# 11

# PUBLIC GOODS AND COMMON RESOURCES

IN THIS CHAPTER YOU WILL . . .

*Learn the defining characteristics of public goods and common resources*

*Examine why private markets fail to provide public goods*

*Consider some of the important public goods in our economy*

*See why the cost-benefit analysis of public goods is both necessary and difficult*

*Examine why people tend to use common resources too much*

*Consider some of the important common resources in our economy*

An old song lyric maintains that "the best things in life are free." A moment's thought reveals a long list of goods that the songwriter could have had in mind. Nature provides some of them, such as rivers, mountains, beaches, lakes, and oceans. The government provides others, such as playgrounds, parks, and parades. In each case, people do not pay a fee when they choose to enjoy the benefit of the good.

Free goods provide a special challenge for economic analysis. Most goods in our economy are allocated in markets, where buyers pay for what they receive and sellers are paid for what they provide. For these goods, prices are the signals that guide the decisions of buyers and sellers. When goods are available free of charge, however, the market forces that normally allocate resources in our economy are absent.

In this chapter we examine the problems that arise for goods without market prices. Our analysis will shed light on one of the *Ten Principles of Economics* in

Chapter 1: Governments can sometimes improve market outcomes. When a good does not have a price attached to it, private markets cannot ensure that the good is produced and consumed in the proper amounts. In such cases, government policy can potentially remedy the market failure and raise economic well-being.

## THE DIFFERENT KINDS OF GOODS

How well do markets work in providing the goods that people want? The answer to this question depends on the good being considered. As we discussed in Chapter 7, we can rely on the market to provide the efficient number of ice-cream cones: The price of ice-cream cones adjusts to balance supply and demand, and this equilibrium maximizes the sum of producer and consumer surplus. Yet, as we discussed in Chapter 10, we cannot rely on the market to prevent aluminum manufacturers from polluting the air we breathe: Buyers and sellers in a market typically do not take account of the external effects of their decisions. Thus, markets work well when the good is ice cream, but they work badly when the good is clean air.

In thinking about the various goods in the economy, it is useful to group them according to two characteristics:

**excludability**
*the property of a good whereby a person can be prevented from using it*

**rivalry**
*the property of a good whereby one person's use diminishes other people's use*

- Is the good **excludable?** Can people be prevented from using the good?
- Is the good **rival?** Does one person's use of the good diminish another person's enjoyment of it?

Using these two characteristics, Figure 11-1 divides goods into four categories:

**private goods**
*goods that are both excludable and rival*

1. **Private goods** are both excludable and rival. Consider an ice-cream cone, for example. An ice-cream cone is excludable because it is possible to prevent someone from eating an ice-cream cone—you just don't give it to him. An ice-cream cone is rival because if one person eats an ice-cream cone, another person cannot eat the same cone. Most goods in the economy are private goods like ice-cream cones. When we analyzed supply and demand in Chapters 4, 5, and 6 and the efficiency of markets in Chapters 7, 8, and 9, we implicitly assumed that goods were both excludable and rival.

**public goods**
*goods that are neither excludable nor rival*

2. **Public goods** are neither excludable nor rival. That is, people cannot be prevented from using a public good, and one person's enjoyment of a public good does not reduce another person's enjoyment of it. For example, national defense is a public good. Once the country is defended from foreign aggressors, it is impossible to prevent any single person from enjoying the benefit of this defense. Moreover, when one person enjoys the benefit of national defense, he does not reduce the benefit to anyone else.

**common resources**
*goods that are rival but not excludable*

3. **Common resources** are rival but not excludable. For example, fish in the ocean are a rival good: When one person catches fish, there are fewer fish for the next person to catch. Yet these fish are not an excludable good because it is difficult to charge fishermen for the fish that they catch.
4. When a good is excludable but not rival, it is an example of a *natural monopoly.* For example, consider fire protection in a small town. It is easy to

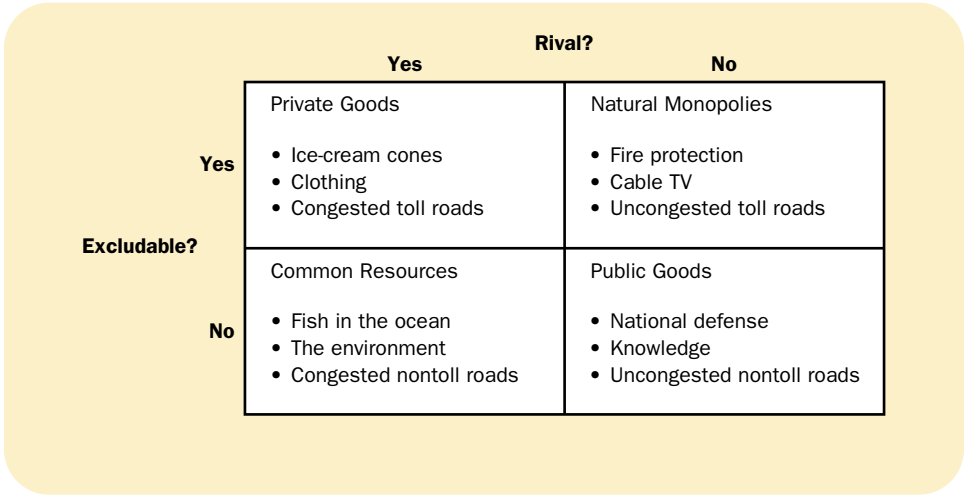


**Figure 11-1**

FOUR TYPES OF GOODS. Goods can be grouped into four categories according to two questions: (1) Is the good excludable? That is, can people be prevented from using it? (2) Is the good rival? That is, does one person's use of the good diminish other people's use of it? This table gives examples of goods in each of the four categories.

exclude people from enjoying this good: The fire department can just let their house burn down. Yet fire protection is not rival. Firefighters spend much of their time waiting for a fire, so protecting an extra house is unlikely to reduce the protection available to others. In other words, once a town has paid for the fire department, the additional cost of protecting one more house is small. In Chapter 15 we give a more complete definition of natural monopolies and study them in some detail.

In this chapter we examine goods that are not excludable and, therefore, are available to everyone free of charge: public goods and common resources. As we will see, this topic is closely related to the study of externalities. For both public goods and common resources, externalities arise because something of value has no price attached to it. If one person were to provide a public good, such as national defense, other people would be better off, and yet they could not be charged for this benefit. Similarly, when one person uses a common resource, such as the fish in the ocean, other people are worse off, and yet they are not compensated for this loss. Because of these external effects, private decisions about consumption and production can lead to an inefficient allocation of resources, and government intervention can potentially raise economic well-being.

**QUICK QUIZ:** Define *public goods* and *common resources*, and give an example of each.

## PUBLIC GOODS

To understand how public goods differ from other goods and what problems they present for society, let's consider an example: a fireworks display. This good is not excludable because it is impossible to prevent someone from seeing fireworks, and it is not rival because one person's enjoyment of fireworks does not reduce anyone else's enjoyment of them.

## THE FREE-RIDER PROBLEM

The citizens of Smalltown, U.S.A., like seeing fireworks on the Fourth of July. Each of the town's 500 residents places a $10 value on the experience. The cost of putting on a fireworks display is $1,000. Because the $5,000 of benefits exceed the $1,000 of costs, it is efficient for Smalltown residents to see fireworks on the Fourth of July.

Would the private market produce the efficient outcome? Probably not. Imagine that Ellen, a Smalltown entrepreneur, decided to put on a fireworks display. Ellen would surely have trouble selling tickets to the event because her potential customers would quickly figure out that they could see the fireworks even without a ticket. Fireworks are not excludable, so people have an incentive to be free riders. A **free rider** is a person who receives the benefit of a good but avoids paying for it.

**free rider**
*a person who receives the benefit of a good but avoids paying for it*

One way to view this market failure is that it arises because of an externality. If Ellen did put on the fireworks display, she would confer an external benefit on those who saw the display without paying for it. When deciding whether to put on the display, Ellen ignores these external benefits. Even though a fireworks display is socially desirable, it is not privately profitable. As a result, Ellen makes the socially inefficient decision not to put on the display.

Although the private market fails to supply the fireworks display demanded by Smalltown residents, the solution to Smalltown's problem is obvious: The local government can sponsor a Fourth of July celebration. The town council can raise everyone's taxes by $2 and use the revenue to hire Ellen to produce the fireworks. Everyone in Smalltown is better off by $8—the $10 in value from the fireworks minus the $2 tax bill. Ellen can help Smalltown reach the efficient outcome as a public employee even though she could not do so as a private entrepreneur.

The story of Smalltown is simplified, but it is also realistic. In fact, many local governments in the United States do pay for fireworks on the Fourth of July. Moreover, the story shows a general lesson about public goods: Because public goods are not excludable, the free-rider problem prevents the private market from supplying them. The government, however, can potentially remedy the problem. If the government decides that the total benefits exceed the costs, it can provide the public good and pay for it with tax revenue, making everyone better off.

## SOME IMPORTANT PUBLIC GOODS

There are many examples of public goods. Here we consider three of the most important.

**National Defense** The defense of the country from foreign aggressors is a classic example of a public good. It is also one of the most expensive. In 1999 the U.S. federal government spent a total of $277 billion on national defense, or about $1,018 per person. People disagree about whether this amount is too small or too large, but almost no one doubts that some government spending for national defense is necessary. Even economists who advocate small government agree that the national defense is a public good the government should provide.

**Basic Research** The creation of knowledge is a public good. If a mathematician proves a new theorem, the theorem enters the general pool of knowledge

"I like the concept if we can do it with no new taxes."

that anyone can use without charge. Because knowledge is a public good, profit-seeking firms tend to free ride on the knowledge created by others and, as a result, devote too few resources to the creation of knowledge.

In evaluating the appropriate policy toward knowledge creation, it is important to distinguish general knowledge from specific, technological knowledge. Specific, technological knowledge, such as the invention of a better battery, can be patented. The inventor thus obtains much of the benefit of his invention, although certainly not all of it. By contrast, a mathematician cannot patent a theorem; such general knowledge is freely available to everyone. In other words, the patent system makes specific, technological knowledge excludable, whereas general knowledge is not excludable.

The government tries to provide the public good of general knowledge in various ways. Government agencies, such as the National Institutes of Health and the National Science Foundation, subsidize basic research in medicine, mathematics, physics, chemistry, biology, and even economics. Some people justify government funding of the space program on the grounds that it adds to society's pool of knowledge. Certainly, many private goods, including bullet-proof vests and the instant drink Tang, use materials that were first developed by scientists and engineers trying to land a man on the moon. Determining the appropriate level of governmental support for these endeavors is difficult because the benefits are hard to measure. Moreover, the members of Congress who appropriate funds for research usually have little expertise in science and, therefore, are not in the best position to judge what lines of research will produce the largest benefits.

**Fighting Poverty** Many government programs are aimed at helping the poor. The welfare system (officially called Temporary Assistance for Needy Families) provides a small income for some poor families. Similarly, the Food Stamp program subsidizes the purchase of food for those with low incomes, and various government housing programs make shelter more affordable. These antipoverty programs are financed by taxes on families that are financially more successful.

Economists disagree among themselves about what role the government should play in fighting poverty. Although we will discuss this debate more fully in Chapter 20, here we note one important argument: Advocates of antipoverty programs claim that fighting poverty is a public good.

Suppose that everyone prefers to live in a society without poverty. Even if this preference is strong and widespread, fighting poverty is not a "good" that the private market can provide. No single individual can eliminate poverty because the problem is so large. Moreover, private charity is hard pressed to solve the problem: People who do not donate to charity can free ride on the generosity of others. In this case, taxing the wealthy to raise the living standards of the poor can make everyone better off. The poor are better off because they now enjoy a higher standard of living, and those paying the taxes are better off because they enjoy living in a society with less poverty.

### CASE STUDY ARE LIGHTHOUSES PUBLIC GOODS?

Some goods can switch between being public goods and being private goods depending on the circumstances. For example, a fireworks display is a public good if performed in a town with many residents. Yet if performed at a private amusement park, such as Walt Disney World, a fireworks display is more like a private good because visitors to the park pay for admission.

Another example is a lighthouse. Economists have long used lighthouses as an example of a public good. Lighthouses are used to mark specific locations so that passing ships can avoid treacherous waters. The benefit that the lighthouse provides to the ship captain is neither excludable nor rival, so each captain has an incentive to free ride by using the lighthouse to navigate without paying for the service. Because of this free-rider problem, private markets usually fail to provide the lighthouses that ship captains need. As a result, most lighthouses today are operated by the government.

USE OF THE LIGHTHOUSE IS FREE TO THE BOAT OWNER. DOES THIS MAKE THE LIGHTHOUSE A PUBLIC GOOD?

In some cases, however, lighthouses may be closer to private goods. On the coast of England in the nineteenth century, some lighthouses were privately owned and operated. The owner of the local lighthouse did not try to charge ship captains for the service but did charge the owner of the nearby port. If the port owner did not pay, the lighthouse owner turned off the light, and ships avoided that port.

In deciding whether something is a public good, one must determine the number of beneficiaries and whether these beneficiaries can be excluded from enjoying the good. A free-rider problem arises when the number of beneficiaries is large and exclusion of any one of them is impossible. If a lighthouse benefits many ship captains, it is a public good. Yet if it primarily benefits a single port owner, it is more like a private good.

## THE DIFFICULT JOB OF COST-BENEFIT ANALYSIS

So far we have seen that the government provides public goods because the private market on its own will not produce an efficient quantity. Yet deciding that the government must play a role is only the first step. The government must then determine what kinds of public goods to provide and in what quantities.

Suppose that the government is considering a public project, such as building a new highway. To judge whether to build the highway, it must compare the total benefits of all those who would use it to the costs of building and maintaining it. To make this decision, the government might hire a team of economists and engineers to conduct a study, called a **cost-benefit analysis,** the goal of which is to estimate the total costs and benefits of the project to society as a whole.

**cost-benefit analysis**
*a study that compares the costs and benefits to society of providing a public good*

Cost-benefit analysts have a tough job. Because the highway will be available to everyone free of charge, there is no price with which to judge the value of the highway. Simply asking people how much they would value the highway is not reliable. First, quantifying benefits is difficult using the results from a questionnaire. Second, respondents have little incentive to tell the truth. Those who would use the highway have an incentive to exaggerate the benefit they receive to get the highway built. Those who would be harmed by the highway have an incentive to exaggerate the costs to them to prevent the highway from being built.

The efficient provision of public goods is, therefore, intrinsically more difficult than the efficient provision of private goods. Private goods are provided in the market. Buyers of a private good reveal the value they place on it by the prices they are willing to pay. Sellers reveal their costs by the prices they are willing to accept. By contrast, cost-benefit analysts do not observe any price signals when evaluating whether the government should provide a public good. Their findings on the costs and benefits of public projects are, therefore, rough approximations at best.

### CASE STUDY HOW MUCH IS A LIFE WORTH?

Imagine that you have been elected to serve as a member of your local town council. The town engineer comes to you with a proposal: The town can spend $10,000 to build and operate a traffic light at a town intersection that now has only a stop sign. The benefit of the traffic light is increased safety. The engineer

estimates, based on data from similar intersections, that the traffic light would reduce the risk of a fatal traffic accident over the lifetime of the traffic light from 1.6 to 1.1 percent. Should you spend the money for the new light?

To answer this question, you turn to cost-benefit analysis. But you quickly run into an obstacle: The costs and benefits must be measured in the same units if you are to compare them meaningfully. The cost is measured in dollars, but the benefit—the possibility of saving a person's life—is not directly monetary. To make your decision, you have to put a dollar value on a human life.

At first, you may be tempted to conclude that a human life is priceless. After all, there is probably no amount of money that you could be paid to voluntarily give up your life or that of a loved one. This suggests that a human life has an infinite dollar value.

For the purposes of cost-benefit analysis, however, this answer leads to nonsensical results. If we truly placed an infinite value on human life, we should be placing traffic lights on every street corner. Similarly, we should all be driving large cars with all the latest safety features, instead of smaller ones with fewer safety features. Yet traffic lights are not at every corner, and people sometimes choose to buy small cars without side-impact air bags or antilock brakes. In both our public and private decisions, we are at times willing to risk our lives to save some money.

Once we have accepted the idea that a person's life does have an implicit dollar value, how can we determine what that value is? One approach, sometimes used by courts to award damages in wrongful-death suits, is to look at the total amount of money a person would have earned if he or she had lived. Economists are often critical of this approach. It has the bizarre implication that the life of a retired or disabled person has no value.

A better way to value human life is to look at the risks that people are voluntarily willing to take and how much they must be paid for taking them. Mortality risk varies across jobs, for example. Construction workers in high-rise buildings face greater risk of death on the job than office workers do. By comparing wages in risky and less risky occupations, controlling for education, experience, and other determinants of wages, economists can get some sense about what value people put on their own lives. Studies using this approach conclude that the value of a human life is about $10 million.

EVERYONE WOULD LIKE TO AVOID THE RISK OF THIS, BUT AT WHAT COST?

## IN THE NEWS

*Existence Value*

COST-BENEFIT ANALYSTS OFTEN RUN INTO hard questions. Here's an example.

### They Exist. Therefore They Are. But, Do You Care?

BY SAM HOWE VERHOVEK

It sounds like a philosophical cousin to the age-old question of whether a tree falling in the forest makes a sound if no one is around to hear it. In this case, though, federal officials are seeking to add an economic variable to the puzzle: Just how much is it worth to *you* to know that a once-dammed river is running wild again—even if you never visit it?

In the midst of a major study of whether or not to breach four huge hydroelectric dams on the Snake River in eastern Washington, economists with the Army Corps of Engineers are adding a factor known as "existence value" to their list of costs and benefits of the contentious proposal.

Breaching the dams would restore 140 miles of the lower Snake to its wild, free-flowing condition and would, many biologists argue, stand a good chance of revitalizing endangered salmon runs in the river. Aside from calculating the proposal's effects on jobs, electric bills, and shipping rates, the Government is now hoping to assign a dollar value to Americans' knowledge that a piece of their wilderness might be regained. . . .

"The idea that you'd be willing to pay something for some state of the world to exist, as you would pay for a commodity or a contract for services, is not at all crazy," said Alan Randall, chairman of the department of agricultural, environmental, and development economics at Ohio State University. "The controversy, really, is mostly about measurability."

Proponents of the dam-breaching proposal have pointed to polls suggesting that Seattle-area residents would be willing to pay a few extra dollars a month on their electricity bills into order to save salmon runs. . . . Economists at the Corps of Engineers have calculated that breaching the four Snake River dams and successfully restoring the salmon is an idea for which Americans would be willing to shell out [in total] as much as $1 billion. . . .

Others question whether such a value can be accurately measured. "The only way to do it is to ask people what they would be willing to pay, and in my view you ask people questions like that and you get very upwardly biased results," said Jerry Hausman, an economics professor at M.I.T. "Why somebody calls you on the phone to ask, it's not real money."

SOURCE: *The New York Times*, Week in Review, October 17, 1999, p. 5.

We can now return to our original example and respond to the town engineer. The traffic light reduces the risk of fatality by 0.5 percent. Thus, the expected benefit from having the traffic light is 0.005 × $10 million, or $50,000. This estimate of the benefit well exceeds the cost of $10,000, so you should approve the project.

**QUICK QUIZ:** What is the *free-rider problem?* ◆ Why does the free-rider problem induce the government to provide public goods? ◆ How should the government decide whether to provide a public good?

## COMMON RESOURCES

Common resources, like public goods, are not excludable: They are available free of charge to anyone who wants to use them. Common resources are, however, rival:

One person's use of the common resource reduces other people's enjoyment of it. Thus, common resources give rise to a new problem. Once the good is provided, policymakers need to be concerned about how much it is used. This problem is best understood from the classic parable called the **Tragedy of the Commons.**

**Tragedy of the Commons**
*a parable that illustrates why common resources get used more than is desirable from the standpoint of society as a whole*

## THE TRAGEDY OF THE COMMONS

Consider life in a small medieval town. Of the many economic activities that take place in the town, one of the most important is raising sheep. Many of the town's families own flocks of sheep and support themselves by selling the sheep's wool, which is used to make clothing.

As our story begins, the sheep spend much of their time grazing on the land surrounding the town, called the Town Common. No family owns the land. Instead, the town residents own the land collectively, and all the residents are allowed to graze their sheep on it. Collective ownership works well because land is plentiful. As long as everyone can get all the good grazing land they want, the Town Common is not a rival good, and allowing residents' sheep to graze for free causes no problems. Everyone in town is happy.

As the years pass, the population of the town grows, and so does the number of sheep grazing on the Town Common. With a growing number of sheep and a fixed amount of land, the land starts to lose its ability to replenish itself. Eventually, the land is grazed so heavily that it becomes barren. With no grass left on the Town Common, raising sheep is impossible, and the town's once prosperous wool industry disappears. Many families lose their source of livelihood.

What causes the tragedy? Why do the shepherds allow the sheep population to grow so large that it destroys the Town Common? The reason is that social and private incentives differ. Avoiding the destruction of the grazing land depends on the collective action of the shepherds. If the shepherds acted together, they could reduce the sheep population to a size that the Town Common can support. Yet no single family has an incentive to reduce the size of its own flock because each flock represents only a small part of the problem.

In essence, the Tragedy of the Commons arises because of an externality. When one family's flock grazes on the common land, it reduces the quality of the land available for other families. Because people neglect this negative externality when deciding how many sheep to own, the result is an excessive number of sheep.

If the tragedy had been foreseen, the town could have solved the problem in various ways. It could have regulated the number of sheep in each family's flock, internalized the externality by taxing sheep, or auctioned off a limited number of sheep-grazing permits. That is, the medieval town could have dealt with the problem of overgrazing in the way that modern society deals with the problem of pollution.

In the case of land, however, there is a simpler solution. The town can divide up the land among town families. Each family can enclose its parcel of land with a fence and then protect it from excessive grazing. In this way, the land becomes a private good rather than a common resource. This outcome in fact occurred during the enclosure movement in England in the seventeenth century.

The Tragedy of the Commons is a story with a general lesson: When one person uses a common resource, he diminishes other people's enjoyment of it. Because of this negative externality, common resources tend to be used excessively.

The government can solve the problem by reducing use of the common resource through regulation or taxes. Alternatively, the government can sometimes turn the common resource into a private good.

This lesson has been known for thousands of years. The ancient Greek philosopher Aristotle pointed out the problem with common resources: "What is common to many is taken least care of, for all men have greater regard for what is their own than for what they possess in common with others."

## SOME IMPORTANT COMMON RESOURCES

There are many examples of common resources. In almost all cases, the same problem arises as in the Tragedy of the Commons: Private decisionmakers use the common resource too much. Governments often regulate behavior or impose fees to mitigate the problem of overuse.

**Clean Air and Water** As we discussed in Chapter 10, markets do not adequately protect the environment. Pollution is a negative externality that can be remedied with regulations or with Pigovian taxes on polluting activities. One can view this market failure as an example of a common-resource problem. Clean air and clean water are common resources like open grazing land, and excessive pollution is like excessive grazing. Environmental degradation is a modern Tragedy of the Commons.

**Oil Pools** Consider an underground pool of oil so large that it lies under many properties with different owners. Any of the owners can drill and extract the oil, but when one owner extracts oil, less is available for the others. The oil is a common resource.

Just as the number of sheep grazing on the Town Common was inefficiently large, the number of wells drawing from the oil pool will be inefficiently large. Because each owner who drills a well imposes a negative externality on the other owners, the benefit to society of drilling a well is less than the benefit to the owner who drills it. That is, drilling a well can be privately profitable even when it is socially undesirable. If owners of the properties decide individually how many oil wells to drill, they will drill too many.

To ensure that the oil is extracted at lowest cost, some type of joint action among the owners is necessary to solve the common-resource problem. The Coase theorem, which we discussed in Chapter 10, suggests that a private solution might be possible. The owners could reach an agreement among themselves about how to extract the oil and divide the profits. In essence, the owners would then act as if they were in a single business.

When there are many owners, however, a private solution is more difficult. In this case, government regulation could ensure that the oil is extracted efficiently.

**Congested Roads** Roads can be either public goods or common resources. If a road is not congested, then one person's use does not affect anyone else. In this case, use is not rival, and the road is a public good. Yet if a road is congested, then use of that road yields a negative externality. When one person drives on the road, it becomes more crowded, and other people must drive more slowly. In this case, the road is a common resource.

## IN THE NEWS

*The Singapore Solution*

TOLLS ARE A SIMPLE WAY TO SOLVE THE problem of road congestion and, according to some economists, are not used as much as they should be. In this opinion column, economist Lester Thurow describes Singapore's success in dealing with congestion.

HOW CAN WE CLEAR THIS MARKET?

### Economics of Road Pricing

BY LESTER C. THUROW

Start with a simple observational truth. No city has ever been able to solve its congestion and pollution problems by building more roads.

Some of the world's cities have built a lot of roads (Los Angeles) and some have very few (Shanghai only recently has had a lot of autos) but the degrees of congestion and pollution don't differ very much. More roads simply encourage more people to use their cars, to live farther away from work, and thus use more road space. . . . A recent analysis of congestion problems in London came to the conclusion that London could tear the entire central city down to make room for roads and would still have something approaching gridlock.

Economists have always had a theoretical answer for auto congestion and pollution problems—road pricing. Charge people for using roads based on what roads they use, what time of day and

One way for the government to address the problem of road congestion is to charge drivers a toll. A toll is, in essence, a Pigovian tax on the externality of congestion. Often, as in the case of local roads, tolls are not a practical solution because the cost of collecting them is too high.

Sometimes congestion is a problem only at certain times of day. If a bridge is heavily traveled only during rush hour, for instance, the congestion externality is larger during this time than during other times of day. The efficient way to deal with these externalities is to charge higher tolls during rush hour. This toll would provide an incentive for drivers to alter their schedules and would reduce traffic when congestion is greatest.

Another policy that responds to the problem of road congestion, discussed in a case study in the previous chapter, is the tax on gasoline. Gasoline is a complementary good to driving: An increase in the price of gasoline tends to reduce the quantity of driving demanded. Therefore, a gasoline tax reduces road congestion.

year they use those roads, and the degree to which pollution problems exist at the time they are using those roads. Set prices at the levels that yield the optimal amounts of usage.

Until Singapore decided to try, no city had ever had the nerve to use road pricing. Many ideas seem good theoretically but have some hidden unexpected flaws. Singapore now has more than a decade of experience. The system works! There are no unexpected flaws. Singapore is the only city on the face of the earth without congestion and auto-induced pollution problems.

In Singapore a series of toll booths surrounds the central core of the city. To drive into the city, each car must pay a toll based on the roads being used, the time of day when the driving will occur, and that day's pollution problem. Prices are raised and lowered to get optimal usage.

In addition, Singapore calculates the maximum number of cars that can be supported without pollution outside of the central city and auctions off the rights to license new cars each month. Different types of plates allow different degrees of usage. A plate that allows one to use their car at any time is much more expensive than a plate that only allows one to use their car on weekends—a time when congestion problems are much less intense. Prices depend on supply and demand.

With this system Singapore ends up not wasting resources on infrastructure projects that won't cure congestion and pollution problems. The revenue collected from the system is used to lower other taxes.

If that is so, why then did London reject road pricing in its recent report on its auto congestion and pollution problems? They feared that such a system would be seen as too much interference from the heavy hand of government and that the public would not put up with a system that allows the rich to drive more than the poor.

Both arguments ignore the fact that we already have toll roads, but new technologies now also make it possible to avoid both problems.

Using bar codes and debit cards, a city can install bar code readers at different points around the city. As any car goes by each point a certain amount is deducted from the driver's debit card account depending upon weather, time of day, and location.

Inside the car, the driver has a meter that tells him how much he has been charged and how much remains in his debit card account. . . .

If one is an egalitarian and thinks that driving privileges should be distributed equally (i.e., not based upon income) then each auto can be given a specified debit card balance every year and those who are willing to drive less can sell their unused balances to those that want to drive more.

Instead of giving the city extra tax revenue, this system gives those who are willing to live near work or to use public transit an income supplement. Since poor people drive less than rich people, the system ends up being an egalitarian redistribution of income from the rich to the poor.

SOURCE: *The Boston Globe*, February 28, 1995, p. 40.

A gasoline tax, however, is an imperfect solution to road congestion. The problem is that the gasoline tax affects other decisions besides the amount of driving on congested roads. For example, the gasoline tax discourages driving on noncongested roads, even though there is no congestion externality for these roads.

**Fish, Whales, and Other Wildlife** Many species of animals are common resources. Fish and whales, for instance, have commercial value, and anyone can go to the ocean and catch whatever is available. Each person has little incentive to maintain the species for the next year. Just as excessive grazing can destroy the Town Common, excessive fishing and whaling can destroy commercially valuable marine populations.

The ocean remains one of the least regulated common resources. Two problems prevent an easy solution. First, many countries have access to the oceans, so any solution would require international cooperation among countries that hold

**IN THE NEWS**

*Should Yellowstone Charge as Much as Disney World?*

NATIONAL PARKS, LIKE ROADS, CAN BE either public goods or common resources. If congestion is not a problem, a visit to a park is not rival. Yet once a park becomes popular, it suffers from the same problem as the Town Common. In this opinion column, an economist argues for the use of higher entrance fees to solve the problem.

### Save the Parks, and Make a Profit

BY ALLEN R. SANDERSON

It is common knowledge that our national parks are overcrowded, deteriorating, and broke. Some suggest that we address these problems by requiring reservations, closing some areas, or asking Congress to increase financing to the National Park Service. But to an economist, there is a more obvious solution: Raise the entrance fees.

When the National Park Service was established in 1916, the admission price to Yellowstone for a family of five arriving by car was $7.50; today, the price is only $10. Had the 1916 price been adjusted for inflation, the comparable 1995 fee would be $120 a day—about what that family would pay for a day of rides at Disney World, . . . or to see a professional football game.

No wonder our national parks are overrun and overtrampled. We are treating our natural and historical treasures as free goods when they are not. We are ignoring the costs of maintaining these places and rationing by congestion—when it gets too crowded, no more visitors are allowed—perhaps the most inefficient way to allocate scarce resources. The price of a family's day in a national park has not kept pace with most other forms of recreation. Systemwide, it barely averages a dollar a person. . . .

An increase in daily user fees to, say, $20 per person would either reduce the overcrowding and deterioration in our parks by cutting down on the number of visitors or it would substantially raise fee revenues for the Park Service (assuming that legislation was passed that would let the park system keep this money). Greater revenue is the more likely outcome. After spending several hundred dollars to reach Yellowstone Park, few people would be deterred by another $20.

The added revenues would bring more possibilities for outdoor recreation, both through expansion of the National Park Service and by encouraging private entrepreneurs to carve out and operate their own parks, something they cannot do alongside a public competitor giving away his product well below cost.

It is time to put our money where our Patagonia outfits are: Either we value the Grand Canyon and Yosemite and won't complain about paying a realistic entrance fee, or we don't really value them and shouldn't wring our hands over their present sorry state and likely sorrier fate.

SOURCE: *The New York Times*, September 30, 1995, p. 19.

different values. Second, because the oceans are so vast, enforcing any agreement is difficult. As a result, fishing rights have been a frequent source of international tension among normally friendly countries.

Within the United States, various laws aim to protect fish and other wildlife. For example, the government charges for fishing and hunting licenses, and it restricts the lengths of the fishing and hunting seasons. Fishermen are often required to throw back small fish, and hunters can kill only a limited number of animals. All these laws reduce the use of a common resource and help maintain animal populations.

### CASE STUDY WHY THE COW IS NOT EXTINCT

Throughout history, many species of animals have been threatened with extinction. When Europeans first arrived in North America, more than 60 million

buffalo roamed the continent. Yet hunting the buffalo was so popular during the nineteenth century that by 1900 the animal's population fell to about 400 before the government stepped in to protect the species. In some African countries today, the elephant faces a similar challenge, as poachers kill the animals for the ivory in their tusks.

Yet not all animals with commercial value face this threat. The cow, for example, is a valuable source of food, but no one worries that the cow will soon be extinct. Indeed, the great demand for beef seems to ensure that the species will continue to thrive.

Why is the commercial value of ivory a threat to the elephant, while the commercial value of beef is a guardian of the cow? The reason is that elephants are a common resource, whereas cows are a private good. Elephants roam freely without any owners. Each poacher has a strong incentive to kill as many elephants as he can find. Because poachers are numerous, each poacher has only a slight incentive to preserve the elephant population. By contrast, cows live on ranches that are privately owned. Each rancher takes great effort to maintain the cow population on his ranch because he reaps the benefit of these efforts.

Governments have tried to solve the elephant's problem in two ways. Some countries, such as Kenya, Tanzania, and Uganda, have made it illegal to kill elephants and sell their ivory. Yet these laws have been hard to enforce, and elephant populations have continued to dwindle. By contrast, other countries, such as Botswana, Malawi, Namibia, and Zimbabwe, have made elephants a private good by allowing people to kill elephants, but only those on their own property. Landowners now have an incentive to preserve the species on their own land, and as a result, elephant populations have started to rise. With private ownership and the profit motive now on its side, the African elephant might someday be as safe from extinction as the cow.

"WILL THE MARKET PROTECT ME?"

**QUICK QUIZ:** Why do governments try to limit the use of common resources?

## CONCLUSION: THE IMPORTANCE OF PROPERTY RIGHTS

In this chapter and the previous one, we have seen there are some "goods" that the market does not provide adequately. Markets do not ensure that the air we breathe is clean or that our country is defended from foreign aggressors. Instead, societies rely on the government to protect the environment and to provide for the national defense.

Although the problems we considered in these chapters arise in many different markets, they share a common theme. In all cases, the market fails to allocate resources efficiently because *property rights* are not well established. That is, some item of value does not have an owner with the legal authority to control it. For example, although no one doubts that the "good" of clean air or national defense is valuable, no one has the right to attach a price to it and profit from its use. A factory

pollutes too much because no one charges the factory for the pollution it emits. The market does not provide for national defense because no one can charge those who are defended for the benefit they receive.

When the absence of property rights causes a market failure, the government can potentially solve the problem. Sometimes, as in the sale of pollution permits, the solution is for the government to help define property rights and thereby unleash market forces. Other times, as in the restriction on hunting seasons, the solution is for the government to regulate private behavior. Still other times, as in the provision of national defense, the solution is for the government to supply a good that the market fails to supply. In all cases, if the policy is well planned and well run, it can make the allocation of resources more efficient and thus raise economic well-being.

## Summary

- Goods differ in whether they are excludable and whether they are rival. A good is excludable if it is possible to prevent someone from using it. A good is rival if one person's enjoyment of the good prevents other people from enjoying the same unit of the good. Markets work best for private goods, which are both excludable and rival. Markets do not work as well for other types of goods.
- Public goods are neither rival nor excludable. Examples of public goods include fireworks displays, national defense, and the creation of fundamental knowledge. Because people are not charged for their use of the public good, they have an incentive to free ride when the good is provided privately. Therefore, governments provide public goods, making their decision about the quantity based on cost-benefit analysis.
- Common resources are rival but not excludable. Examples include common grazing land, clean air, and congested roads. Because people are not charged for their use of common resources, they tend to use them excessively. Therefore, governments try to limit the use of common resources.

## Key Concepts

excludability, p. xxx
rivalry, p. xxx
private goods, p. xxx
public goods, p. xxx
common resources, p. xxx
free rider, p. xxx
cost-benefit analysis, p. xxx
Tragedy of the Commons, p. xxx

## Questions for Review

1. Explain what is meant by a good being "excludable." Explain what is meant by a good being "rival." Is a pizza excludable? Is it rival?
2. Define and give an example of a public good. Can the private market provide this good on its own? Explain.
3. What is cost-benefit analysis of public goods? Why is it important? Why is it hard?
4. Define and give an example of a common resource. Without government intervention, will people use this good too much or too little? Why?

## Problems and Applications

1. The text says that both public goods and common resources involve externalities.
   a. Are the externalities associated with public goods generally positive or negative? Use examples in your answer. Is the free-market quantity of public goods generally greater or less than the efficient quantity?
   b. Are the externalities associated with common resources generally positive or negative? Use examples in your answer. Is the free-market use of common resources generally greater or less than the efficient use?

2. Think about the goods and services provided by your local government.
   a. Using the classification in Figure 11-1, explain what category each of the following goods falls into:
      - police protection
      - snow plowing
      - education
      - rural roads
      - city streets
   b. Why do you think the government provides items that are not public goods?

3. Charlie loves watching *Teletubbies* on his local public TV station, but he never sends any money to support the station during their fund-raising drives.
   a. What name do economists have for Charlie?
   b. How can the government solve the problem caused by people like Charlie?
   c. Can you think of ways the private market can solve this problem? How does the existence of cable TV alter the situation?

4. The text states that private firms will not undertake the efficient amount of basic scientific research.
   a. Explain why this is so. In your answer, classify basic research in one of the categories shown in Figure 11-1.
   b. What sort of policy has the United States adopted in response to this problem?
   c. It is often argued that this policy increases the technological capability of American producers relative to that of foreign firms. Is this argument consistent with your classification of basic research in part (a)? (Hint: Can excludability apply to some potential beneficiaries of a public good and not others?)

5. Why is there litter along most highways but rarely in people's yards?

6. The Washington, D.C., metro (subway) system charges higher fares during rush hours than during the rest of the day. Why might it do this?

7. Timber companies in the United States cut down many trees on publicly owned land and many trees on privately owned land. Discuss the likely efficiency of logging on each type of land in the absence of government regulation. How do you think the government should regulate logging on publicly owned lands? Should similar regulations apply to privately owned land?

8. An *Economist* article (Mar. 19, 1994) states: "In the past decade, most of the rich world's fisheries have been exploited to the point of near-exhaustion." The article continues with an analysis of the problem and a discussion of possible private and government solutions:
   a. "Do not blame fishermen for overfishing. They are behaving rationally, as they have always done." In what sense is "overfishing" rational for fishermen?
   b. "A community, held together by ties of obligation and mutual self-interest, can manage a common resource on its own." Explain how such management can work in principle, and what obstacles it faces in the real world.
   c. "Until 1976 most world fish stocks were open to all comers, making conservation almost impossible. Then an international agreement extended some aspects of [national] jurisdiction from 12 to 200 miles offshore." Using the concept of property rights, discuss how this agreement reduces the scope of the problem.
   d. The article notes that many governments come to the aid of suffering fishermen in ways that encourage increased fishing. How do such policies encourage a vicious cycle of overfishing?
   e. "Only when fishermen believe they are assured a long-term and exclusive right to a fishery are they likely to manage it in the same far-sighted way as good farmers manage their land." Defend this statement.
   f. What other policies to reduce overfishing might be considered?

9. In a market economy, information about the quality or function of goods and services is a valuable good in its

own right. How does the private market provide this information? Can you think of any way in which the government plays a role in providing this information?

10. Do you think the Internet is a public good? Why or why not?
11. High-income people are willing to pay more than lower-income people to avoid the risk of death. For example, they are more likely to pay for safety features on cars. Do you think cost-benefit analysts should take this fact into account when evaluating public projects? Consider, for instance, a rich town and a poor town, both of which are considering the installation of a traffic light. Should the rich town use a higher dollar value for a human life in making this decision? Why or why not?