure 4-2

The Effects of a Price Ceiling

The dark horizontal line represents the government-imposed price ceiling on rents of $800 per month. This price ceiling reduces the quantity of apartments supplied to 1.8 million, point *A*, and increases the quantity demanded to 2.2 million, point *B*. This creates a persistent shortage of 400,000 units: 400,000 people who want apartments at the legal rent of $800 but cannot get them.



Rent control, like all price ceilings, creates inefficiency in at least three distinct ways: in the allocation of apartments to renters, in the time wasted searching for apartments, and in the inefficiently low quality or condition in which landlords maintain apartments. In addition to inefficiency, price ceilings give rise to illegal behavior as people try to circumvent them.

Inefficient Allocation to Consumers In the case shown in Figure 4-2, 2.2 million people would like to rent an apartment at $800 per month, but only 1.8 million apartments are available. Of those 2.2 million who are seeking an apartment, some want an apartment badly and are willing to pay a high price to get one. Others have a less urgent need and are only willing to pay a low price, perhaps because they have alternative housing. An efficient allocation of apartments would reflect these differences: people who really want an apartment will get one and people who aren't all that anxious to find an apartment won't. In an inefficient distribution of apartments, the opposite will happen: some people who are not especially anxious to find an apartment will get one but others who are very anxious to find an apartment won't. And because under rent control people usually get apartments through luck or personal connections, rent control generally results in an **inefficient allocation to consumers** of the few apartments available.

Price ceilings often lead to inefficiency in the form of **inefficient allocation to consumers:** people who want the good badly and are willing to pay a high price don't get it, and those who care relatively little about the good and are only willing to pay a low price do get it.

To see the inefficiency involved, consider the plight of the Lees, a family with young children who have no alternative housing and would be willing to pay up to $1,500 for an apartment—but are unable to find one. Also consider George, a retiree who lives most of the year in Florida but still has a lease on the New York apartment he moved into 40 years ago. George pays $800 per month for this apartment, but if the rent were even slightly more—say, $850—he would give it up and stay with his children when he is in New York.

This allocation of apartments—George has one and the Lees do not—is a missed opportunity: there is a way to make the Lees and George both better off at no additional cost. The Lees would be happy to pay George, say, $1,200 a month to sublet his apartment, which he would happily accept since the apartment is worth no more than $850 a month to him. George would prefer the money he gets from the Lees to keeping his apartment; the Lees would prefer to have the apartment rather than the money. So both would be made better off by this transaction—and nobody else would be hurt.

Generally, if people who really want apartments could sublet them from people who are less eager to stay in them, both those who gain apartments and those who trade their leases for more money would be better off. However, subletting is illegal under rent control because it would occur at prices above the price ceiling. But just because subletting is illegal doesn't mean it never happens; in fact, it does occur in New York, although not on a scale that would undo the effects of rent control. This illegal subletting is a kind of *black market activity*, which we will discuss shortly.

Wasted Resources A second reason a price ceiling causes inefficiency is that it leads to **wasted resources**. The Economics in Action on page 79 describes the gasoline shortages of 1979, when millions of Americans spent hours each week waiting in lines at gas stations. The *opportunity cost* of the time spent in gas lines—the wages not earned, the leisure time not enjoyed—constituted wasted resources from the point of view of consumers and of the economy as a whole. Because of rent control, the Lees will spend all their spare time for several months searching for an apartment, time they would rather have spent working or in family activities. That is, there is an opportunity cost to the Lees' prolonged search for an apartment—the leisure or income they had to forgo. If the market for apartments worked freely, the Lees would quickly find an apartment at $1,000 and have time to earn more or to enjoy themselves—an outcome that would make them better off at no expense to anyone else. Again, rent control creates missed opportunities.

Price ceilings typically lead to inefficiency in the form of **wasted resources:** people spend money and expend effort in order to deal with the shortages caused by the price ceiling.

Inefficiently Low Quality A third way a price ceiling causes inefficiency is by causing goods to be of **inefficiently low quality**.

Price ceilings often lead to inefficiency in that the goods being offered are of **inefficiently low quality:** sellers offer low-quality goods at a low price even though buyers would prefer a higher quality at a higher price.

FOR INQUIRING MINDS

THE RENT CONTROL ARISTOCRACY

One of the ironies of New York's rent-control system is that some of the biggest beneficiaries are not the working-class families the system was intended to help but affluent tenants whose families have lived for many decades in choice apartments that would now command very high rents.

One well-known example: the 1986 movie *Hannah and Her Sisters* took place mainly in the real-life home of actress Mia Farrow, a spectacular 11-room apartment overlooking Central Park. Ms. Farrow "inherited" this apartment from her mother, the actress Maureen O'Hara. A few years after the movie came out, a study found that Ms. Farrow was paying less than $2,300 a month—about what a 2-bedroom apartment in a far less desirable location would have cost on the uncontrolled market.

Again, consider rent control. Landlords have no incentive to provide better conditions because they cannot raise rents to cover their repair costs but are still able to find tenants easily. In many cases tenants would be willing to pay much more for improved conditions than it would cost for the landlord to provide them—for example, the upgrade of an antiquated electrical system that cannot safely run air conditioners or computers. But any additional payment for such improvements would be legally considered a rent increase, which is prohibited. Indeed, rent-controlled apartments are notoriously badly maintained, rarely painted, subject to frequent electrical and plumbing problems, sometimes even hazardous to inhabit. As one former manager of Manhattan buildings described his job: "At unregulated apartments we'd do most things that the tenants requested. But on the rent-regulated units, we did absolutely only what the law required. . . . We had a perverse incentive to make those tenants unhappy. With regulated apartments, the ultimate objective is to get people out of the building."

This whole situation is a missed opportunity—some tenants would be happy to pay for better conditions, and landlords would be happy to provide them for payment. But such an exchange would occur only if the market were allowed to operate freely.

Black Markets And that leads us to a last aspect of price ceilings: the incentive they provide for *illegal activities*, specifically the emergence of **black markets**. We have already described one kind of black market activity—illegal subletting by tenants. But it does not stop there. Clearly, there is a temptation for a landlord to say to a potential tenant, "Look, you can have the place if you slip me an extra few hundred in cash each month"—and for the tenant to agree, if he or she is one of those people who would be willing to pay much more than the maximum legal rent.

A **black market** is a market in which goods or services are bought and sold illegally—either because it is illegal to sell them at all or because the prices charged are legally prohibited by a price ceiling.

What's wrong with black markets? In general, it's a bad thing if people break *any* law, because it encourages disrespect for the law in general. Worse yet, in this case illegal activity worsens the position of those who try to be honest. If the Lees are scrupulous about not breaking the rent control law but others—who may need an apartment less than the Lees do—are willing to bribe landlords, the Lees may *never* find an apartment.

So Why Are There Price Ceilings?

We have seen three common results of price ceilings:

- A persistent shortage of the good
- Inefficiency arising from this persistent shortage in the form of inefficient allocation of the good to consumers, resources wasted in searching for the good, and the inefficiently low quality of the good offered for sale
- The emergence of illegal, black market activity

Given these unpleasant consequences, why do governments still sometimes impose price ceilings—and why does rent control, in particular, persist in New York?

One answer is that although price ceilings may have adverse effects, they do benefit some people. In practice, New York's rent control rules—which are more complex than our simple model—hurt most residents but give a small minority of renters much cheaper housing than they would get in an unregulated market. And those who benefit from the controls are typically better organized and more vocal than those who are harmed by them.

Also, when price ceilings have been in effect for a long time, buyers may not have a realistic idea of what would happen without them. In our previous example, the rental rate in an uncontrolled market (Figure 4-1) would be only 25 percent higher than in the controlled market (Figure 4-2)—$1,000 instead of $800. But how would renters know that? Indeed, they might have heard about black market transactions at much higher prices—the Lees or some other family paying George $1,200 or more—and would not realize that these black market prices are much higher than the price that would prevail in a fully free market.

A last answer is that government officials often do not understand supply and demand analysis! It is a great mistake to suppose that economic policies in the real world are always sensible or well informed.

economics in action

Oil Shortages in the 1970s

In 1979 a revolution overthrew the government of Iran, one of the world's major petroleum-exporting countries. The political chaos in Iran disrupted oil production there, and the sudden fall in world supply caused the price of crude oil to shoot up by 300 percent.

In most of the world this price increase made gasoline more expensive at the pump but did not lead to shortages. In the United States, however, gasoline was subject to a price ceiling, imposed six years earlier during an oil crisis sparked by the Arab–Israeli war of 1973. The main purpose of those price controls was to prevent U.S. oil producers from reaping large profits as a result of temporary disruptions of supply.

As we learned in Chapter 3, a fall in supply generally raises prices. But here, because the price of gasoline at the pump couldn't rise, the reduction in supply showed up as shortages. As it turned out, these shortages became much worse because of panic: drivers who weren't sure when they would next be able to get gas rushed to fill up even if they still had plenty in their tanks. This produced a temporary surge in demand and long lines at gas stations.

For a few months the gasoline shortage dominated the national scene. Hours were wasted sitting in gasoline lines; families canceled vacations for fear of being stranded. Eventually, higher production began to work its way through the refineries, increasing supply. And the end of the summer driving season reduced demand. Both together led to a fall in price.

In 1981 price controls on gasoline, now discredited as a policy, were abolished. But the uncontrolled gasoline market faced a major test in the spring of 2000. Oil-producing nations restricted their output in order to drive up prices and achieved unexpected success, more than doubling world prices over a period of a few months. Prices at the pump rose sharply—many people altered their driving plans and some felt distinctly poorer as a result of the higher prices. But there were no shortages and life continued in the United States without nearly as much disruption as price controls had generated in the 1970s.

Interestingly, however, the oil price shock of 2000 *did* cause serious disruptions in some European countries—because truck drivers and farmers, protesting the high price of fuel, blocked deliveries. This protest was an extreme illustration of the reasons why governments sometimes try to control prices despite the known problems with price controls! ■

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>>QUICK REVIEW

- *Price controls* take the form of either legal maximum prices—*price ceilings*—or legal minimum prices—*price floors*.
- A price ceiling below the equilibrium price benefits successful buyers but causes predictable adverse effects such as persistent *shortages,* which lead to three types of *inefficiencies: inefficient allocation to consumers, wasted resources,* and *inefficiently low quality.*
- Price ceilings also produce *black markets,* as buyers and sellers attempt to evade the price restriction.

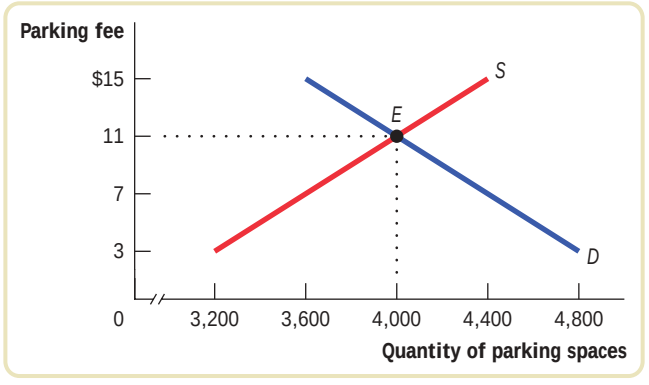
>>CHECK YOUR UNDERSTANDING 4-1

1. Homeowners near Middletown University's stadium used to rent parking spaces in their driveways to fans at a going rate of $11. A new town ordinance now sets a maximum parking fee of $7. Use the accompanying supply and demand diagram to explain how each of the following corresponds to a price-ceiling concept.

a. Some homeowners now think it's not worth the hassle to rent out spaces.
b. Some fans who used to carpool to the game now drive alone.
c. Some fans can't find parking and leave without seeing the game.

Explain how each of the following arises from the price ceiling.

d. Some fans now arrive several hours early to find parking.
e. Friends of homeowners near the stadium regularly attend games, even if they aren't big fans. But some serious fans have given up because of the parking situation.
f. Some homeowners rent spaces for more than $7 but pretend that the buyers are non-paying friends or family.



2. True or false? Explain your answer. Compared to a free market, price ceilings at a price below the equilibrium price do the following:

a. Increase quantity supplied
b. Make some people who want to consume the good worse off
c. Make all producers worse off

Solutions appear at back of book.

Price Floors

Sometimes governments intervene to push market prices up instead of down. *Price floors* have been widely legislated for agricultural products, such as wheat and milk, as a way to support the incomes of farmers. Historically, there were also price floors on such services as trucking and air travel, although these were phased out by the United States in the 1970s. If you have ever worked in a fast-food restaurant, you are likely to have encountered a price floor: the United States and many other countries maintain a lower limit on the hourly wage rate of a worker's labor—that is, a floor on the price of labor, called the **minimum wage**.

The **minimum wage** is a legal floor on the wage rate, which is the market price of labor.

Just like price ceilings, price floors are intended to help some people but generate predictable and undesirable side effects. Figure 4-3 shows hypothetical supply and demand curves for butter. Left to itself, the market would move to equilibrium at point *E*, with 10 million pounds of butter bought and sold at a price of $1 per pound.

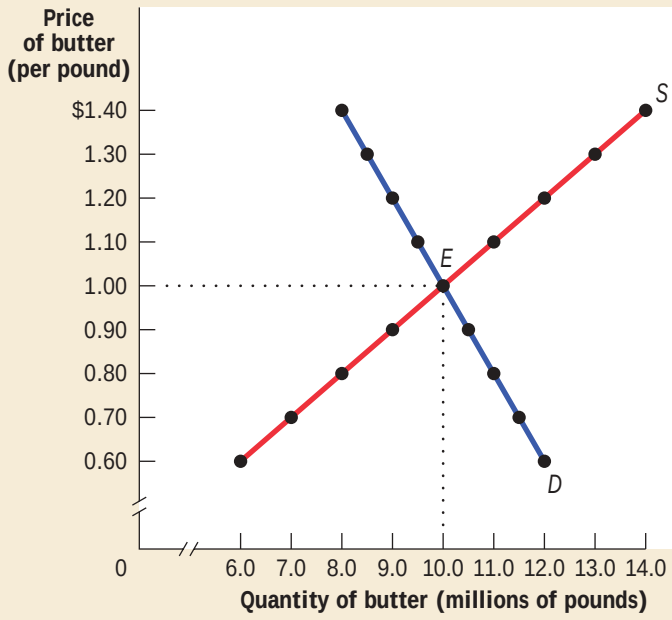
But now suppose that the government, in order to help dairy farmers, imposes a price floor on butter of $1.20 per pound. Its effects are shown in Figure 4-4, where the line at $1.20 represents the price floor. At a price of $1.20 per pound, producers would want to supply 12 million pounds (point *B* on the supply curve) but consumers would want to buy only 9 million pounds (point *A* on the demand curve). There would therefore be a persistent surplus of 3 million pounds of butter.

Does a price floor always lead to an unwanted surplus? No. Just as in the case of a price ceiling, the floor may not be binding—that is, it may be irrelevant. If the equilibrium price of butter is $1 per pound but the floor is set at only $0.80, the floor has no effect.

But suppose that a price floor is binding: what happens to the unwanted surplus? The answer depends on government policy. In the case of agricultural price floors, governments buy up unwanted surplus. Therefore the U.S. government has at times found itself warehousing thousands of tons of butter, cheese, and other farm products. (The European Commission, which administers price floors for a number of European countries, once found itself the owner of a so-called butter mountain, equal in weight to the entire population of Austria.) The government then has to find a way to dispose of these unwanted goods.

Some countries pay exporters to sell products at a loss overseas; this is standard procedure for the European Union. (See For Inquiring Minds on page 82.) At one point the United States tried giving away surplus cheese to the poor. In some cases, governments have actually destroyed the surplus production. To avoid the problem of

Figure 4-3 The Market for Butter in the Absence of Government Controls



Price of butter (per pound)	Quantity of butter (millions of pounds) Quantity demanded	Quantity supplied
$1.40	8.0	14.0
1.30	8.5	13.0
1.20	9.0	12.0
1.10	9.5	11.0
1.00	10.0	10.0
0.90	10.5	9.0
0.80	11.0	8.0
0.70	11.5	7.0
0.60	12.0	6.0

Without government intervention, the market for butter reaches equilibrium at a price of $1 per pound and with 10 million pounds of butter bought and sold.

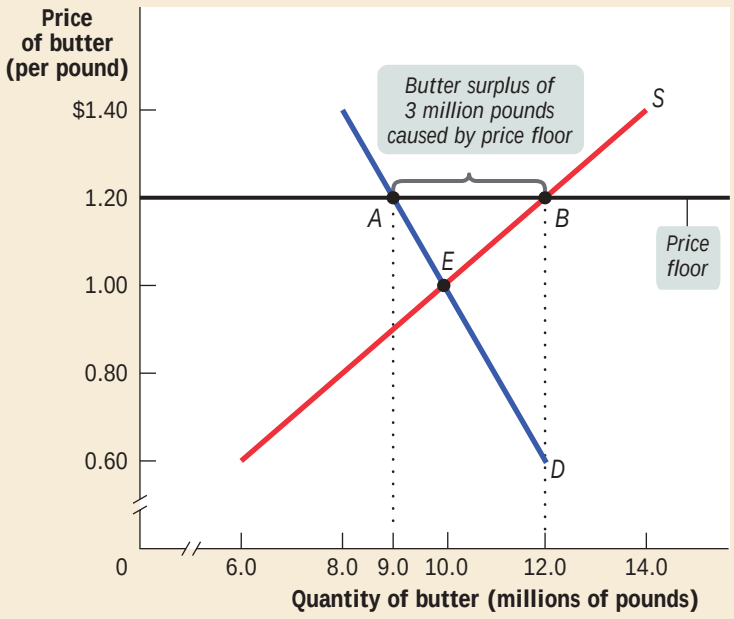
dealing with the unwanted supplies, the U.S. government typically pays farmers not to produce the products at all.

When the government is not prepared to purchase the unwanted surplus, a price floor means that would-be sellers cannot find buyers. This is what happens when there is a price floor on the wage rate paid for an hour of labor, the *minimum wage*: when the

Figure 4-4

The Effects of a Price Floor

The dark horizontal line represents the government-imposed price floor of $1.20 per pound of butter. The quantity of butter demanded falls to 9 million pounds while the quantity supplied rises to 12 million pounds, generating a persistent surplus of 3 million pounds of butter.



FOR INQUIRING MINDS

PRICE FLOORS AND BUTTER COOKIES

Wander down the cookie aisle of your supermarket, and you will probably find a large section of imported cookies, especially "butter cookies"—cookies containing lots of butter—from Denmark and other countries. Why does the United States—with a pretty strong cookie-baking tradition of its own—import cookies from overseas? Part of the answer lies in European price floors.

Twenty-five European countries are currently members of the European Union, an organization that coordinates their policies on foreign trade, regulations, and other matters. The European Union also sets price floors for agricultural goods, under the so-called Common Agricultural Policy, or CAP. These price floors have led to large surpluses, particularly of butter. To cope with these surpluses, the CAP pays a subsidy to companies that export goods such as butter—that is, sell them outside Europe.

And guess what: butter contained in a cookie sold in America counts as exported butter—and receives a subsidy. As a result, butter cookies from Europe are artificially cheap in America. So now you know why your supermarket stocks them. *Bon appetit!*

minimum wage is above the equilibrium wage rate, some people who are willing to work—that is, sell labor—cannot find buyers—that is, employers willing to give them jobs.

Why a Price Floor Causes Inefficiency

The persistent surplus that results from a price floor creates missed opportunities—inefficiencies—that resemble those created by the shortage that results from a price ceiling. These include inefficient allocation of sales among sellers, wasted resources, inefficiently high quality, and the temptation to break the law by selling below the legal price.

Price floors lead to **inefficient allocation of sales among sellers:** those who would be willing to sell the good at the lowest price are not always those who actually manage to sell it.

Inefficient Allocation of Sales Among Sellers Like a price ceiling, a price floor can lead to *inefficient allocation*—but in this case **inefficient allocation of sales among sellers** rather than inefficient allocation to consumers.

An episode from the Belgian movie *Rosetta*, a realistic fictional story, illustrates the problem of inefficient allocation of selling opportunities quite well. Like many European countries, Belgium has a high minimum wage, and jobs for young people are scarce. At one point Rosetta, a young woman who is very anxious to work, loses her job at a fast-food stand because the owner of the stand replaces her with his son—a very reluctant worker. Rosetta would be willing to work for less money, and with the money he would save, the owner could give his son an allowance and let him do something else. But to hire Rosetta for less than the minimum wage would be illegal.

Wasted Resources Also like a price ceiling, a price floor generates inefficiency by *wasting resources*. The most graphic examples involve agricultural products with price floors when the government buys up the unwanted surplus. The surplus production is sometimes destroyed, which is a pure waste; in other cases the stored produce goes, as officials euphemistically put it, "out of condition" and must be thrown away.

Price floors also lead to wasted time and effort. Consider the minimum wage. Would-be workers who spend many hours searching for jobs, or waiting in line in the hope of getting jobs, play the same role in the case of price floors as hapless families searching for apartments in the case of price ceilings.

Inefficiently High Quality Again like price ceilings, price floors lead to inefficiency in the quality of goods produced.

We saw that when there is a price ceiling, suppliers produce products that are of inefficiently low quality: buyers prefer higher-quality products and are willing to pay for them, but sellers refuse to improve the quality of their products because the price

ceiling prevents their being compensated for doing so. This same logic applies to price floors, but in reverse: suppliers offer goods of **inefficiently high quality**.

How can this be? Isn't high quality a good thing? Yes, but only if it is worth the cost. Suppose that suppliers spend a lot to make goods of very high quality but that this quality is not worth all that much to consumers, who would rather receive the money spent on that quality in the form of a lower price. This represents a missed opportunity: suppliers and buyers could make a mutually beneficial deal in which buyers got goods of somewhat lower quality for a much lower price.

Price floors often lead to inefficiency in that goods of **inefficiently high quality** are offered: sellers offer high-quality goods at a high price, even though buyers would prefer a lower quality at a lower price.

A good example of the inefficiency of excessive quality comes from the days when transatlantic airfares were set artificially high by international treaty. Forbidden to compete for customers by offering lower ticket prices, airlines instead offered expensive services, like lavish in-flight meals that went largely uneaten. At one point the regulators tried to restrict this practice by defining maximum service standards—for example, that snack service should consist of no more than a sandwich. One airline then introduced what it called a "Scandinavian Sandwich," a towering affair that forced the convening of another conference to define *sandwich*. All of this was wasteful, especially considering that what passengers really wanted was less food and lower airfares.

Since the deregulation of U.S. airlines in the 1970s, American passengers have experienced a large decrease in ticket prices accompanied by a decrease in the quality of in-flight service—smaller seats, lower-quality food, and so on. Everyone complains about the service—but thanks to lower fares, the number of people flying on U.S. carriers has grown several hundred percent since airline deregulation.

Illegal Activity Finally, like price floors, price ceilings can provide an incentive for *illegal activity*. For example, in countries where the minimum wage is far above the equilibrium wage rate, workers desperate for jobs sometimes agree to work off the books for employers who conceal their employment from the government—or bribe the government inspectors. This practice, known in Europe as "black labor," is especially common in Southern European countries such as Italy and Spain (see Economics in Action below).

So Why Are There Price Floors?

To sum up, a price floor creates various negative side effects:

- A persistent surplus of the good
- Inefficiency arising from the persistent surplus in the form of inefficient allocation of sales among sellers, wasted resources, and an inefficiently high level of quality offered by suppliers
- The temptation to engage in illegal activity, particularly bribery and corruption of government officials

So why do governments impose price floors when they have so many negative side effects? The reasons are similar to those for imposing price ceilings. Government officials often disregard warnings about the consequences of price floors either because they believe that the relevant market is poorly described by the supply and demand model or, more often, because they do not understand the model. Above all, just as price ceilings are often imposed because they benefit some influential buyers of a good, price floors are often imposed because they benefit some influential *sellers*.

economics in action

"Black Labor" in Southern Europe

The best-known example of a price floor is the minimum wage. Most economists believe, however, that the minimum wage has relatively little effect on the job market in the United States, mainly because the floor is set so low. (This effectively makes

the U.S. minimum wage a *nonbinding* price floor—a political symbol more than a substantive policy.) In 1968, the U.S. minimum wage was 53 percent of the average wage of blue-collar workers; by 2003, it had fallen to about 34 percent.

The situation is different, however, in many European countries, where minimum wages have been set much higher than in the United States. This has happened despite the fact that European workers are somewhat less productive than their American counterparts, which means that the equilibrium wage in Europe—the wage that would clear the labor market—is probably lower in Europe than in the United States. Moreover, European countries often require employers to pay for health and retirement benefits, which are more extensive and therefore more costly than comparable American benefits. These mandated benefits make the actual cost of hiring a European worker considerably more than the worker's paycheck.

The result is that in Europe the price floor on labor is definitely binding: the minimum wage is well above the wage rate that would make the quantity of labor supplied by workers equal to the quantity of labor demanded by employers.

The persistent surplus that results from this price floor appears in the form of high unemployment—millions of workers, especially young workers, seek jobs but cannot find them. In countries where the enforcement of labor laws is lax, however, there is a second, entirely predictable result: widespread evasion of the law. In both Italy and Spain, officials believe there are hundreds of thousands, if not millions, of workers who are employed by companies that pay them less than the legal minimum, fail to provide the required health and retirement benefits, or both. In many cases the jobs are simply unreported: Spanish economists estimate that about a third of the country's reported unemployed are in the black labor market—working at unreported jobs. In fact, Spaniards waiting to collect checks from the unemployment office have been known to complain about the long lines that keep them from getting back to work!

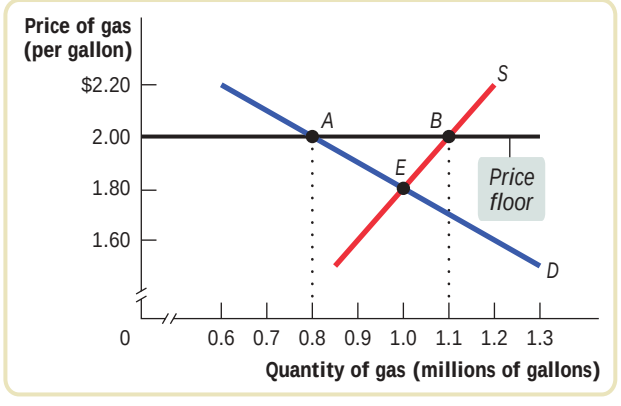
Employers in these countries have also found legal ways to evade the wage floor. For example, Italy's labor regulations apply only to companies with 15 or more workers. This gives a big cost advantage to small Italian firms, many of which remain small in order to avoid having to pay higher wages and benefits. And sure enough, in some Italian industries there is an astonishing proliferation of tiny companies. For example, one of Italy's most successful industries is the manufacture of fine woolen cloth, centered in the Prato region. The average textile firm in that region employs only four workers! ■

>>QUICK REVIEW

- The most familiar price floor is the *minimum wage*. Price floors are also commonly imposed on agricultural goods.
- A price floor above the equilibrium price benefits successful sellers but causes predictable adverse effects such as a persistent *surplus*, which leads to three kinds of inefficiencies: *inefficient allocation of sales among sellers, wasted resources*, and *inefficiently high quality*.
- Price floors encourage illegal activity, such as workers who work off the books, often leading to official corruption.

>>CHECK YOUR UNDERSTANDING 4-2

1. The state legislature mandates a price floor for gasoline of $2 per gallon. Assess the following statements and illustrate your answer using the figure provided:



a. Proponents of the law claim it will increase the income of gas station owners. Opponents claim it will hurt gas station owners because they will lose customers.
b. Proponents claim consumers will be better off because gas stations will provide better service. Opponents claim consumers will be generally worse off because they prefer to buy gas at cheaper prices.
c. Proponents claim that they are helping gas station owners without hurting anyone else. Opponents claim that consumers are hurt and will end up doing things like buying gas in a nearby state or on the black market.

Solutions appear at back of book.

Controlling Quantities

In the 1930s, New York City instituted a system of licensing for taxicabs: only taxis with a "medallion" were allowed to pick up passengers. Because this system was intended to assure quality, medallion owners were supposed to maintain certain standards, including safety and cleanliness. A total of 11,787 medallions were issued, with taxi owners paying $10 for each medallion.

In 1995, there were still only 11,787 licensed taxicabs in New York, even though the city had meanwhile become the financial capital of the world, a place where hundreds of thousands of people in a hurry tried to hail a cab every day. (An additional 400 medallions were issued in 1995, and in 2003 plans were announced to issue 900 more.)

The result of this restriction on the number of taxis was that those medallions became very valuable: if you wanted to operate a New York taxi, you had to lease a medallion from someone else or buy one for a going price of about $250,000.

It turns out that the New York story is not unique; other cities introduced similar medallion systems in the 1930s and, like New York, have issued few new medallions since. In San Francisco and Boston, as in New York, taxi medallions trade for six-figure prices.

A taxi medallion system is a form of **quantity control**, or **quota**, by which the government regulates the quantity of a good that can be bought or sold rather than the price at which it is transacted. The total amount of the good that can be transacted under the quantity control is called the **quota limit**. Typically, the government limits quantity in a market by issuing **licenses;** only people with a license can legally supply the good. A taxi medallion is just such a license. The government of New York City limits the number of taxi rides that can be sold by limiting the number of taxis to only those who hold medallions. There are many other cases of quantity controls, ranging from limits on how much foreign currency (for instance, British pounds or Mexican pesos) people are allowed to buy to the quantity of clams New Jersey fishing boats are allowed to catch. Notice, by the way, that although there are price controls on both sides of the equilibrium price—price ceilings and price floors—in the real world, quantity controls always set an upper, not a lower, limit on quantities. After all, nobody can be forced to buy or sell more than they want to!

A **quantity control,** or **quota,** is an upper limit on the quantity of some good that can be bought or sold. The total amount of the good that can be legally transacted is the **quota limit.**

A **license** gives its owner the right to supply a good.

Some of these attempts to control quantities are undertaken for good economic reasons, some for bad ones. In many cases, as we will see, quantity controls introduced to address a temporary problem become politically hard to remove later because the beneficiaries don't want them abolished, even after the original reason for their existence is long gone. But whatever the reasons for such controls, they have certain predictable—and usually undesirable—economic consequences.

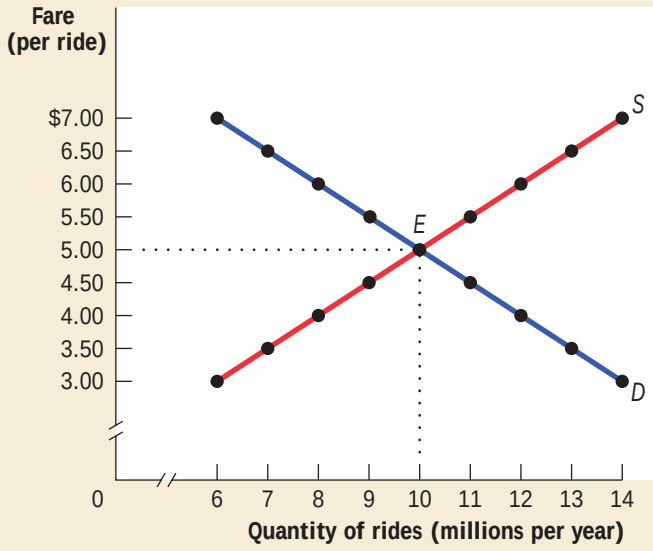
The Anatomy of Quantity Controls

To understand why a New York taxi medallion is worth so much money, we consider a simplified version of the market for taxi rides, shown in Figure 4-5 on page 86. Just as we assumed in the analysis of rent controls that all apartments are the same, we now suppose that all taxi rides are the same—ignoring the real-world complication that some taxi rides are longer, and thus more expensive, than others. The table in the figure shows supply and demand schedules. The equilibrium—indicated by point *E* in the figure and by the shaded entries in the table—is a fare of $5 per ride, with 10 million rides taken per year. (You'll see in a minute why we present the equilibrium this way.)

The New York medallion system limits the number of taxis, but each taxi driver can offer as many rides as he or she can manage. (Now you know why New York taxi drivers are so aggressive!) To simplify our analysis, however, we will assume that a medallion system limits the number of taxi rides that can legally be given to 8 million per year.

Until now, we have derived the demand curve by answering questions of the form: "How many taxi rides will passengers want to take if the price is $5 per ride?" But it is possible to reverse the question and ask instead: "At what price will consumers want

Figure 4-5 The Market for Taxi Rides in the Absence of Government Controls



Fare (per ride)	Quantity of rides (millions per year) Quantity demanded	Quantity supplied
$7.00	6	14
6.50	7	13
6.00	8	12
5.50	9	11
5.00	10	10
4.50	11	9
4.00	12	8
3.50	13	7
3.00	14	6

Without government intervention, the market reaches equilibrium with 10 million rides taken per year at a fare of $5 per ride.

The **demand price** of a given quantity is the price at which consumers will demand that quantity.

The **supply price** of a given quantity is the price at which producers will supply that quantity.

to buy 10 million rides per year?" The price at which consumers want to buy a given quantity—in this case, 10 million rides at $5 per ride—is the **demand price** of that quantity. You can see from the demand schedule in Figure 4-5 that the demand price of 6 million rides is $7, the demand price of 7 million rides is $6.50, and so on.

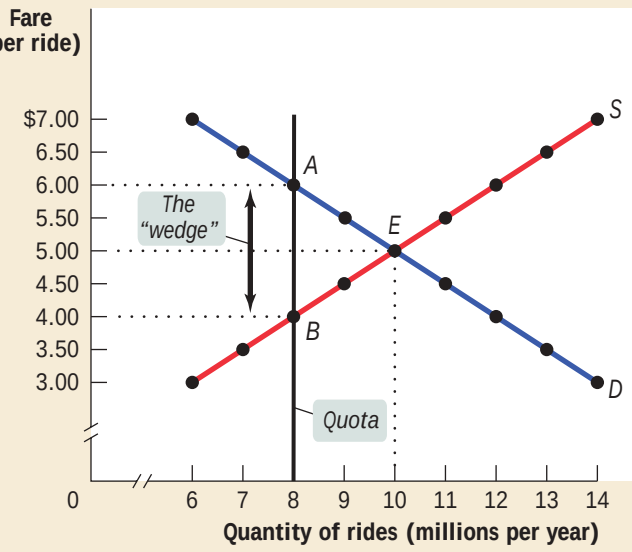
Similarly, the supply curve represents the answer to questions of the form: "How many taxi rides would taxi drivers supply at a price of $5 each?" But we can also reverse this question to ask: "At what price will suppliers be willing to supply 10 million rides per year?" The price at which suppliers will supply a given quantity—in this case, 10 million rides at $5 per ride—is the **supply price** of that quantity. We can see from the supply schedule in Figure 4-5 that the supply price of 6 million rides is $3, the supply price of 7 million rides is $3.50, and so on.

Now we are ready to analyze a quota. We have assumed that the city government limits the quantity of taxi rides to 8 million per year. Medallions, each of which carries the right to provide a certain number of taxi rides per year, are made available to selected people in such a way that a total of 8 million rides will be provided. Medallion holders may then either drive their own taxis or rent their medallions to others for a fee.

Figure 4-6 shows the resulting market for taxi rides, with the line at 8 million rides per year representing the quota limit. Because the quantity of rides is limited to 8 million, consumers must be at point *A* on the demand curve, corresponding to the shaded entry in the demand schedule: the demand price of 8 million rides is $6. Meanwhile, taxi drivers must be at point *B* on the supply curve, corresponding to the shaded entry in the supply schedule: the supply price of 8 million rides is $4.

But how can the price received by taxi drivers be $4 when the price paid by taxi riders is $6? The answer is that in addition to the market in taxi rides, there will also be a market in medallions. Medallion-holders may not always want to drive their taxis: they may be ill or on vacation. So those who do not want to drive their own taxis will sell the right to use the medallion to someone else. So we need to consider two sets of transactions here, and hence two prices: (1) the transactions in taxi rides and the price at which these will occur, and (2) the transactions in medallions and the price at which these will occur. It turns out that since we are looking at two markets, the $4 and $6 prices will both be right.

Figure 4-6 **Effect of a Quota on the Market for Taxi Rides**



Fare (per ride)	Quantity of rides (millions per year): Quantity demanded	Quantity supplied
$7.00	6	14
6.50	7	13
6.00	8	12
5.50	9	11
5.00	10	10
4.50	11	9
4.00	12	8
3.50	13	7
3.00	14	6

The table shows the demand price and the supply price corresponding to each quantity: the price at which that quantity would be demanded and supplied, respectively. The city government imposes a quota of 8 million rides by selling licenses for only 8 million rides, represented by the dark vertical line. The price paid by consumers rises to $6 per ride, the demand price of 8 million rides, shown by point *A*. The supply price of 8 million rides is only $4 per ride, shown by point *B*. The difference between these two prices is the quota rent per ride, the earnings that accrue to the owner of a license. The quota rent drives a wedge between the demand price and the supply price.

To see how this all works, consider two imaginary New York taxi drivers, Sunil and Harriet. Sunil has a medallion but can't use it because he's recovering from a severely sprained wrist. So he's looking to rent his medallion out to someone else. Harriet doesn't have a medallion but would like to rent one. Furthermore, at any point in time there are many other people like Harriet who would like to rent a medallion as well as many others like Sunil who have a medallion to rent. Suppose Sunil agrees to rent his medallion to Harriet. To make things simple, assume that any driver can give only one ride per day and that Sunil is renting his medallion to Harriet for one day. What rental price will they agree on?

To answer this question, we need to look at the transactions from the viewpoints of both drivers. Once she has the medallion, Harriet knows she can make $6 per day—the demand price of a ride under the quota. And she is willing to rent the medallion only if she makes at least $4 per day—the supply price of a ride under the quota. So Sunil cannot demand a rent of more than $2—the difference between $6 and $4. And if Harriet offered Sunil less than $2—say, $1.50—there would be other eager drivers willing to offer him more, up to $2. Hence, in order to get the medallion, Harriet must offer Sunil at least $2. Therefore, since the rent can be no more than $2 and no less than $2, it must be exactly $2.

It is no coincidence that $2 is exactly the difference between $6, the demand price of 8 million rides, and $4, the supply price of 8 million rides. In every case in which the supply of a good is legally restricted, there is a **wedge** between the demand price of the quantity transacted and the supply price of the quantity transacted. This wedge, illustrated by the double-headed arrow in Figure 4-6, has a special name: the **quota rent**. It is the earnings that accrue to the license-holder from ownership of a valuable commodity, the license. In the case of Sunil and Harriet, the quota rent of $2 goes to Sunil because he owns the license, and the remaining $4 from the total fare of $6 goes to Harriet.

A quantity control, or quota, drives a **wedge** between the demand price and the supply price of a good; that is, the price paid by buyers ends up being higher than that received by sellers. The difference between the demand and supply price at the quota limit is the **quota rent,** the earnings that accrue to the license-holder from ownership of the right to sell the good. It is equal to the market price of the license when the licenses are traded.

So Figure 4-6 also illustrates the quota rent in the market for New York taxi rides. The quota limits the quantity of rides to 8 million per year, a quantity at which the demand price of $6 exceeds the supply price of $4. The wedge between these two prices, $2, is the quota rent that results from the restrictions placed on the quantity of taxi rides in this market.

But wait a second. What if Sunil doesn't rent out his medallion? What if he uses it himself? Doesn't this mean that he gets a price of $6? No, not really. Even if Sunil doesn't rent out his medallion, he could have rented it out, which means that the medallion has an *opportunity cost* of $2: if Sunil decides to drive his own taxi rather than renting it to Harriet, the $2 represents his opportunity cost of not renting out his medallion. That is, the $2 quota rent is now the rental income he forgoes by driving his own taxi. In effect, Sunil is in two businesses—the taxi-driving business and the medallion-renting business. He makes $4 per ride from driving his taxi and $2 per ride from renting out his medallion. It doesn't make any difference that in this particular case he has rented his medallion to himself!

Notice, by the way, that quotas—like price ceilings and price floors—don't always have a real effect. If the quota were set at 12 million rides—that is, above the equilibrium quantity in an unregulated market—it would have no effect because it would not be binding.

The Costs of Quantity Controls

Like price controls, quantity controls can have some undesirable side effects. The first is the by-now-familiar problem of *inefficiency* due to missed opportunities: quantity controls prevent mutually beneficial transactions from occurring, transactions that would benefit both buyers and sellers. Looking back at Figure 4-6, you can see that starting at the quota limit of 8 million rides, New Yorkers would be willing to pay at least $5.50 per ride for an additional 1 million rides and that taxi drivers would be willing to provide those rides as long as they got at least $4.50 per ride. These are rides that would have taken place if there were no quota limit. The same is true for the next 1 million rides: New Yorkers would be willing to pay at least $5 per ride when the quantity of rides is increased from 9 to 10 million, and taxi drivers would be willing to provide those rides as long as they got at least $5 per ride. Again, these rides would have occurred without the quota limit. Only when the market has reached the free-market equilibrium quantity of 10 million rides are there no "missed-opportunity rides"—the quota limit of 8 million rides has caused 2 million "missed-opportunity rides." Generally, *as long as the demand price of a given quantity exceeds the supply price, there is a missed opportunity.* A buyer would be willing to buy the good at a price that the seller would be willing to accept, but such a transaction does not occur because it is forbidden by the quota.

And because there are transactions that people would like to make but are not allowed to, quantity controls generate an incentive to evade them or even to break the law. New York's taxi industry again provides clear examples. Taxi regulation applies only to those drivers who are hailed by passengers on the street. A car service that makes prearranged pickups does not need a medallion. As a result, such hired cars provide much of the service that might otherwise be provided by taxis, as in other cities. In addition, there are substantial numbers of unlicensed cabs that simply defy the law by picking up passengers without a medallion. Because these cabs are illegal, their drivers are completely unregulated, and they generate a disproportionately large share of traffic accidents in New York.

In sum, quantity controls typically create the following undesirable side effects:

- Inefficiencies, or missed opportunities, in the form of mutually beneficial transactions that don't occur
- Incentives for illegal activities

economics in action

The Clams of New Jersey

Forget the refineries along the Jersey Turnpike; one industry that New Jersey *really* dominates is clam fishing. The Garden State supplies 80 percent of the world's surf clams, whose tongues are used in fried-clam dinners, and 40 percent of the quahogs, which are used to make clam chowder.

In the 1980s, however, excessive fishing threatened to wipe out New Jersey's clam beds. To save the resource, the U.S. government introduced a clam quota, which sets an overall limit on the number of bushels of clams that may be caught and allocates licenses to owners of fishing boats based on their historical catches.

Notice, by the way, that this is an example of a quota that is probably justified by broader economic and environmental considerations—unlike the New York taxicab quota, which has long since lost any economic rationale. Still, whatever its rationale, the New Jersey clam quota works the same way as any other quota.

Once the quota system was established, many boat owners stopped fishing for clams. They realized that rather than operate a boat part time, it was more profitable to sell or rent their licenses to someone else, who could then assemble enough licenses to operate a boat full time. Today, there are about 50 boats fishing for clams; the license required to operate one is worth more than the boat itself. ■

>>QUICK REVIEW

- *Quantity controls,* or *quotas,* are government-imposed limits on how much of a good may be bought or sold. The quantity allowed for sale is the *quota limit.* The government then issues a *license*—the right to sell a given quantity of a good under the quota.
- When the quota limit is smaller than the quantity of the good transacted in an unregulated market, the *demand price* is higher than the *supply price*—there is a *wedge* between them at the quota limit.
- This wedge is the *quota rent*, the earnings that accrue to the licenseholder from ownership of the right to sell the good—whether by actually supplying the good or by renting the license to someone else. The market price of a license equals the quota rent.
- Like price controls, quantity controls create inefficiencies and encourage illegal activity.

>>CHECK YOUR UNDERSTANDING 4-3

1. Suppose that the supply and demand for taxi rides is given by Figure 4-5 but the quota is set at 6 million rides instead of 8 million. Find the following and indicate them on Figure 4-5.
   a. The price of a ride
   b. The quota rent
   c. Suppose the quota limit on taxi rides is increased to 9 million. What happens to the quota rent?
2. Assume that the quota limit is 8 million rides. Suppose demand decreases due to a decline in tourism. What is the smallest parallel leftward shift in demand that would result in the quota no longer having an effect on the market? Illustrate your answer using Figure 4-5.

Solutions appear at back of book.

A Surprise Parallel: Taxes

To provide the services we want, from national defense to public parks, governments must collect taxes. But taxes impose costs on the economy. Among the most important roles of economics is tax analysis: figuring out the economic costs of taxation, determining who bears those costs, and suggesting ways to change the tax system that will reduce the costs it imposes. It turns out that the same analysis we have just used to understand quotas can be used, with hardly any modification, to make a preliminary analysis of taxes, too.

Why Is a Tax Like a Quota?

Suppose that the supply and demand curves for New York taxis were exactly as shown in Figure 4-5. This means that in the absence of government action, the equilibrium price of a taxi ride will be $5 and 10 million rides will be bought and sold.

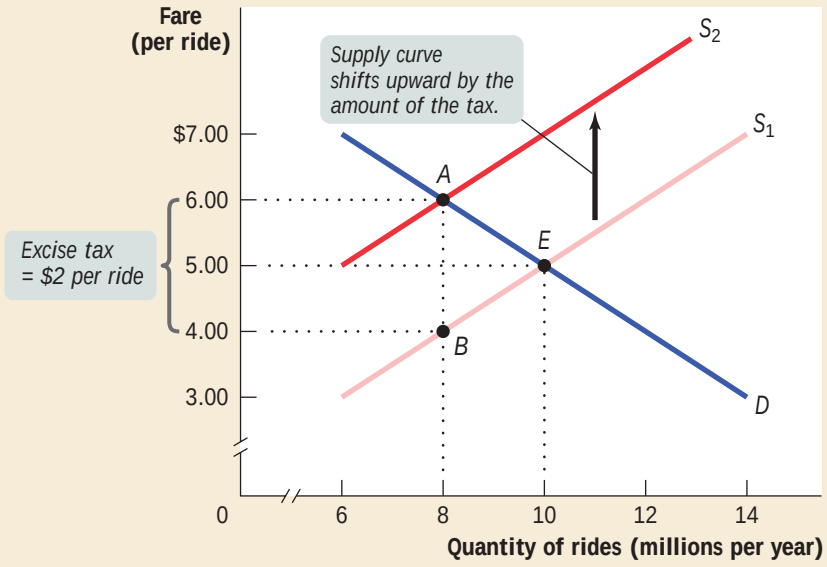
Now suppose that instead of imposing a quota on the quantity of rides, the city imposes an **excise tax**—a tax on sales. Specifically, it charges taxi drivers $2 for each ride they provide. What is the effect of the tax?

An **excise tax** is a tax on sales of a good or service.

Figure 4-7

Effect of an Excise Tax Levied on Sales of Taxi Rides

S_1 is the supply curve before the tax. After the city requires drivers to pay a tax of $2 for every ride they give, the supply curve shifts upward by $2, to the new supply curve S_2. This means that the price drivers receive net of tax is $4, represented by point *B* on the old supply curve S_1. And the price paid by riders is $6, represented by point *A* on the new supply curve S_2. The tax drives a wedge between the demand price, $6, and the original supply price, $4.



From the point of view of a taxi driver, the tax means that he or she doesn't get to keep all of the fare: if a passenger pays $5, $2 is collected as a tax, so the driver gets only $3. For any given quantity of rides supplied, the *post-tax supply price* is higher than the pre-tax supply price. For example, drivers will now require a price of $6 to supply as many rides as they would have been willing to supply at a price of $4 in the absence of the $2 tax.

So the tax on sales shifts the supply curve upward, by the amount of the tax. This is shown in Figure 4-7, where S_1 is the supply curve before the tax is imposed and S_2 is the supply curve after the tax is imposed. The market equilibrium moves from *E*, where the price is $5 per ride and 10 million rides are bought and sold, to *A*, where the price is $6 per ride and 8 million rides are bought and sold. *A* is, of course, on both the demand curve *D* and the new supply curve S_2.

But how do we know that 8 million rides will be supplied at a price of $6? Because the price *net of the tax* is $4 and the pre-tax supply price of 8 million rides is $4, as shown by point *B* in Figure 4-7.

Does all this look familiar? It should. The equilibrium with a $2 tax on rides, which reduces the quantity bought and sold to 8 million rides, looks just like the equilibrium with a quota of 8 million rides, which leads to a quota rent of $2 per ride. Just like a quota, the tax *drives a wedge* between the demand price and the original, pre-tax supply price.

The only difference is that instead of paying a $2 rent to the owner of a license, drivers pay a $2 tax to the city. In fact, there is a way to make an excise tax and a quota completely equivalent. Imagine that instead of issuing a limited number of licenses, the city simply sold licenses at $2 each. This $2 license fee would, for all practical purposes, be a $2 excise tax.

Finally, imagine that instead of selling licenses at a fixed price, the city were to issue 8 million licenses and auction them off—that is, sell them for whatever price the, um, traffic will bear. What would be the price of a license? Surely it would be $2—the quota rent. And so in this case the quota rent would act just like an excise tax.

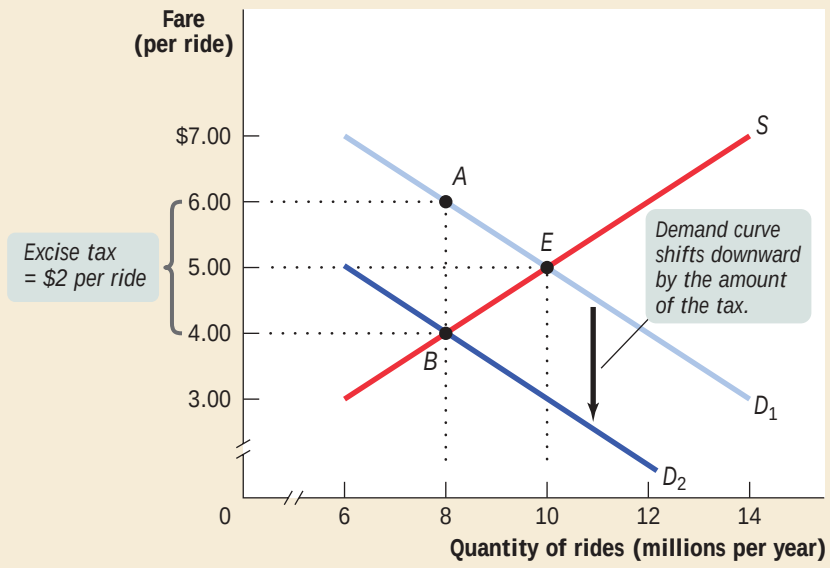
Who Pays an Excise Tax?

We have just imagined a tax that must be paid by the *sellers* of a good. But what would happen if the tax were instead paid by the *buyers*—say, if you had to pay a special $2 tax to ride in a taxicab?

Figure 4-8

Effect of an Excise Tax Levied on Purchases of Taxi Rides

D_1 is the demand curve before the tax. After the city requires riders to pay the $2 tax per ride, the demand curve shifts down by $2 to the new demand curve D_2. Drivers again receive, net of tax, $4, represented by point *B*, while riders again pay a total price of $6, represented by point *A*. The incidence of the tax is exactly the same as in Figure 4-7. This shows that who officially pays a tax is irrelevant when answering the question of who bears the burden of the tax.



The answer is shown in Figure 4-8. If a taxi rider must pay a $2 tax on each ride, then the price riders pay must be $2 less in order for the quantity of taxi rides demanded post-tax to be the same quantity as that demanded pre-tax. So the demand curve shifts *downward*, from D_1 to D_2, by the amount of the tax. This shifts the equilibrium from *E* to *B*, where the market price is $4 per ride and 8 million rides are bought and sold. In this case, $4 is the supply price of 8 million rides and $6 is the demand price—but in effect riders do pay $6, when you include the tax. So it is just as if riders were on their original demand curve at point *A*.

If you compare Figures 4-7 and 4-8, you will immediately notice that they show the same price effect. In each case, buyers pay an effective price of $6, sellers receive an effective price of $4, and 8 million rides are bought and sold. *It doesn't seem to make any difference who officially pays the tax.*

This insight is a general one in analyzing taxes: the **incidence** of a tax—who really bears the burden of the tax—is often not a question you can answer by asking who actually writes the check to the government. In this particular case, a $2 tax on taxi rides is reflected in a $1 increase in the price paid by buyers and a $1 decrease in the price received by sellers; so the incidence of the tax is actually evenly split between buyers and sellers. This incidence is the same regardless of whether the check to the city government is made out by buyers or by sellers.

The **incidence** of a tax is a measure of who really pays it.

The incidence of an excise tax isn't always split evenly between buyers and sellers as in this exapmle. Depending on the shapes of supply and demand curves, the incidence of an excise tax may be divided differently.

The Revenue from an Excise Tax

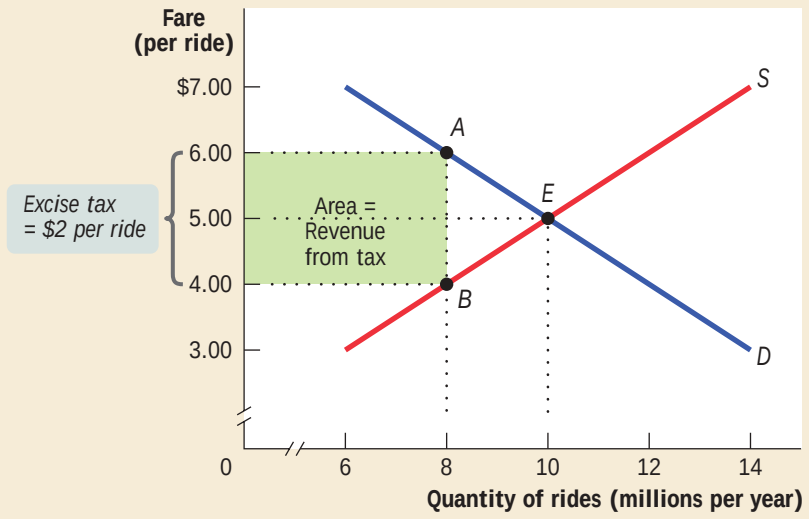
Although both buyers and sellers lose from an excise tax, the government does collect revenue—which is the whole point of the tax. How much revenue does the government collect? The revenue is equal to the area of the shaded rectangle in Figure 4-9 on page 92.

To see why this is the revenue collected by a $2 tax on taxi rides, notice that the *height* of the rectangle is $2. This is the amount of the tax per ride; it is also, as we have seen, the size of the wedge that the tax drives between the supply price and the demand price. Meanwhile, the *width* of the rectangle is 8 million rides, which is the equilibrium quantity of rides given that $2 tax.

Figure 4-9

The Revenue from an Excise Tax

The government revenue collected by this excise tax is equal to the area of the shaded rectangle. In this case it is $2 per ride × 8 million rides = $16 million.



The revenue collected by the tax is

Revenue = $2 per ride × 8 million rides = $16 million

But the area of the rectangle is

Area = height × width = $2 × 8 million = $16 million

This is a general principle: *The revenue collected by an excise tax is equal to the area of the rectangle whose height is the wedge that the tax drives between the supply and demand curves, and whose width is the quantity bought and sold under the tax.*

The Costs of Taxation

What is the cost of a tax? You might be inclined to answer that it is the money taxpayers pay to the government. But suppose the government used that money to provide services everyone wants or simply handed the money back to taxpayers. Would we then say that the tax didn't cost anything?

No—because a tax, like a quota, prevents mutually beneficial transactions from occurring. Consider Figure 4-9 once more. With a $2 tax on taxi rides, riders pay $6 per ride but drivers receive only $4. There are therefore some potential riders who would be willing to pay only, say, $5.50 per ride; and there are some drivers who would be willing to charge them, say, $4.50. If those drivers and riders could be brought together, this would be a mutually beneficial transaction. But such a deal would be illegal, because the $2 tax would not have been paid.

More broadly, we know that there are 2 million potential taxi rides that would have been taken in the absence of the tax, to the mutual benefit of riders and drivers, that do not take place because of that tax.

So an excise tax imposes additional costs, over and above the money actually paid in taxes, in the form of inefficiency, which occurs because the tax discourages mutually beneficial transactions. This is the **excess burden,** or **deadweight loss,** from a tax. And all real-world taxes do impose some excess burden, although badly designed taxes impose bigger excess burdens than well-thought-out ones.

The **excess burden,** or **deadweight loss,** from a tax is the extra cost in the form of inefficiency that results because the tax discourages mutually beneficial transactions.

Economists sometimes say that the real cost of a tax is not the taxes that people pay but the taxes that they *don't* pay. What they mean is that people change their

FOR INQUIRING MINDS

IF SELLING CIGARETTES IS A CRIME, ONLY CRIMINALS WILL SELL CIGARETTES

Cigarettes have long been subject to state excise taxes. As the antismoking movement has gained political power, many states and local governments have increased those taxes. Officials see high taxes on cigarettes as a way of doing well by doing good—raising more revenue while discouraging a bad habit. In 2002, increases at both the state and local levels raised the tax on a pack of cigarettes sold in New York City from $1.19 to $3.

But tobacco-growing states have not followed the trend. In Virginia, for example, the cigarette tax is only 2.5 cents per pack. And this divergence has created an opportunity for those who don't mind breaking the law: there is large-scale smuggling of cigarettes from low-tax tobacco-growing states to high-tax locations like New York.

Authorities believe that interstate cigarette smuggling, like alcohol smuggling during Prohibition, has largely been taken over by organized crime. But there is still room for smaller players: in July 2000, the FBI broke up a group, based in Charlotte, North Carolina, that had been funneling its profits to a foreign group that the U.S. government classifies as a terrorist organization.

behavior in order to avoid taxes—for example, by walking instead of taking a taxi—and in so doing miss opportunities for mutual benefit.

One final point: like all of the other government policies analyzed in this chapter, taxes create incentives for illegal activity. For Inquiring Minds above explains how excise taxes on cigarettes have given rise to a substantial smuggling business. And, of course, even seemingly respectable people have been know to be a bit creative with their income taxes.

economics in action

Who Pays the FICA?

Anyone who works for an employer receives a paycheck that itemizes not only the money received but also the money deducted for various taxes. One of the big items for most people is *FICA*, which stands for Federal Insurance Contributions Act. This is the money taken out of your paycheck for the Social Security and Medicare systems, which provide income and medical care to retired and disabled Americans.

As of the time of writing, most American workers paid 7.65 percent of their earnings in FICA. But this is literally only the half of it: employers are required to pay an equal amount.

So how should we think about FICA? Well, it's like an excise tax—a tax on the sale and purchase of labor. Half of it is a tax on the sellers—that is, workers. The other half is a tax on the buyers—that is, employers.

But we already know that the incidence of a tax does not really depend on who actually makes out the check. So the fact that employers nominally pay half the FICA tells us nothing about who really bears the burden.

In fact, most economists believe that the real effect of the FICA is, to a very good approximation, to reduce wages by the full amount of the combined employee and employer payments. That is, you not only pay your own share; your employer's share is reflected in a lower wage, so that you really pay that share, too. Your employer, though she pays the tax, is fully compensated by the lower wage rate. So workers, not employers, bear the burden of both halves of the tax.

>>QUICK REVIEW

- Like a quota, an *excise tax* drives a wedge between the demand price and the supply price.
- The *incidence* of an excise tax does not depend on who officially pays it, the buyer or the seller.
- Like a quota, an excise tax creates inefficiency, by preventing mutually beneficial transactions between buyers and sellers. This *excess burden,* or *deadweight loss,* means that the true cost is always larger than the amount paid in taxes.
- Like quotas, taxes create an incentive for illegal activity.

The reason economists think that workers, not employers, really pay the FICA is that the supply of labor (the number of workers willing to take jobs) is much less responsive to the wage rate than is the demand for labor (the number of jobs employers are willing to offer). According to this reasoning, since workers are relatively unresponsive to decreases in the wage rate, employers can easily pass the burden of the tax on to them through lower wages. ■

>>CHECK YOUR UNDERSTANDING 4-4

1. Use Figure 4-3 to answer the following questions.
   a. What amount of excise tax generates the same level of inefficiency as a quota of 9 million pounds of butter?
   b. What quota level generates the same level of inefficiency as an excise tax of $0.60 per pound of butter?
   c. In part a, find how the burden of an excise tax is split between buyers and sellers. That is, explain how much of the tax is paid by buyers and how much by sellers in each case.

Solutions appear at back of book.

• A LOOK AHEAD •

In the last two chapters we have gotten a first taste of how economic models help us understand the real world. As we've seen, supply and demand—a simple model of how competitive markets work—can be used to understand and predict the effects of everything from bad weather to misconceived government policies.

In the chapters to come, we'll see how models—including supply and demand, but also going beyond it—can shed light on a wide variety of economic phenomena and issues. •

SUMMARY

1. Governments often intervene in markets in attempts to "defy" supply and demand. Interventions can take the form of **price controls** or **quantity controls**. But they generate predictable and undesirable side effects, consisting of various forms of inefficiency and illegal activity.

2. A **price ceiling**, a maximum market price below the equilibrium price, benefits successful buyers but creates persistent shortages: Because the price is maintained below the equilibrium price, the quantity demanded is increased and the quantity supplied is decreased compared to the equilibrium quantity. This leads to predictable problems: **inefficiencies** in the form of **inefficient allocation to consumers**, **wasted resources**, and **inefficiently low quality**. It also encourages illegal activity as people turn to **black markets** to get the good. Because of these problems, price ceilings have generally lost favor as an economic policy tool. But some governments continue to impose them either because they don't understand the effects or because the price ceilings benefit some influential group.

3. A **price floor**, a minimum market price above the equilibrium price, benefits successful sellers but creates persistent surplus: because the price is maintained above the equilibrium price, the quantity demanded is decreased and the quantity supplied is increased compared to the equilibrium quantity. This leads to predictable problems: inefficiencies in the form of **inefficient allocation of sales among sellers**, **wasted resources**, and **inefficiently high quality**. It also encourages illegal activity and black markets. The most well known kind of price floor is the **minimum wage**, but price floors are also commonly applied to agricultural products.

4. **Quantity controls**, or **quotas**, limit the quantity of a good that can be bought or sold. The amount allowed for sale is the **quota limit**. The government issues **licenses** to individuals, the right to sell a given quantity of the good. The owner of a license earns a **quota rent**, earnings that accrue from ownership of the right to sell the good. It is equal to the difference between the **demand price** at the quota limit, what consumers are willing to pay for that amount, and the **supply price** at the quota limit, what suppliers are willing to accept for that amount. Economists say that a quota drives a **wedge** between the demand price and the supply price; this wedge is equal to the quota rent. Quantity controls generate inefficiency in the form of mutually beneficial transactions that don't occur in addition to encouraging illegal activity.

5. **Excise taxes**—taxes on the purchase or sale of a good—have effects similar to quotas. They raise the price paid by buyers and reduce the price received by sellers, driving a wedge between the two. The **incidence** of the tax—the division of higher prices to consumers and lower prices to sellers—does not depend on who officially pays the tax. Excise taxes cause inefficiency—called **excess burden** or **deadweight loss—**because they prevent some mutually beneficial transactions. They also encourage illegal activity in attempts to avoid the tax.

KEY TERMS

Price controls, p. 74
Price ceiling, p. 74
Price floor, p. 74
Inefficient, p. 76
Inefficient allocation to consumers, p. 77
Wasted resources, p. 77
Inefficiently low quality, p. 77
Black markets, p. 78
Minimum wage, p. 80
Inefficient allocation of sales among sellers, p. 82
Inefficiently high quality, p. 83
Quantity control, p. 85
Quota, p. 85
Quota limit, p. 85
License, p. 85
Demand price, p. 86
Supply price, p. 86
Wedge, p. 87
Quota rent, p. 87
Excise tax, p. 89
Incidence, p. 91
Excess burden, p. 92
Deadweight loss, p. 92

PROBLEMS

1. Suppose it is decided that rent control in New York City will be abolished and that market rents will now prevail. Assume that all rental units are identical and are therefore offered at the same rent. To address the plight of residents who may be unable to pay the market rent, an income supplement will be paid to all low-income households equal to the difference between the old controlled rent and the new market rent.
   - **a.** Use a diagram to show the effect on the rental market of the elimination of rent control. What will happen to the quality and quantity of rental housing supplied?
   - **b.** Now use a second diagram to show the additional effect of the income-supplement policy on the market. What effect does it have on the market rent and quantity of rental housing supplied in comparison to your answers to part a?
   - **c.** Are tenants better or worse off as a result of these policies? Are landlords better or worse off?
   - **d.** From a political standpoint, why do you think cities have been more likely to resort to rent control rather than a policy of income supplements to help low-income people pay for housing?
2. In order to ingratiate himself with voters, the mayor of Gotham City decides to lower the price of taxi rides. Assume, for simplicity, that all taxi rides are the same distance and therefore cost the same. The accompanying table shows the demand and supply schedules for taxi rides.

Fare (per ride)	Quantity of rides (millions per year) Quantity demanded	Quantity supplied
$7.00	10	12
6.50	11	11
6.00	12	10
5.50	13	9
5.00	14	8
4.50	15	7

   - **a.** Assume that there are no restrictions on the number of taxi rides that can be supplied in the city (i.e., there is no medallion system). Find the equilibrium price and quantity.
   - **b.** Suppose that the mayor sets the maximum price at $5.50. How large is the shortage of rides? Illustrate with a diagram. Who loses and who benefits from this policy?
   - **c.** Suppose that the stock market crashes and, as a result, people in Gotham City are poorer. This reduces the quantity of taxi rides demanded by 6 million rides per year at any given price. What effect will the mayor's new policy have now? Illustrate with a diagram.
   - **d.** Suppose that the stock market rises and the demand for taxi rides returns to normal (that is, returns to the demand schedule given in the table). The mayor now decides to ingratiate himself with taxi drivers. He announces a policy in which operating licenses are given to existing taxi drivers; the number of licenses is restricted such that only 10 million rides per year can be given. Illustrate the effect of this policy on the market, and indicate the resulting price and quantity transacted. What is the quota rent per ride?

3. In the late eighteenth century, the price of bread in New York City was controlled, set at a predetermined price above the market price.

a. Draw a diagram showing the effect of the policy. Did the policy act as a price ceiling or a price floor?

b. What kinds of inefficiencies were likely to have arisen when the controlled price of bread was above the market price? Explain in detail.

One year during this period, a poor wheat harvest caused a leftward shift in the supply of bread and therefore an increase in its market price. New York bakers found that the controlled price of bread in New York was below the market price.

c. Draw a diagram showing the effect of the price control on the market for bread during this one-year period. Did the policy act as a price ceiling or a price floor?

d. What kinds of inefficiencies do you think occurred during this period? Explain in detail.

4. The accompanying table shows the demand and supply schedules for milk per year. The U.S. government decides that the incomes of dairy farmers should be maintained at a level that allows the traditional family dairy farm to survive. It therefore implements a price floor of $1 per pint by buying surplus milk until the market price is $1 per pint.

Price of milk (per pint)	Quantity of milk (millions of pints per year)	
	Quantity demanded	Quantity supplied
$1.20	550	850
1.10	600	800
1.00	650	750
0.90	700	700
0.80	750	650

a. How much surplus milk will be produced as a result of this policy?

b. What will be the cost to the government of this policy?

c. Since milk is an important source of protein and calcium, the government decides to provide the surplus milk it purchases to elementary schools at a price of only $0.60 per pint. Assume that schools will buy any amount of milk available at this low price. But parents now reduce their purchases of milk at any price by 50 million pints per year because they know their children are getting milk at school. How much will the dairy program now cost the government?

d. Give two examples of inefficiencies arising from wasted resources that are likely to result from this policy. What is the missed opportunity in each case?

5. As noted in the text, European governments tend to make greater use of price controls than does the American government. For example, the French government sets minimum starting yearly wages for new hires who have completed *le bac*, certification roughly equivalent to a high school diploma. The demand schedule for new hires with *le bac* and the supply schedule for similarly credentialed new job seekers are given in the accompanying table. The price here—given in euros, the currency used in France—is the same as the yearly wage.

Wage (per year)	Quantity demanded (new job offers per year)	Quantity supplied (new job seekers per year)
€45,000	200,000	325,000
40,000	220,000	320,000
35,000	250,000	310,000
30,000	290,000	290,000
25,000	370,000	200,000

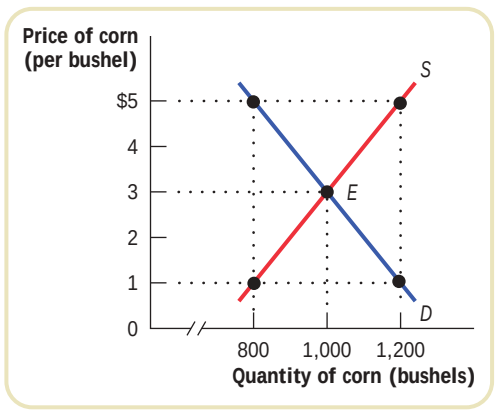
a. In the absence of government interference, what is the equilibrium wage and number of graduates hired per year? Illustrate with a diagram. Will there be anyone seeking a job at the equilibrium wage who is unable to find one—that is, will there be anyone who is involuntarily unemployed?

b. Suppose the French government sets a minimum yearly wage of €35,000. Is there any involuntary unemployment at this wage? If so, how much? Illustrate with a diagram. What if the minimum wage is set at €40,000? Also illustrate with a diagram.

c. Given your answer to part b and the information in the table, what do you think is the relationship between the level of involuntary unemployment and the level of the minimum wage? Who benefits from such a policy? Who loses? What is the missed opportunity here?

6. Until recently, the standard number of hours worked per week for a full-time job in France was 39 hours, just as in the United States. But in response to social unrest over high levels of involuntary unemployment, the French government instituted a 35-hour workweek—a worker could not work more than 35 hours per week even if both the worker and employer wanted it. The motivation behind this policy was that if current employees worked fewer hours, employers would be forced to hire more new workers. Assume that it is costly for employers to train new workers. French employers were greatly opposed to this policy and threatened to move their operations to neighboring countries that did not have such employment restrictions. Can you explain their attitude? Give an example of both an inefficiency and an illegal activity that are likely to arise from this policy.

7. For the last 70 years the U.S. government has used price supports to provide income assistance to American farmers. At times the government has used price floors, which it maintains by buying up the surplus farm products. At other times, it has used target prices, a policy by which the government gives the farmer an amount equal to the difference between the market price and the target price for each unit sold. Consider the market for corn depicted in the accompanying figure.



a. If the government sets a price floor of $5 per bushel, how many bushels of corn are produced? How many are purchased by consumers? By the government? How much revenue do corn farmers receive? How much does the program cost the government?

b. Suppose the government sets a target price of $5 per bushel for any quantity supplied up to 1,000 bushels. How many bushels of corn are purchased by consumers and at what price? By the government? How much revenue do corn farmers receive? How much does the program cost the government?

c. Which of these programs (in a, b) costs corn consumers more? Which program costs the government more? Explain.

d. What are the inefficiencies that arise in each of these cases (a, b)?

8. The waters off the North Atlantic coast were once teeming with fish. Now, due to overfishing by the commercial fishing industry, the stocks of fish are seriously depleted. In 1991, the National Marine Fishery Service of the U.S. government implemented a quota to allow fish stocks to recover. The quota limited the amount of swordfish caught per year by all U.S.-licensed fishing boats to 7 million pounds. As soon as the U.S. fishing fleet had met the quota limit, the swordfish catch was closed down for the rest of the year. The accompanying table gives the hypothetical demand and supply schedules for swordfish caught in the United States per year.

Price of swordfish (per pound)	Quantity of swordfish (million pounds per year) Quantity demanded	Quantity supplied
$20	6	15
18	7	13
16	8	11
14	9	9
12	10	7

a. Use a diagram to show the effect of the quota on the market for swordfish in 1991.

b. How do you think fishermen will change how they fish in response to this policy?

c. Use your diagram from part a to show an excise tax that achieves the same reduction in the amount of pounds of swordfish caught as the quota. What is the amount of the tax per pound?

d. What kinds of activities do you think an excise tax will tempt people to engage in?

e. The excise tax is collected from the fishermen, who protest that they alone are bearing the burden of this policy. Why might this protest be misguided?

9. The U.S. government would like to help the American auto industry compete against foreign automakers that sell cars in the United States. It can do this either by imposing a quota on the number of foreign autos imported or by imposing an excise tax on each foreign auto sold in the United States. The hypothetical demand and supply schedules for imported trucks are given in the accompanying table.

Price of imported truck	Quantity of imported trucks (thousands) Quantity demanded	Quantity supplied
$32,000	100	400
31,000	200	350
30,000	300	300
29,000	400	250
28,000	500	200
27,000	600	150

a. In the absence of government interference, what is the price of an imported truck? How many are sold in the United States? Illustrate with a diagram.

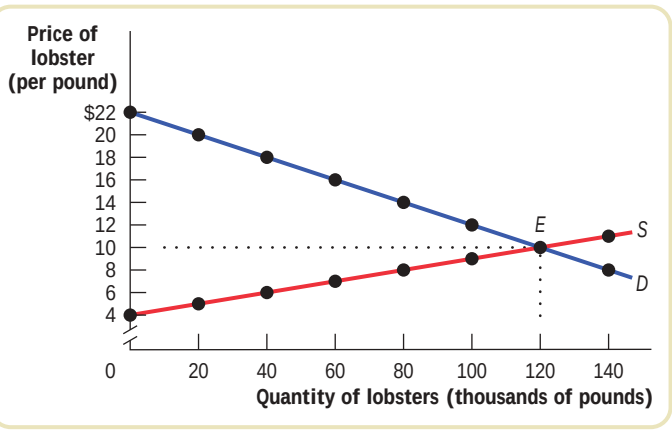
b. Suppose the government adopts a quota, allowing no more than 200,000 foreign trucks to be imported. What is the effect on the market for these trucks? Illustrate with a diagram and explain.

c. Now suppose that, instead of a quota, the government imposes an excise tax of $3,000 per truck. Illustrate the effect of this excise tax in your diagram from part a. How many trucks will now be purchased and at what price? What will the foreign automaker receive per truck?

d. Calculate the government revenue raised by the excise tax in part c. Then illustrate it on your diagram from that part. Do you think the government, from a revenue standpoint, prefers an excise tax or a quota?

e. Explain how the government policy, whether it be a quota or an excise tax, benefits American automakers. Whom does it hurt? What is the missed opportunity here and how does it reflect inefficiency?

10. In Maine, you must have a license to harvest lobster commercially; these licenses are issued yearly. The state of Maine is concerned about the dwindling supplies of lobsters found off its coast. The state fishery department has decided to place a yearly quota of 80,000 pounds of lobsters harvested in all Maine waters. It has also decided to give licenses this year only to those fishermen who had licenses last year. The accompanying figure shows the demand and supply curves for pounds of Maine lobsters.



a. In the absence of government restrictions, what are the equilibrium price and quantity?

b. What is the *demand price* at which consumers wish to purchase 80,000 pounds of lobsters?

c. What is the *supply price* at which suppliers are willing to supply 80,000 pounds of lobsters?

d. What is the *quota rent* per pound of lobster when 80,000 pounds are sold?

e. Find an excise tax that achieves the same reduction in the harvest of lobsters. Show it on the figure. What is the government revenue collected from this tax?

f. Explain a transaction that benefits both buyer and seller but is prevented by the quota restriction. Explain a transaction that benefits both buyer and seller but is prevented by the excise tax.

11. In each of the following cases involving taxes, explain: (i) whether the incidence of the tax falls more heavily on consumers or producers, (ii) why government revenue raised from the tax is not a good indicator of the true cost of the tax, and (iii) what missed opportunity, or inefficiency, arises.

a. The government imposes an excise tax on the sale of all college textbooks. Before the tax was imposed, 1 million textbooks were sold every year at a price of $50. After the tax is imposed, 600,000 books are sold yearly; students pay $55 per book, $30 of which publishers receive.

b. The government imposes an excise tax on the sale of all airplane tickets. Before the tax was imposed, 3 million airline tickets were sold every year at a price of $500. After the tax is imposed, 1.5 million tickets are sold yearly; travelers pay $550 per ticket, $450 of which the airlines receive.

c. The government imposes an excise tax on the sale of all toothbrushes. Before the tax, 2 million toothbrushes were sold every year at a price of $1.50. After the tax is imposed, 800,000 toothbrushes are sold every year; consumers pay $2 per toothbrush, $1.25 of which producers receive.