

## WHAT ARE EXTERNALITIES?

Externalities are common in virtually every area of economic activity. They are defined as **third party** (or spill-over) **effects** arising from the **production** and/or **consumption** of goods and services for which no appropriate compensation is paid.

Externalities can cause **market failure** if the **price mechanism** does not take into account the full **social costs** and **social benefits** of production and consumption.

The study of externalities by economists has become extensive in recent years - not least because of concerns about the link between the economy and the environment.

## PRIVATE AND SOCIAL COSTS

Externalities create a **divergence** between the **private** and **social costs** of production.

Social cost includes all the costs of production of the output of a particular good or service. We include the third party (external) costs arising, for example, from pollution of the atmosphere.

## SOCIAL COST = PRIVATE COST + EXTERNALITY

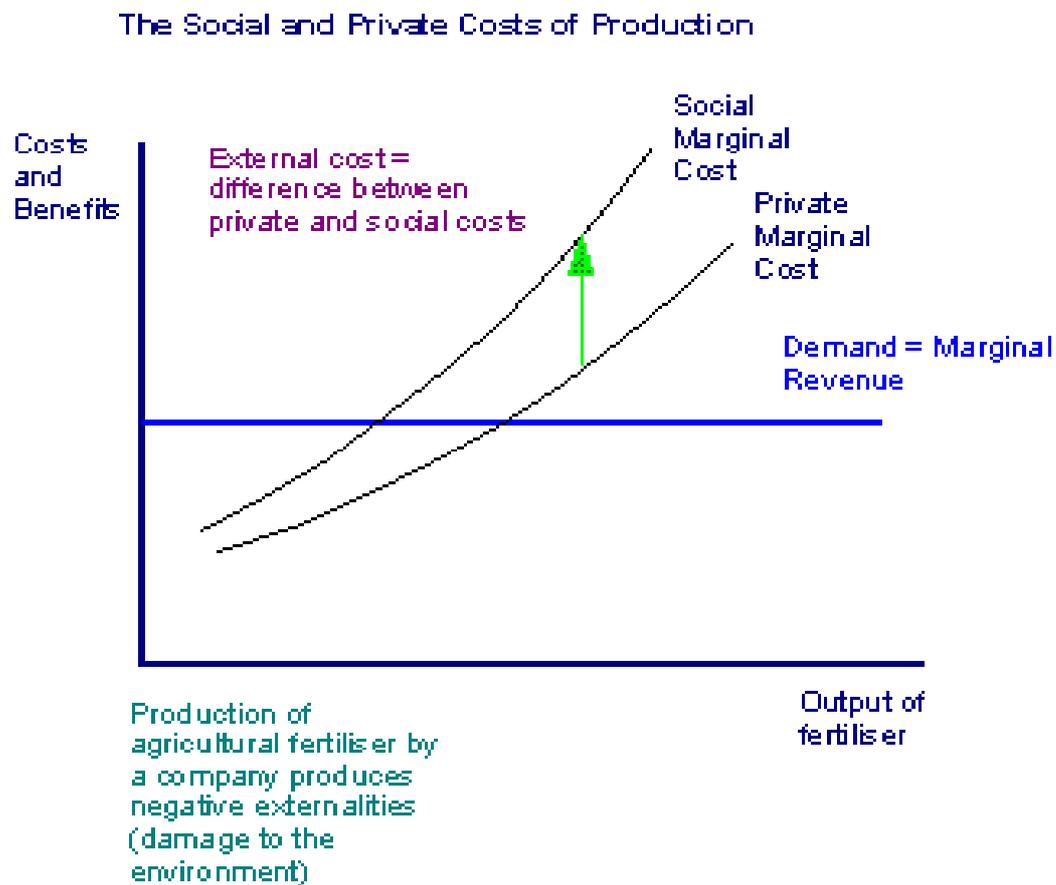
For example: - a chemical factory emits wastage as a by-product into nearby rivers and into the atmosphere. This creates negative externalities which impose higher **social costs** on other firms and consumers. e.g. clean up costs and health costs.

Another example of higher social costs comes from the problems caused by traffic congestion in towns, cities and on major roads and motor ways.

It is important to note though that the manufacture, purchase and use of private cars can also generate **external benefits** to society. This why **cost-benefit analysis** can be useful in measuring and putting some monetary value on both the social costs and benefits of production.

## MARKET FAILURE AND EXTERNALITIES

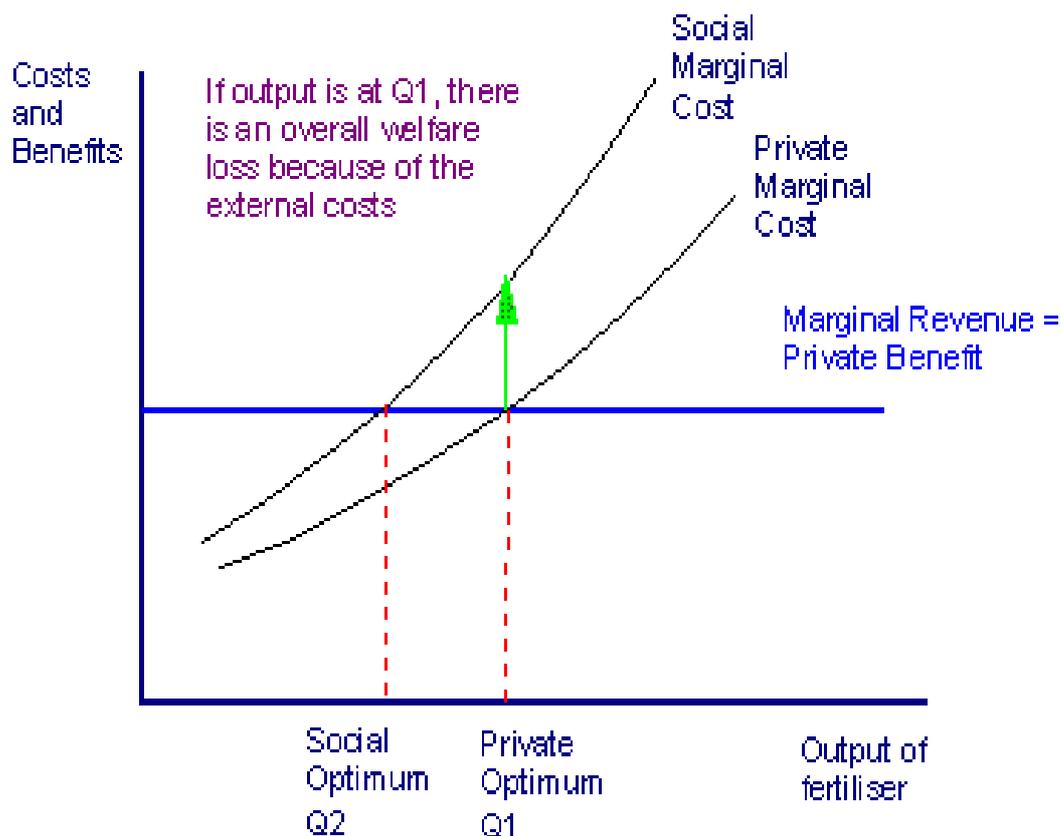
When negative production externalities exist, **marginal social cost > private marginal cost**. This is shown in the diagram below where the marginal social cost of production exceeds the private costs faced only by the producer/supplier of the product. In our example a supplier of fertiliser to the agricultural industry creates some external costs to the environment arising from their production process.



## WHY DO EXTERNALITIES LEAD TO MARKET FAILURE?

If we assume that the producer is interested in **maximising profits** - then they will only take into account the **private costs** and **private benefits** arising from their supply of the product. We can see from the diagram below that the profit-maximising level of output is at Q1. However the **socially efficient** level of production would consider the **external costs** too. The **social optimum output level is lower at Q2**.

### Market Failure arising from Negative Externalities



This leads to the **private optimum output being greater than the social optimum** level of production. The producer creating the externality *does not* take the effects of externalities into their own calculations. We assume that producers are only concerned with their own self interest.

In the diagram above, the private optimum output is when **where private marginal benefit = private marginal cost**, giving an output of Q1. For society as a whole though the social optimum is where social marginal benefit = social marginal cost at output Q2. The failure to take into account the negative externality effects is an example of **market failure**.

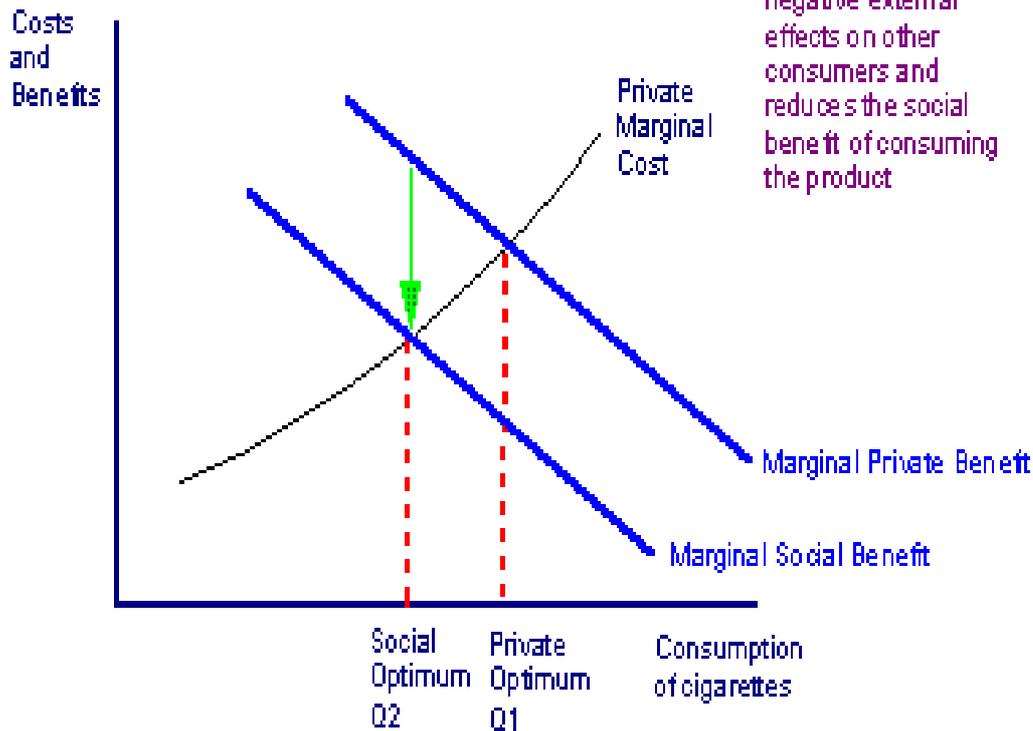
## **NEGATIVE CONSUMPTION EXTERNALITIES**

Consumers can create externalities when they purchase and consume goods and services.

- Pollution from cars and motorbikes
- Litter on streets and in public places
- Noise pollution from using car stereos or ghetto-blasters
- Negative externalities created by smoking and alcohol abuse
- Externalities created through the mis-treatment of animals
- Vandalism of public property
- Negative externalities arising from crime

In these situations the **marginal social benefit** of consumption will be less than the **marginal private benefit** of consumption. (i.e.  $SMB < PMB$ ) This leads to the good or service being over-consumed relative to the social optimum. Without government intervention the good or service will be under-priced and the negative externalities will not be taken into account. Again there will be a deadweight loss of economic welfare.

## Negative Consumption Externalities



In the example shown in the chart above we illustrate the potentially negative effects of people consuming cigarettes on other consumers. The **disutility** (dis-satisfaction) created leads to a reduction in the overall social benefit of consumption. If the cigarette consumer only considers their own private costs and benefits, then there will be over-consumption of the product. Ideally, the socially efficient level of cigarette consumption will be lower (Q2). The issue is really which

policies/strategies are most appropriate in reducing the total level of cigarette consumption!

## **CORRECTING FOR EXTERNALITIES – GOVERNMENT POLICIES.**

Individuals who consider only their own **private costs** and **private benefits** will do too much of any activity that generates negative externalities, and too little of one that generates positive externalities. When an activity generates both positive and negative externalities, private and social welfare will coincide only in the unlikely event that these opposing effects happen to offset one this exactly.

When externalities are present the individual pursuit of **self interest** rarely results in **maximum social welfare**. When it does not, we have an outcome that is, by definition, inefficient. This, in turn, means that it is possible to rearrange things in a way that makes at least some people better off without harming others in the process. There is an economic rationale for some form of **government intervention** in markets where externalities are prevalent.

How can we take into account the third party effects that necessarily arise? The key is to **internalise the externalities** that exist - i.e. make the firms and consumer that create the externalities **take them into account** when making their decisions

## **POLLUTION TAXES**

The classic way to adjust for externalities is to tax those who create negative externalities. This is sometimes known as making the polluter pay or introducing **Pigouvian Taxes**.

### ***Problems with environmental taxes***

If taxation is too high, in part a result of the problem of assigning accurate monetary values to the external costs created by producers and consumers, the result can be the expansion of grey markets where producers and consumers try to avoid the taxes.

One of the effects of the Landfill Tax over the last four years has been an explosion in "fly-tipping" as producers seek to avoid paying the tax.

Taxation may not be directed correctly if it is hard to pinpoint precisely who is causing the pollution - such is the case along rivers where several industrial plants might be emitting effluents. Should producers be subject to a consistent tax regime when some are more at risk of polluting than others?

Producers may be able to pass on the burden of the tax to the consumers if the demand for the good is inelastic or the supply of the product is elastic.

Higher taxes may cause cost-push inflation which itself may have detrimental effects on the economy - affecting those people who have had nothing to do with the pollution itself.

A further problem with using taxes to control externalities is that some taxes have a regressive effect on people on low incomes. Good examples to use would be the increased real level of duty on cigarettes and alcohol and the impact this has on households on below average incomes.

Examples of "**green taxation**" introduced into the UK in recent years includes the increased real level of excise duty on cigarettes and alcohol; the **landfill tax** and substantial increases in the real value of **duties on petrol**.

The government has also announced the introduction of the **climate change levy** - a controversial decision described in one article as "manufacturing industry's version of the poll tax"

## **POLLUTION REGULATION**

Examples include:

- Setting minimum standards for health and safety at the workplace
- Stricter penalties for firms and consumers who break regulations
- Banning cigarette advertising and making workplaces no-smoking environments

## **THE COASE THEOREM**

An alternative to pollution taxes and government regulation is for the polluters and those affected to come to a **bargaining solution** where the latter are compensated.

**Ronald Coase**, from the University of Chicago, was the first to see that if **property rights** are fully assigned and if people can negotiate at low cost with one another they will arrive at efficient solutions to problems caused

by externalities without the need for explicit government intervention in the form of regulation and/or taxation.

This insight is called the **Coase Theorem**, and on the strength of it Coase was awarded the Nobel Prize in Economics in 1991.

## WHAT ARE POSITIVE EXTERNALITIES?

**Positive externalities** exist when the **marginal social benefit** of production and or consumption exceeds the **marginal private benefit** i.e. production and/or consumption generate external benefits that may go under-valued by the market

There are plenty of examples of economic activities that can generate positive externalities:

**Industrial training by firms:** This can reduce the costs faced by other firms and has important effects on labour productivity. A faster growth of productivity allows more output to be produced from a given amount of resources and helps improve living standards throughout the economy. See the revision notes on the **production possibility frontier**

**Research into new technologies** which can then be disseminated for use by other producers. These technology spill-over effects help to reduce the costs of other producers and cost savings might be passed onto consumers through lower prices

**Education:** A well educated labour force can increase efficiency and produce other important social benefits. Increasingly policy-makers are coming to realise the increased returns that might be exploited from investment in **human capital** at all ages.

**Health provision:** Improved health provision and health care reduces absenteeism and creates a better quality of life and higher living standards.

**Employment creation** by new small firms

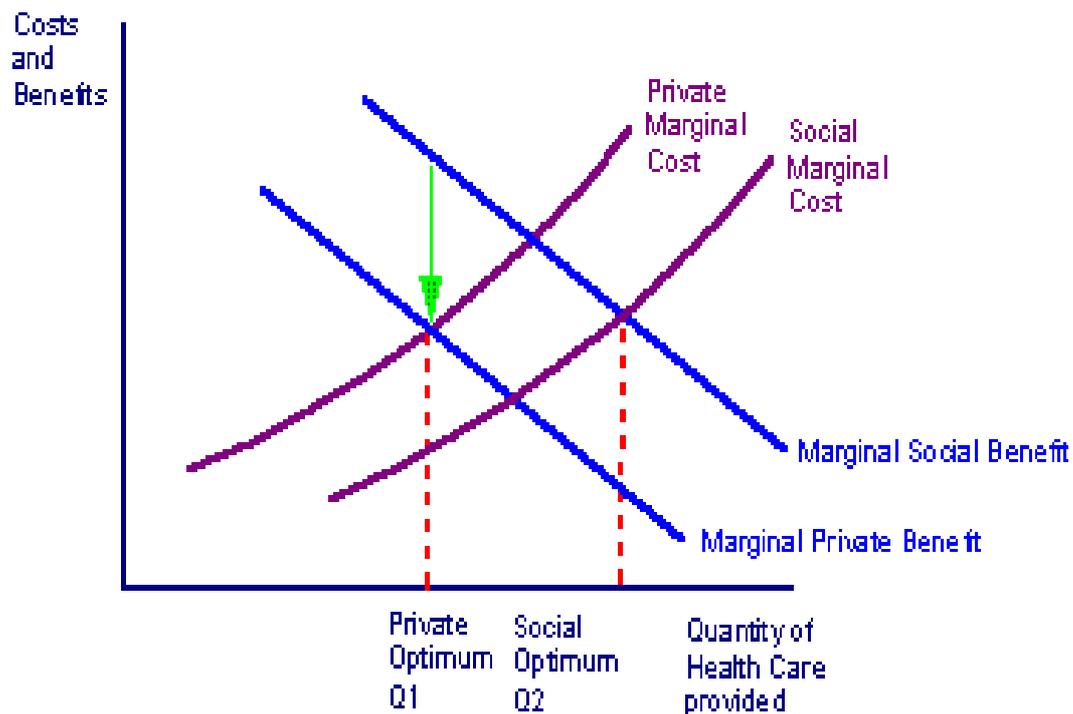
**Flood protection system and spending on improved fire protection in schools and public arenas**

## Arts and sporting participation and enjoyment derived from historic buildings

### POSITIVE EXTERNALITIES AND MARKET FAILURE

Why do positive externalities lead to a failure of the normal free-market mechanism?

Positive Externalities - Adding to Social Benefits and Reducing Social Costs



Where substantial positive externalities exist, the good or service may be **under consumed or under provided** since the free market may fail to take into account their effects. This is because the **marginal social**

**benefits** of consuming the good  $>$  **private marginal benefits**. In the case of external benefits from production, the **marginal social cost** would be  $<$  **private marginal costs**.

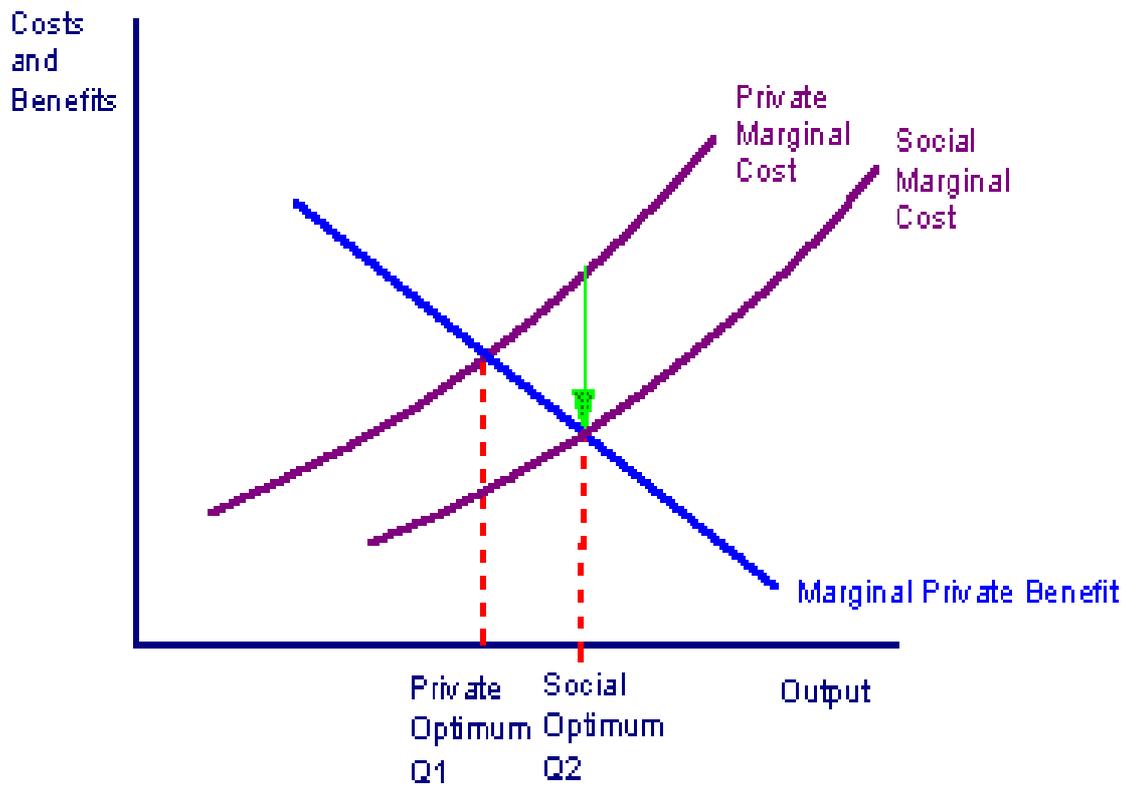
Consider the example of health care. Good quality health care brings positive spillover effects both for the recipient of the care but also their families and associates. A well functioning health care system also reduces the scale of absenteeism from work due to sickness and illness.

We see in the diagram above how the provision and consumption of health care services leads to an increase in social benefits and a reduction in social costs. As a society we should be encouraging people to increase their consumption of health care services.

### **Positive externalities from technological spill-overs**

In the diagram below we assume there has been a positive externality in production in the form of a technology spillover. The use of new technology has brought down costs to other producers - social cost lies below private cost and output of the product (i.e. a new robot or piece of software) should be encouraged towards output  $Q_b$  rather than the private optimum  $Q_a$ . This might be achieved through the use of a producer subsidy that reduces the cost of production / consumption and encourages an expansion of supply in the market.

### Technology Spillovers - Lower Social Costs



## **GOVERNMENT FAILURE.**

### **What is Government Failure?**

Some economists believe that even with good intentions governments seldom get their policy application correct. They can tax, control and regulate but the eventual outcome will be a deepening of the market failure or even worse a new failure may arise.

### **Possible Causes of Government Failure**

**(1) The pursuit of self-interest** amongst both politicians and civil servants rather than operating on behalf of citizens which leads to a misallocation of resources (for example decisions about where to build new roads, by-passes, schools and hospitals, inappropriate tariffs and other forms of import control and also decisions as to which industries and markets to offer government subsidies)

**(2) Electoral pressures** leading to inappropriate government spending and tax decisions - e.g. boosting state welfare spending in the run up to an election, or decisions to bring forward major items of government capital spending on infrastructural projects ahead of an election without the projects being subjected to a full and proper cost-benefit analysis

**(3) A tendency to look for short term solutions** to economic problems rather than making considered analysis of long term considerations (examples might include important decisions about transport policy or extra funding for the National Health Service). The risk is that myopic decision-making will only provide short term relief to particular problems but does little to address structural problems. A decision for example to build more roads might simply add to the problems of traffic congestion in the long run. Short term subsidies to the steel industry or coal producers to keep open loss-making steel plants and coal pits might eventually prove to be a waste of scarce resources if the industries concerned have little realistic prospect of achieving an economic rate of return in the long run.

**(4) Regulatory capture.** This is when the industries under the control of a regulatory body begin to move policy options so as their outcome is in their favour. Some economists argue that regulators can prevent the ability of the market to operate freely. We might find examples of this in agriculture, telecommunications and the other utilities and also in environmental protection.

**(5) Disincentive effects** created by measures designed to reduce income inequalities (including the poverty trap) or the loss of business competitiveness caused by the introduction of the National Minimum Wage or the Working Families Tax Credit – thousands of small & medium sized enterprises have faced higher costs because of the increasing levels of red tape brought about by new government regulations.

Equally a decision by the government to raise taxes on de-merit goods (such as cigarettes) might lead to an increase in tax evasion, smuggling and the development of grey markets where trade takes place between consumers and suppliers without paying tax. Equally a decision to legalize and then tax some drugs might lead to a rapid expansion of the supply of drugs and a substantial loss of social welfare arising from over consumption.

**(6) The Environmental impact** of government price support for farmers (including the long term impact of exemptions from taxation for farmers selling land to developers, the externalities arising from increasing use of subsidized fertilizers, and the long running issue of structural excess supply arising from guaranteed intervention prices for farmers within the CAP)

**(7) Imperfect information** - How does the government establish what citizens want it to do? Our electoral system is not an ideal way to discover this! Proponents of government failure argue that the free market mechanism is the best way of finding out (a) what consumer preferences are and (b) aggregating these preferences based on the number of people that are willing and able to pay for particular goods and services

## **THE UK LANDFILL TAX.**

The **Landfill Tax** was introduced in October 1996 and is levied on waste deposited in landfills. The objectives of the tax are to

- encourage waste producers to minimise the volume of waste generated
- reduce the amount deposited in landfills
- encourage recycling

Landfill operators are liable for the tax on all consignments of wastes accepted for landfill disposal.

A distinction is made between **inactive waste**, which is taxed at £2 per tonne, and **other waste** at the standard rate of £10 per tonne.

In the March 1999 budget, the Chancellor announced that the standard rate will be subject to a **landfill tax escalator** of £1 per tonne per year for at least another five years, reaching £15 per tonne in 2004. This is designed to increase the incentive to re-cycle or incinerate waste (see below)

### **Exemptions to the Landfill Tax**

A number of categories of waste are exempt from taxation. These are:

- dredgings from inland waterways and harbours
- naturally-occurring minerals from mines and quarries
- domestic pets, buried in pets' cemeteries
- wastes from the remediation of historically contaminated land if the purpose of the remediation is development, conservation or the provision of amenity, or to remove the potential harm from pollutants

Areas at landfill sites where waste is sorted, recycled or incinerated may be designated tax-free areas

Landfill Accounts for around 90% of controlled waste in the UK. 90 - 100 million tonnes of waste are sent to landfill each year. The trend is towards fewer but much larger landfill sites in UK.

Landfill is regarded as the only option for some inert wastes and for wastes that are difficult to burn or recycle.

## **Social Costs of Landfill**

Landfills can release chemicals into surface & underground water, and soil, and to generate methane, which is a 'greenhouse gas'. The noise from increased traffic of heavy lorries also creates external costs as does the odour and visual dis-amenity. There is also the risk of contamination of land and surrounding water.

The Landfill Tax has had mixed results. One consequence has been a rapid rise of illegal fly-tipping - i.e. the dumping of waste on private land. There is some evidence of fraud and the tax revenue from the tax is not being used to fund recycling. Most of the burden of the tax falls on local councils

## PROPERTY RIGHTS AND MARKETABLE POLLUTION PERMITS.

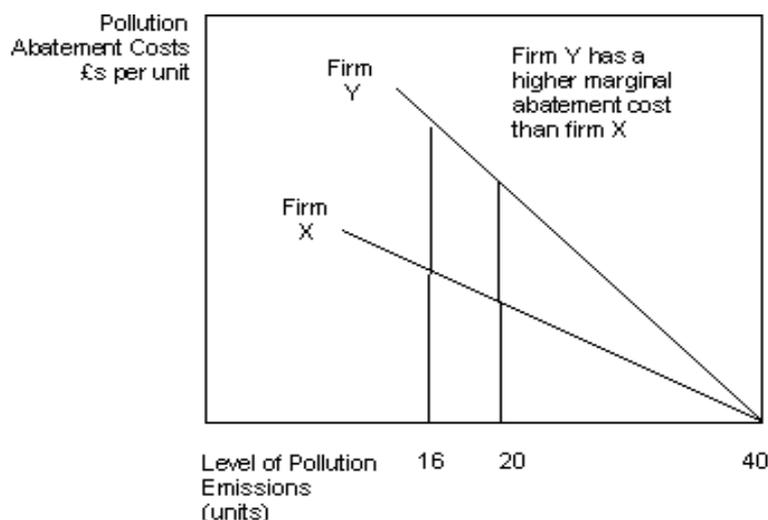
Some economists believe that a **tax-subsidy solution** to externalities rarely works effectively and without distortions to the way a market operates. They believe that the free market mechanism offers a better solution.

If **property rights** exist for producers and other owners of factors of production, these rights can be bought and sold to reflect the value of externality effects created.

**Pollution permits** are a combination of **command and control** and **market-based** approaches to the task of limiting pollution emissions. Polluters can bid for a **permit** that allows them to create a fixed amount of pollution. These permits can be resold: The government can gradually reduce the number (volume) of pollution permits available so that total pollution emissions can be controlled.

- If you can sell a permit for more than it is worth to you -- you do so
- If you can buy a permit for less than it is worth to you -- you do so

If a company (X) has a high marginal benefit from pollution emissions – it will be willing to buy some permits from another business (Y) who has a lower marginal benefit from emitting pollution.



Assume initially that both firms X and Y are producing 20 units of a pollutant each from their output. The government may decide that only eighteen units of pollution is permissible for each firm. If firm X manages

to reduce pollution emissions to sixteen units it would be given a credit of 2 units.

This permit could be traded with firm Y – allowing Y to continue producing twenty units of the pollutant. The effect is that total pollution emissions still falls to thirty six units (for the two firms combined) - but the systems of traded permits means that pollution reduction is concentrated in the firms where pollution abatement can be achieved at the lowest cost.

The market for permits will reach a market-clearing price where the marginal benefit of pollution emissions is equal. Businesses can either buy permits or invest in technology to reduce pollution emissions - whichever approach saves them money. Gradually the total amount of pollution allowed can be reduced – as the stringency of pollution limits is tightened, so the value of permits may rise, they will be more valuable to companies that can bring down pollution levels at lowest marginal cost.

**Marketable permits** have been tried in several countries – including **Singapore** where an **auction mechanism** has been introduced for the trading of ozone-depleting substances. For the system to be effective there needs to be common acceptance of the legal framework for the trading of permits and regulation of the amount of pollution produced. The **Kyoto Summit** on Climate Change (held in December 1997) witnessed a decisive move towards a greater use of **internationally traded pollution permits** – based on the idea that each country is required to achieve a specific percentage reduction in pollutants such as CO<sub>2</sub>.

#### **Potential problems with traded pollution permits:**

- How are permitted levels of pollution decided? If based on current production levels they may be no advantage for firms that have *already* taken steps to control their pollution emissions
- Traded permits may see **pollution being concentrated in certain geographical areas**. At the Kyoto Summit, developing countries were not required to make reductions in pollution – but could be given credits for “certified reductions” in pollution that could be then traded with other countries. This might allow countries such as the United States to buy up pollution permits from LDCs (including many from high polluting countries in Eastern Europe) – and avoid the need to reduce pollution themselves

- There are likely to be high **administrative costs** associated with monitoring pollution emissions – particularly if the number of firms involved is very large.