

## MODULE 76 / 40: PUBLIC GOODS

The purpose of this module is to show that only private goods can be efficiently exchanged in a market. When goods are either nonexcludable, nonrival, or both, a market will fail to provide the efficient quantity and price.

### Student learning objectives:

- How public goods are characterized and why markets fail to supply efficient quantities of public goods.
- What common resources are and why they are overused.
- What artificially scarce goods are and why they are under-consumed.
- How government intervention in the production and consumption of these types of goods can make society better off.
- Why finding the right level of government intervention is often difficult.

### Key Economic Concepts For This Module:

- Private goods (cars, clothing, e.g.) that are excludable and rival can be efficiently exchanged in a market.
- Public goods (fire protection, national defense, e.g.) are nonexcludable and nonrival and markets are unlikely to provide must be provided by the government.
- Artificially scarce goods (pay-per-view movies, e.g.) are excludable and nonrival. Because suppliers can exclude consumers by charging a price above zero, less than the efficient amount will be consumed.
- Common resources (clean water, fish in the ocean, e.g.) are nonexcludable and rival and will be overused unless government is able to assign property rights or require users of the resource to pay prices that reflect the entire cost of their consumption.

### Common Student Difficulties:

- Students understand free-riding behavior if they have ever worked on a group project and a group member contributed minimal effort to the project while receiving the same grade. Ask the students if they could design the group assignment so that each member of the group received a grade that reflected her/his effort. Students will see that the teacher (or government) has a difficult time dealing with free-riding behavior.
- The classroom exercise provided for this module has proven to be an excellent way for the students to see that voluntary contributions to a public good will usually fail to provide for the public good.
- Many of our current environmental problems can be described as the result of a “tragedy of the commons”. Provide students with current event articles on the state of our global fisheries or illegal rainforest harvesting. Here is a link from PBS NewsHour on the problem of overfishing. [http://www.pbs.org/newshour/bb/environment/jan-june03/oceans\\_06-04.html#](http://www.pbs.org/newshour/bb/environment/jan-june03/oceans_06-04.html#)

## In-Class Presentation of Module and Sample Lecture

Suggested time: This module can be covered in up to two one-hour class sessions.

- I. Private Goods – And Others
  - A. Characteristics of Goods
  - B. Why Markets Can Supply Only Private Goods Efficiently
- II. Public Goods
  - A. Providing Public Goods
  - B. How Much of a Public Good Should Be Provided?
- III. Common Resources
  - A. The Problem of Overuse
  - B. The Efficient Use and Maintenance of a Common Resource
- IV. Artificially Scarce Goods

### I. Private Goods – And Others

To this point in the course, we have discussed markets for goods and services known as private goods. Markets exist for goods like coffee, cars and Snuggies because they are both excludable and rival in consumption. There are some goods and services, like lighthouses and police protection, for which markets do not, and could not exist.

#### A. Characteristics of Goods

The reason that cars and police protection cannot be efficiently exchanged in a market is because cars are private goods.

1. Private goods have two important characteristics.

- They are excludable: suppliers of the good can prevent people who don't pay from consuming it.
- They are rival in consumption: the same unit of the good cannot be consumed by more than one person at the same time.

**Example:** A car dealership sells a car to Tom at a price of \$20,000. Tom gets the car because he is willing and able to pay that price. The seller does not sell a car to Becky because Becky considers that price to be out of her budget. The car is excludable. This means that the seller does not have to provide a car to Becky or the rest of the people in town who are unwilling and unable to pay the going price. Once Tom has purchased the car, the car is his. In other words, he has consumed this unit of that good and thus prevents Huck from buying it off of the car lot. Of course Tom could give Huck a ride, or sell the used car to Huck, but once he sells it to Huck it now belongs to Huck. Tom cannot sell it to Huck and also sell it to Becky.

2. Public goods lack these characteristics. In other words they are nonexcludable and nonrival in consumption.

**Example:** Cities have fire departments that protect all homes in the city and can't exclude anyone on the basis of payment. And more than one person can consume the fire protection at the same time. If a fire breaks out at Margaret's house, the fire department rushes to put it out. This prevents the fire from spreading to Melanie's store, so both people are consuming the same unit of fire protection.

Note: Instructors will often get students who ask something like, "Yes but what if a person is rich enough to hire his own police force and they will only police his property?" The instructor should stress that the distinction between pure private and pure public goods is sometimes a matter of degree. In other words, if a good is primarily excludable/rival, but there are certain rare scenarios that could be dreamt up by students, we can still put that good safely in the category of private good.

3. Artificially scarce goods are excludable, and nonrival in consumption.

**Example:** A college economics lecture is excludable because only students who have paid tuition can enroll in the course and attend the lecture. However it is nonrival because many people can consume the same unit of the good at the same time. Other examples are pay-per-view movies or sporting events.

4. Common resources are nonexcludable, but rival in consumption.

**Example:** The stock of salmon in the Pacific Ocean has historically been a common resource. If a person had a boat, they could harvest salmon from the ocean, or even scoop the fish from the bank of a river as the salmon headed upstream. This made the salmon nonexcludable. However once a salmon is caught, it cannot be caught by a second person, which makes it rival.

We will see that this combination of characteristics makes for a difficult situation for common resources like salmon.

### **B. Why Markets Can Supply Only Private Goods Efficiently**

Suppose our car dealership was selling cars to people like Tom and charging \$20,000 but was also required to give cars away to people like Huck and Becky. It wouldn't take long for people like Tom to realize that he could get a car and NOT pay for it. Free-riders are people who receive the benefit from a good and don't pay for it.

Another example is a large fireworks display. Roman Candle, an aspiring entrepreneur and pyrotechnic enthusiast, has a great idea. He will purchase lots of fireworks and shoot them off on the night of July 4<sup>th</sup> from a barge in the Ohio River town of Madtucky. He will recoup his costs by charging \$5 for people to have a seat in his grandstand.

Roman's venture will fail because the rational people of Madtucky will realize that they can sit in their front lawns and enjoy the fireworks, at no charge. Large-scale free riding behavior will doom this firm and no market will emerge to provide these services.

- With public goods, the nonexcludable nature of the goods and free-riding will prevent the efficient quantity from being produced in a market. And there may not be any units produced at all.

What about artificially scarce goods like a pay-per-view college football game or movie offered for purchase by cable or satellite companies? This good is excludable, but nonrival.

- The marginal cost of offering the football game to the next consumer is zero so the efficient quantity in a market would be where the marginal benefit to the next consumer falls to zero. Thus the efficient price is \$0.
- Suppose your satellite television company is offering the pay-per-view football game at a price of \$10. Because this is greater than zero, fewer consumers will purchase the game and so the actual number of units consumed is less than the efficient quantity.

What about private goods like cars, coffee and Snuggies?

- Because these goods are excludable, firms can charge a price and thus have an incentive to produce them.
- Because these goods are rival, consumers have an incentive to pay a positive price for them.
- So if firms have an incentive to offer a good at a price above zero and there are enough consumers out there who are willing to pay that price a market will emerge for the good.

## II. Public Goods

Public goods are both nonexcludable and nonrival. Because they are nonexcludable, their exchange suffers from the free-rider problem and private firms will not emerge to supply them to a market.

So how are we going to get important public goods like national defense, environmental protection, and disease prevention?

### A. Providing Public Goods

There are really only a small number of ways in which a good is supplied: by private firms or by the government. Private firms won't supply public goods, so that leaves voluntary contributions or the government.

Research for disease prevention is a public good that requires a lot of money to provide. Some of those funds are donated by citizens and corporations, but the government must provide the rest.

National defense is a public good that could not survive on voluntary donations so the government provides all of it.

How does the government provide public goods? By collecting involuntary taxes from the population.

Note: this might be a good time for the class to do the exercise provided in this module.

### B. How Much of a Public Good Should Be Provided?

How much are people willing to pay for something like national defense, disease prevention or environmental protection?

**Example:** Streetlights along a city street are a public good. How many lights should be provided in the city?

Suppose that Bob and Sandy are the only residents and that they truthfully tell the government how much they would be willing to pay for each streetlight. This willingness to pay (*WTP*) is also each resident's marginal private benefit (*MPB*) to having the next light installed.

So what is the first streetlight worth to this town? It's worth \$10 to Bob and \$18 to Sandy, so the sum total of each person's *WTP* is the total marginal private benefit of \$28.

The final column of the table below shows total marginal social benefit of each streetlight.

Streetlights	Bob's $WTP_b =$ $MPB_b$	Sandy's $WTP_s =$ $MPB_s$	Total $MSB =$ $MPB_b + MPB_s$
1	\$10	\$18	\$28
2	8	15	23
3	6	12	18
4	4	9	13
5	2	6	8

How many streetlights should the town government install? It depends upon the marginal social cost of the lights. If each light cost the town \$12, the first four will be installed because  $MSB > MSC$ , but the fifth would be inefficient.

Of course it's likely that Bob would want to free ride on Sandy's willingness to pay, and Sandy would want to do the same. If each can get a streetlight without paying, that would be better than paying, right?

### III. Common Resources

Common resources, like populations of fish in the sea, are nonexcludable and rival and this creates special problems for the use of the resource.

Other examples of common resources are the oceans themselves, clean air, clean water and biodiversity.

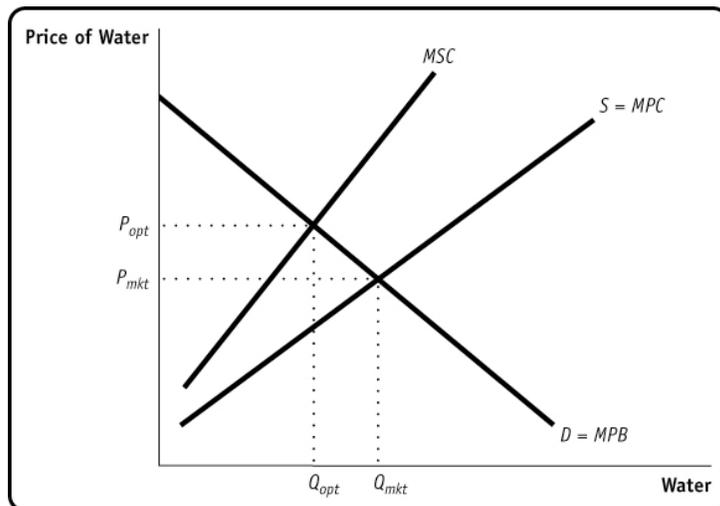
#### A. The Problem of Overuse

Suppose that I live in an area of the country that gets most of its fresh water from an aquifer. If I drill a well, I can access this clean water for my own personal use; it's nonexcludable. However every gallon that I pump for my own use is a gallon that someone else cannot use; it's rival. My consumption of water draws down the water in the aquifer, and makes it more difficult (costly) for other people to get their water.

In the language of economics, my marginal private cost of the next gallon of water is lower than the marginal social cost. In the graph below, the socially optimal quantity of water is less than the market quantity of water. This tells us that a common resource will be overused. If rainfall is insufficient to recharge the aquifer, we will exhaust it.

The same is true of common resources like fish in the ocean. Every fish that I catch provides benefit only to me, while imposing a small, almost imperceptible, cost upon everyone else. Since I don't really have to worry about those social costs, I will catch as many fish as I can. When everyone is doing that, the fish can't repopulate quickly enough and the fishery collapses.

This was labeled the "Tragedy of the Commons" by Garrett Hardin (1968).



Note: The instructor can direct the students to this website for "Tragedy of the Bunnies" where they can, perhaps at home, participate in the problem of the overuse of common resources.

<http://www.bunnygame.org/index.htm>

#### B. The Efficient Use and Maintenance of a Common Resource

In order to find a solution to the overuse of a common resource, economists need to find ways for the user to bear the full costs of the consumption, including the costs they previously would have imposed upon others.

The solutions are similar to those we studied with negative externalities:

1. Tax or otherwise regulate the use of the common resource
  2. Create a system of tradable licenses for the right to use the common resource
  3. Make the common resource excludable and assign property rights to some individuals
- For example, cities can charge higher prices for water consumption to encourage more economical use of the water in the aquifer.
  - In the case of overfishing, each person would need to have a license to harvest the fish. These licenses would be limited in number to restrict the harvest to the optimal level. They could be traded in a secondary market to insure that those who are willing to pay the most are those that actually get to use the license and profit from the fish.
  - If the common resource can be excludable, the government could assign property rights to it. For example, if there is a public forest and everyone can harvest trees from it, it will soon be overused and no trees will remain. But if the government sells the forest to private individuals, their self-interest will promote conservation of the forest. They will harvest trees slowly so that the resource isn't overused.

#### IV. Artificially Scarce Goods

The pay-per-view movies are artificially scarce because they are excludable but nonrival. The cable company can exclude me from watching the movie if I don't pay the price, and if I watch the movie it doesn't deny another household from also watching the movie.

The marginal cost of providing the movie to one more household is zero. The efficient quantity would be the quantity where the demand curve intersects the horizontal axis and the price would be zero. Of course there is no way the firm can profit if the price is zero, so the firm sets a price of maybe \$5 and excludes some of the potential customers.

If the price is \$5, fewer movies will be ordered than the efficient number. This is why this good is called "artificially scarce".

### In-Class Activities and Demonstrations

#### Will Students Contribute to a Public Good when Extra Credit is on the line?

I have used this classroom game many times to show students how easy, and predictable, it is to free ride on contributions to a public good. Below is a link to a paper by Charles A. Holt and Susan K. Laury, published in the *Journal of Economic Perspectives* (1997).  
<http://www.google.com/url?sa=t&source=web&cd=1&ved=0CBMQFjAA&url=http%3A%2F%2Fciteseerx.ist.psu.edu%2Fviewdoc%2Fdownload%3Fdoi%3D10.1.1.22.7469%26rep%3Drep1%26type%3Dpdf&ei=M0QSTdifloaasAPMrrioAg&usg=AFQjCNHU0xo4RKHa1s8jFw-F1WKuP9I5kg>

To give the students a scenario they can understand, I tell them that we are in a small town that relies on a volunteer fire department to put out fires. We are all at a meeting in City Hall and we have been asked to contribute to a fund that will purchase new, and better, firefighting equipment for our town. I then proceed with the game as described by Holt and Laury.

Although Holt and Laury suggest paying the students a fraction of their fictional earnings in cash, I have found that extra credit points are also good motivational payoffs. I tell the students that they should strive to earn as much fictional money as possible because their individual extra credit will be positively related to their earnings.