

Group goods according to two characteristics:

1. How excludable is the good?

This means, what is the cost of preventing someone from consuming the good? If the cost is low, the good is excludable.

2. How rival is the good?

This means what is the additional cost of providing the good to an additional person? To what extent does one person's consumption of the good preclude another person's consumption? If one person's consumption precludes another person's consumption, it is rival.

Divide goods into 4 categories according to how excludable and how rival they are:

1. *Private goods are rival and excludable.*

Examples: Food is rival and excludable {once one person has eaten it, another person can't eat it, and a person can be prevented from consuming a particular piece of food.

Clothing is rival and excludable one person's wearing a particular piece of clothing prevents another person from wearing it at the same time, and a person can be prevented from wearing a particular piece of clothing.

2. *Public goods are neither rival nor excludable.*

Examples: A tornado siren {when it sounds, it is impossible to prevent anyone from hearing it, and the cost of providing it to an additional person is zero.

National defence: it is impossible to prevent any American from consuming it, and the cost of providing it to an additional person is zero.

3. *Common resources are rival in consumption but not excludable.*

Examples: **Fish in the ocean** (it is difficult to prevent people from catching them, but one person's catching a fish prevents another person from catching that fish).

congested non-toll roads (if the road is not a toll road, it is difficult to prevent someone from using it, but one person using the road limits the possibility of another person's using it.

Rainforest trees (it is difficult to prevent people from cutting them down, but one person's cutting a tree down prevents another person from doing so.

4. *Goods produced by a natural monopoly are excludable but not rival in consumption.*

Examples: Fire protection (the fire department can choose not to save a particular person's house from fire. However, it doesn't cost much more to provide fire protection to an additional person once the system has been set up.

TV and radio stations (it costs nothing to provide TV or radio service to an additional person, but by scrambling the signal, the TV or radio provider can exclude from service a person who hasn't paid.

Goods can be excludable or rival to varying degrees.

Some goods that cause positive or negative externalities are **public goods or public bads**.

For instance consider smoking. Among people in a room, the smoke is not excludable. No one can be prevented from breathing the smoke.

Also it is virtually non-rival (one person's breathing the smoke barely affects how much smoke another person breathes).

Thus smoke can be considered a public bad. Similar for other kinds of pollution.

It is difficult or costly to prevent a person from consuming one of these goods.

With public goods, externalities arise due to the fact that a good has **positive value but zero price**.

With common resources, externalities arise because when one person uses a common resource there is less for other people. This same externality exists for private goods. But for private goods, the externality can be dealt with through the market as consumers can be made to pay for the fact that they prevent others from consuming. With common resources, this is not possible because they are not excludable.

If the economy left to its own devices, efficient level of public goods, common resources may not be provided.

Public Goods, Problem with free-riding

New Year fireworks display, say:

Characteristics - **Not excludable** and **Not rival**.

It would be hard to prevent someone from seeing it, and one person's consumption of the fireworks does not prevent another person's consumption (unless it gets very crowded).

The free-rider problem

It is obviously impossible to sell tickets for such a firework display: No one can be excluded from it. Impossible to distinguish between those who watch it and those who don't.

The impossibility of putting a price on fireworks arises from the '**not excludable**' property of the good.

People want to see fireworks, but **no business will offer them if price is zero**.

The market outcome is not efficient.

A suggested Solution: Local government sponsors a New Year fireworks display.

It raises taxes, and hires a fireworks professional to make the display.

Efficient outcome if everyone in the town wants to see fireworks.

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Thus, the 'Free-rider problem' arises when the number of potential beneficiaries is large and excluding one of them is impossible.

Cost-benefit analysis

When should a public good be provided?

Cost-benefit analysis is used to decide whether to start a public project, e.g. new (non-toll) highway.

Quantity now is not regulated by intersection of supply and demand with help of price. Government must decide how much to build.

But there is no price to judge how much the highway is worth. Once built, it will be available to everyone free of charge. There is no point in asking people as to how they value the highway. They are unlikely to provide correct information. Thus, assessment of benefits is very difficult.

The government cannot find out all costs either: If someone feels harmed by highway, he will overstate the costs so it that won't be built.

For these reasons efficient provision of public goods is very, very difficult to achieve.

Private good: Buyers reveal their value by their willingness to pay. Sellers reveal their costs by price they are willing to accept.

To summarise, we may define or classify goods in accordance with the following method.

Characteristics	Rival	Non-rival
Excludable	Private Good	Natural Monopoly
Non-excludable	Common Resource	Public Good

All of the above goods may see inefficient solutions provided by the market, and indeed, the absence of any market at all (as discussed in case of a public good).

This is the reason why governments need to intervene and control economic activities or markets in some cases.