

6

MARKET FAILURE

6.1

The meaning of market failure and externalities

Learning outcomes

- Analyse the concept of market failure as a failure of the market to achieve allocative efficiency, resulting in an over-allocation of resources (over-provision of a good) or an under-allocation of resources (under-provision of a good).
- Describe the concepts of marginal private benefits (MPB), marginal social benefits (MSB), marginal private costs (MPC) and marginal social costs (MSC).
- Describe the meaning of externalities as the failure of the market to achieve a social optimum where $MSB = MSC$.



Who pays for industrial pollution like this? In a way, everyone does, which is a clear case of market failure.

Meaning of market failure

We have so far looked at how effective markets can be in bringing society what it wants with efficiency. However, the strict conditions that apply for the theory to work may not always be in effect. When real-world conditions cause markets to function inefficiently, market failure has occurred. Market failure is any situation where the allocation of resources by a free market is not efficient. These situations, from society's viewpoint, could be improved on if resources were allocated differently. Market failure is most often associated with market power, asymmetric information and externalities.

First, it is important to remember that markets function quite well if left free and competitive. Consumers enjoy allocative efficiency, and large amounts of producer and consumer surplus are produced. You will recall that the supply and demand curves explained in Chapter 2 also represent the marginal cost (MC) and marginal benefit (MB)



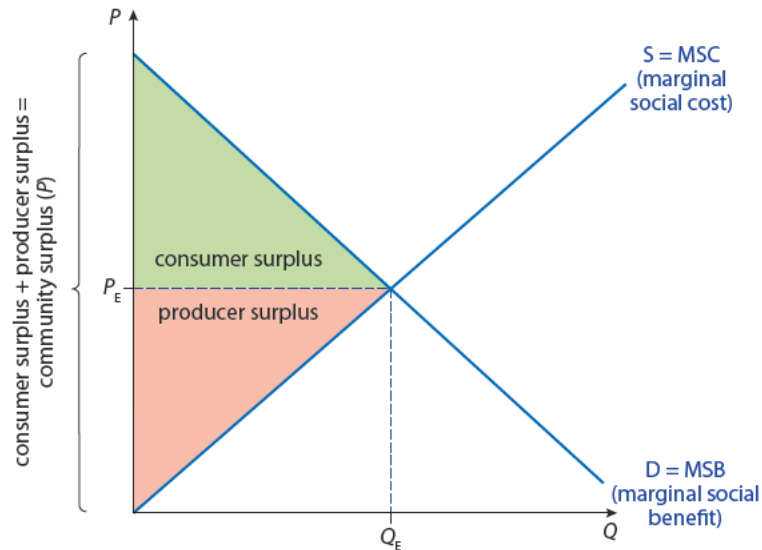
Market failure is any situation where the allocation of resources by a free market is not efficient.

curves. Furthermore, allocative efficiency is achieved where marginal benefits equal marginal costs: $MB = MC$. Normally, this is where supply meets demand. We can now expand the idea of marginal analysis to include society's benefits and costs, and so MB becomes MSB (marginal social benefit) and MC becomes MSC (marginal social cost).

Figure 6.1 shows the supply (MSC) and demand (MSB) curves at market equilibrium. At P_E and Q_E , to produce any greater quantity would cause costs to exceed benefits. Any less output, a quantity to the left of Q_E , and some portion of consumer/producer surplus is left unenjoyed. Therefore, the equilibrium point results in what economists call a maximum of community surplus, where community surplus is the combination of producer and consumer surplus.

Figure 6.1

Community surplus.



At this normally functioning competitive market equilibrium, economists argue that there exists a state of Pareto optimality. 'Pareto optimal' refers to a market situation where no one can be made better off without making someone else worse off. Look again at Figure 6.1. There are no other possible combinations of price and quantity that can improve one group's situation without hurting the other. If the price were higher than P_E , consumers would be worse off. If price were below P_E , producers would be worse off. If the quantity produced were greater than Q_E , society's costs (MSC) would be greater than its benefits (MSB), so everyone would be worse off. If the quantity were less than Q_E , some amount of community surplus would be lost. Thus, maximization of community surplus achieved at P_E and Q_E , where $MSB = MSC$, is synonymous with Pareto optimality, and is also called social efficiency.

Competitive markets provide Pareto optimality by maximizing community surplus. These markets also tend to be allocatively efficient, delivering the goods society wants by matching MSB and MSC . However, markets often do not meet the conditions of free competition, and we admit that markets can fail. When resources are not allocated in an optimal or socially efficient manner, this is called market failure. When this occurs, it is left to governments to address the problem to help society get the most from its resources.

This chapter considers various forms of market failure and evaluates the solutions most often proposed to deal with them.

Types of market failure:

- negative externalities (of production and consumption)
- positive externalities (of production and consumption)

To learn more about market failure, visit www.pearsonhotlinks.com, enter the title or ISBN of this book and select weblink 6.1.



- lack of public goods
- common access to resources and threat to sustainability
- asymmetric information
- abuse of monopoly power.

Meaning of externalities

We have made the assumption that marginal benefit and marginal cost can now be viewed more broadly, going beyond the individual and incorporating all the costs and benefits to society. When true, it is said that the marginal social costs and marginal social benefits are taken into account. For example, consider the purchase of a simple good like a pencil. If the buyer enjoys all the benefits of the pencil, we can assume that his or her private enjoyment represents all of society's enjoyment. And if the producer of the pencil pays all the costs associated with making the pencil, his or her cost is the same as society's cost.

However, there are many instances where someone outside of a transaction, a third party, may suffer the costs or enjoy the benefits of someone else's transactions. When this occurs, it is called an externality. Someone outside the original transaction is being affected by it, either positively (enjoying benefits) or negatively (suffering costs).

When the side-effects are good, it is called a positive externality. When the side-effects are bad, it is called a negative externality. Another term for externality is 'spillover,' which suggests that costs or benefits have gone beyond the initial actors in the transaction. Thus, someone suffering the effects of a negative externality may be paying some of the spillover costs. Someone feeling the effects of a positive externality is enjoying spillover benefits.

When an externality occurs, there is a difference between society's experience and that of the individual firm or consumer. No longer can we assume that the private benefit is equal to society's benefit. For example, in the case of a positive externality, the utility experienced by someone is only part of the overall benefit to society. Others share in the enjoyment of the good as well. Therefore it is possible to say that marginal social benefits of the good are equal to the private benefit *plus* the additional amount of beneficial externality. Figure 6.2 demonstrates the idea of externalities in terms of spillover costs and benefits.

i An externality is a transaction where someone other than the buyer or seller (a third party), experiences a benefit or loss as a result of the transaction.

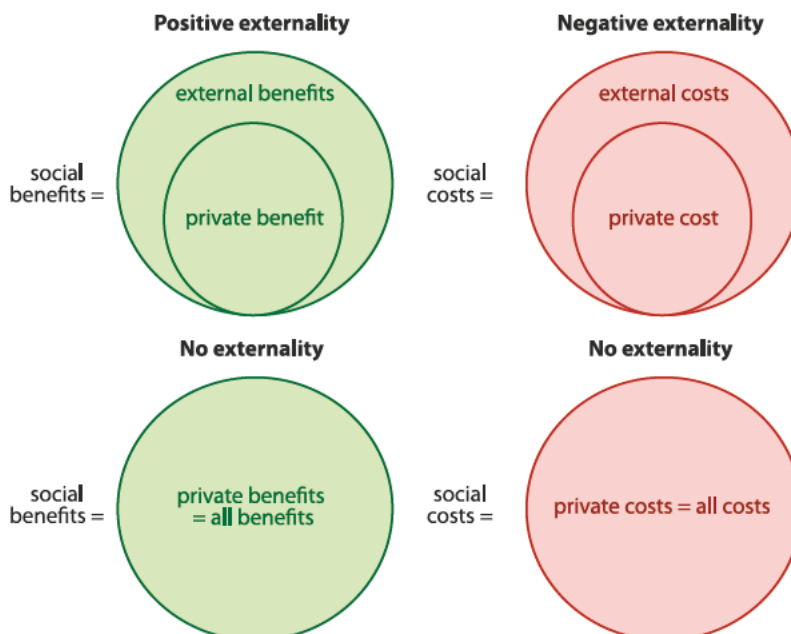


Figure 6.2
Social benefits and social costs.

Marginal social benefit is all the utility or benefit derived from the use of a good, including benefits to the consumer and the rest of society.

Marginal private benefit is the benefit derived exclusively by the consumer of a good.

Marginal social cost is all the cost incurred from the production or use of a good, including costs to the producers and the rest of society.

Marginal private cost is the costs of a good suffered solely by the producer.



We can also summarize the concept mathematically.

Where there are externalities:

- $\text{social benefits} = \text{private benefit} + \text{external benefit}$
- $\text{social costs} = \text{private cost} + \text{external costs}$

Where no externalities exist:

- $\text{social benefits} = \text{private benefits}$
- $\text{social costs} = \text{private costs}$

Furthermore, externalities of both types can occur in the course of the production or consumption of a good. This makes four types of externality:

- negative externality of consumption – use of a product creates spillover costs to others
- negative externality of production – making of a product creates spillover costs to others
- positive externality of consumption – use of a product creates spillover benefits to others
- positive externality of production – making of a product creates spillover benefits to others.

6.2

Negative externalities

Learning outcomes

- Explain, using diagrams and examples, the concepts of negative externalities of production and consumption, and the welfare loss associated with the production or consumption of a good or service.
- Explain that demerit goods are goods whose consumption creates external costs.
- Evaluate, using diagrams, the use of policy responses, including market-based policies (taxation and tradable permits), and government regulations, to the problem of negative externalities of production and consumption.

Negative production externalities

Sometimes, the most innocuous products cause problems for other people. Not for the consumer, who enjoys using it, nor for the producer, who is paid for it. Third parties, who had no part in the transaction, suffer costs ranging from the small to the very large, from lost money to poor health. These production costs are called negative production externalities. Beyond private costs, the external costs suffered by others increase the overall social costs, as seen in Figure 6.2 above.

There are many examples of negative production externalities.

- Nearly all school and office furniture contains wood particle board. This board is made from large amounts of processed pieces of wood, pressed into shape and held there by strong chemical glues and hardeners. The use of these glues and chemicals may cause workers' health to diminish, and create waste products that are difficult to eliminate.
- Coal is produced with significant air pollution as a by-product, along with the deaths of hundreds of miners working in dangerous conditions every year.
- Oil production appears to be getting more and more costly, as spills and refinery pollution cause significant external losses worldwide, not to mention the depletion of reserves.

Using supply and demand with marginal analysis, it is possible to represent negative production externalities using a typical market diagram (Figure 6.3). Note that the supply curve has been split. Marginal private cost (MPC) is another name for the supply curve representing the costs paid by the firm to produce. However, making particle board incurs costs suffered by others, so the cost to society, marginal social cost (MSC), is higher than the private cost.

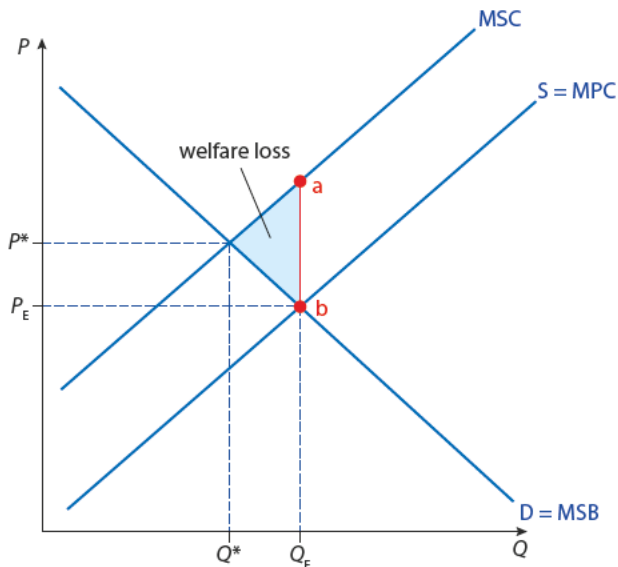


Figure 6.3
Negative externality of production.

At the free market equilibrium of P_E , quantity Q_E is produced. At that quantity, the external costs to society are quite high, represented by the distance between points a and b. This implies that if the good were priced to cover all of the relevant costs, the price would be much higher. In fact, the entire MSC curve lies above the MPC curve, showing that the private costs of production are less than the costs to all of society at every price.

This is *not* a shift to the left of the supply curve, merely a more accurate representation of the full costs of production. You could refer to the MSC curve as the ‘true’ supply curve because it shows all the costs to society.

Moreover, if the marginal social costs are the accurate costs to society, the intersection of MSC with the MSB curve should provide the optimal equilibrium point, the best allocation of resources, at the point where $MSC = MSB$. The socially efficient price and output would be P^* and Q^* . When all the costs are added into the process, it appears that the optimal amount of production is Q^* , significantly less than Q_E . We can also conclude that the equilibrium price would be higher, at P^* , than the current free market price of P_E .

This implies that goods whose production creates a negative externality are overproduced, and are sold at prices that are too low, or below what the market would show if all costs were added in. Furthermore, because production is not where marginal costs are equal to marginal benefits, resources are being misallocated. The distance between MSC and MPC at Q_E represents the marginal negative externality at that point. If the optimal output and price are Q^*P^* , then the production beyond that amount produces the negative externality, shown by the area of the shaded triangle. Economists refer to this area as a welfare loss.

Potential solutions

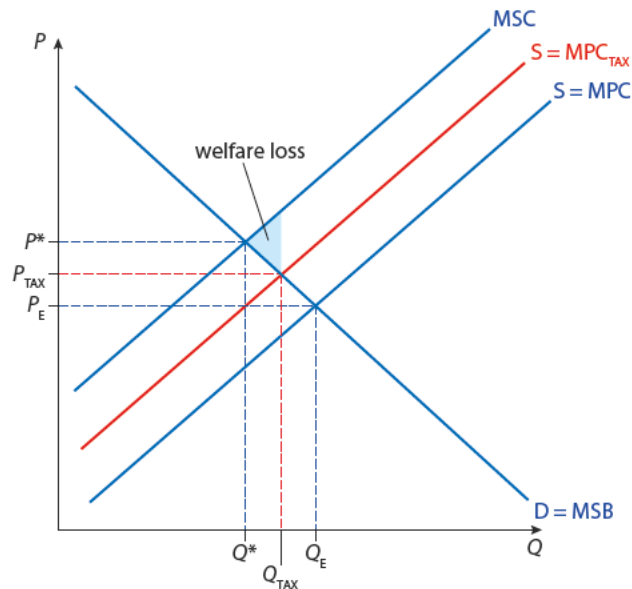
Taxes

Some governments choose to tax the product that produces the externality. A tax of this sort will shift the MPC curve to the left. Figure 6.4 (overleaf) shows the possible effects

of a tax on particle board. Supply shifts to the left, raising the price to P_{TAX} , and reducing the amount consumed to Q_{TAX} . This tax covers only a portion of the externality costs. The welfare loss triangle is still present, though significantly reduced. In sum, prices have increased to nearly the optimal market price, and quantity has decreased to nearly the optimal quantity.

Figure 6.4

Tax applied to negative externality.



Debate over carbon tax has raged in many developed economies for the last 20 years. Since it became clear that industry's emissions of carbon dioxide were contributing to global warming, governments have tried to develop tax schemes to reduce these emissions. Not surprisingly, industry's response has been overwhelmingly negative. As a result, comprehensive agreements across the EU and especially for the US have yet to happen.

Some advantages of this approach are that it:

- reduces the size of the externality (shaded triangle box)
- 'internalizes the externality,' by compelling producers and consumers to pay the costs of their transaction
- brings output down towards the optimal level, Q^* .

Disadvantages of the approach are that:

- assessing the magnitude of the externality is extremely difficult; governments and firms normally hire cost-benefit analysts to determine this
- determining the appropriate tax amount is a challenge
- taxing the good may not deter pollution, only reduce it.

Legislation and regulation

Governments can enact laws to deter production of products or services that cause harm to others. It may force cleaner production with improved technology or order the firms to reduce the amount of the good actually produced. In any case, the effect would be to reduce the size of spillover costs, likely moving MSC closer to MPC. It may also move the MPC to the left, decreasing supply because the new technology will increase costs of production. This can be very costly to implement. To enforce their regulations, the government must then create an agency or office to monitor and enforce compliance with the rules. Again, determining the value of pollution losses can be very difficult. The complexity of such lawmaking and enforcement is very challenging.

Furthermore, there is a cost to government resources, as well as the cost firms will spend on meeting the regulation requirements. Disputes between governments and firms often incur extra costs in legal expenses as well. The extreme course is an outright ban on the good. This would eliminate the externality. But this extraordinary measure is likely to destroy the market completely, as well as all previous community surplus in the process. Bans incur major opportunity costs in terms of lost market benefit.

Tradable permits

As a special category relating to sustainable development, tradable permits are discussed in detail later in this chapter (page 141).

Negative consumption externalities

Spillover costs can occur on the consumption side as well. In these cases, a person's use of a product affects others adversely. A surprising number of products create obvious third-party costs:

- smoking
- alcohol consumption
- gambling
- automobile use.

Recently, some have argued that the consumption of high-fat diets, which contribute to heart disease, constitutes the same kind of consumer spillover cost. In the case of a negative externality of consumption, the costs are seen on the marginal benefit curve.

While this may seem counter-intuitive, remember that this is a consumption externality and, therefore, it is the demand (or consumption) side where the costs occur. For negative externalities of consumption, the marginal social benefits are less than the benefits enjoyed by the private consumer. In other words, the benefit of a cigarette that is enjoyed by the smoker is greater than society's benefit. This is because the smoker is a part of society, so their enjoyment is part of the total. But others will eventually pay some of the costs of this smoking (in higher insurance premiums or taxes for government health programmes). This cost to others actually reduces the overall benefit to society. Figure 6.5 shows the negative externality where marginal social benefit falls below or behind the marginal private benefit.

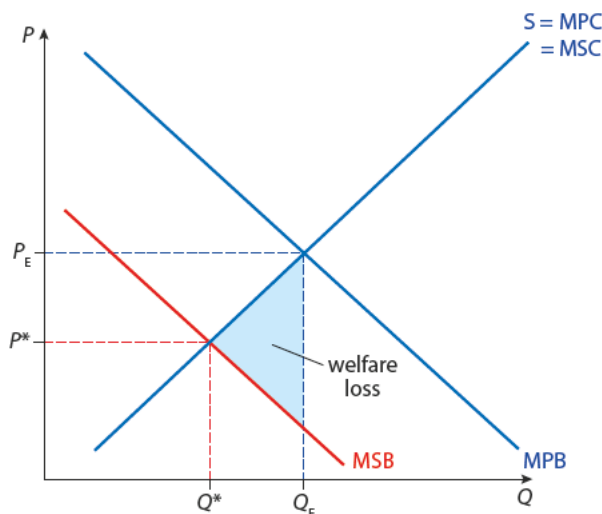


Figure 6.5
Negative externality of consumption.

Automobile use creates negative externalities of consumption with noise pollution, air pollution, and car accidents. In fact, in the developed world, death in traffic accidents is consistently ranked in the top 10 causes of death. At the same time, cars tend to be one of the most income-elastic goods (Chapter 4, page 87). As people's income rises a little, their propensity to buy cars rockets upwards. So, as the ranks of developed countries grow, we can expect the size of this externality, in global terms, to grow as well. Figure 6.5 shows the actual price and quantity at P_E and Q_E , and the optimum price and quantity at P^* and

Q^* , where marginal costs and benefits to society are equal. If the market were able to incorporate all the associated costs of car consumption, it would demand fewer cars at Q^* and would value them less, at only P^* per car.

In reality, marginal private benefit is greater than (and to the right of) marginal social benefit, reflecting the greater benefit enjoyed by private car users than the benefit enjoyed by society overall. With all of the respective costs and benefits in mind, we can say that there are too many cars produced and too many consumed. The shaded triangular area shows the area of welfare loss, resulting from problems that third parties will pay for eventually.

Worldwide, car crashes kill more people than war. How far will society go to address the problem?



According to a World Health Organization/World Bank report *The Global Burden of Disease*, deaths from non-communicable diseases (or other social problems) are expected to climb from 28.1 million a year in 1990 to 49.7 million by 2020 – an increase in absolute numbers of 77%. Traffic accidents are the main cause of this rise. Road traffic injuries are expected to take third place in the rank order of ‘disease burden’ by the year 2020.

RANKING OF CAUSES OF DEATH		
Cause of death	Position in rank order (1990)	Position in rank order 2020 (projected)
road traffic accidents	9	3
war	16	8
self-inflicted injury	17	14
violence	19	12

- Interpret the citation of an increase of 77% in traffic deaths. To what extent is this statistic worrisome?
- Is there more or other types of information that could be useful in understanding the issue? Explain.
- Evaluate some of the possible solutions to this growing problem.
- As poorer countries race to catch up with richer ones in terms of car consumption, to what extent is it ethical to limit car consumption in poor countries?
- Consider the way we have come to understand this issue. How does our perception of it change based on way of knowing about it? How would our perception change based on whether we have:
 - seen the statistics cited above?
 - suffered from a traffic accident ourselves?
 - lost someone close to us in a car accident?

Potential solutions

Legislation and regulation

Governments can ban the consumption of goods with high spillover costs to society. And many governments do indeed deem certain activities illegal for just this reason. They may limit behaviours such as consumption of alcohol or use of phones while driving, or require new residential buildings to have garages and car parks. Children are banned from smoking in most countries, and the consumption of many drugs is heavily regulated. Drug use, prostitution, gambling and other activities with the potential to harm others are widely banned in many societies.

Goods that have a long cultural history of acceptable use may be limited or restricted by legislation, rather than being banned completely. Bans on alcohol, especially in countries where its use is common, have typically failed dramatically. Strict enforcement of drinking laws (in relation to driving and underage consumption) reflects a more modest limit on alcohol use, and an attempt to reduce the costs specifically.

It is difficult to imagine a ban on, say, car use because the good seems so vitally important to modern life. However, in several congested major cities, governments allow car use only on alternate days of the week, in effect banning use half of the time. As you might expect, this kind of restriction is subject to major deception by drivers who find ways around it. More likely, governments will attempt to reduce the externalities by limiting emissions, encouraging alternative methods of transport, limiting sound pollution, and so on. It goes without saying that the greater legal restrictions on the production of a good, the greater the costs of production, as well as the more bureaucracy required to enforce the laws.

Taxation

In an attempt to 'internalize the externality,' governments may also choose to tax the good. This should compel the market actors involved to pay the costs to society instead of the third parties. A tax would increase the MPC and shift private supply to the left. This has the beneficial effect of reducing consumption, perhaps to some point close to the optimum level of Q^* . This result would, of course, depend on an accurate assessment of the external costs and an equally accurate application of the tax. In this desirable but somewhat unlikely case, MPC shifts back to intersect exactly at Q^* , decreasing the amount sold and raising the market price to P_{TAX} . Figure 6.6 shows the supply curve shifting backwards by the amount of the per-unit tax, from S to S_{TAX} . This brings the market to P_{TAX} and Q_{TAX} , in line with the optimal amount of output at Q^* .

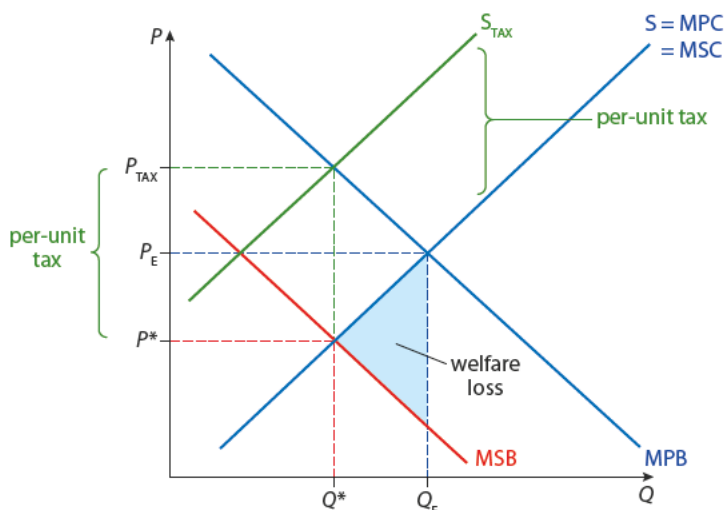


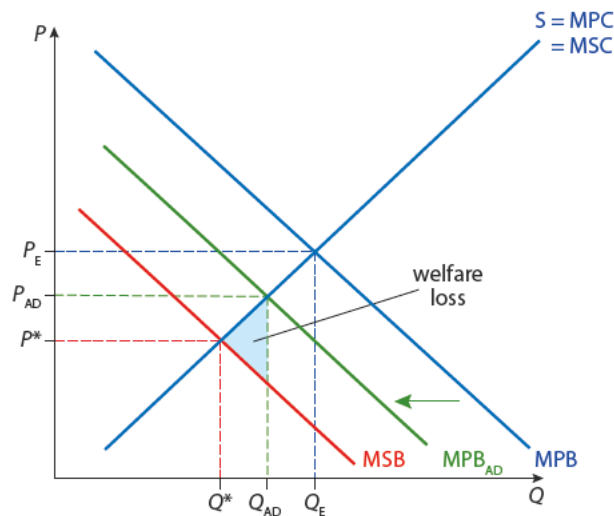
Figure 6.6
Taxing a negative
consumption externality.

Advertising and persuasion

Governments can also attempt to persuade consumers to change their behaviour. Most often and most expensively, this is done through advertising the negative effects of the product to discourage further use. This method has been used to discourage smoking, drinking and driving, littering, the sale of endangered species, and to encourage recycling, among many other examples. In combination with activism and legal changes, advertising can be effective at changing the value that consumers place on a good. And, in turn, they may switch to other products that serve the same ends (e.g. public transport in the case of automobiles) or merely reduce their consumption, shifting demand left in either case.

Figure 6.7 shows the effect of a decrease in demand on the negative externality. The government has advertised the virtues of public transport compared to driving your own car. Advertising shifts private demand (MPB) to the left as consumers find the product less desirable. This brings the equilibrium price and quantity closer to the socially optimal P^* and Q^* .

Figure 6.7
Advertising and negative
consumption externalities.



The price decreases, as does quantity consumed, with perhaps less direct market interference than a specific tax. The area of the welfare loss has shrunk as a result. However, changing attitudes through advertising can be expensive, especially in an age of fragmented and narrowly cast media messages. For example, how does advertising reach smokers? The media available include television, billboards, web advertising, social networking, radio, and so on. Officials must weigh the opportunity cost of such expensive campaigns against the social good that can be achieved.

An externality challenge: food or fuel



Maize is usually a food crop ...



... but some farmers grow it for biofuel.

The negative externalities associated with car emissions are well known: carbon dioxide gas and carbon monoxide gas are the primary pollutants from cars. Carbon monoxide is very poisonous because it prevents the blood from carrying oxygen round the body (without oxygen, you die). The American Lung Association says that in 1998, 30 000 people in the US died as a result of car emissions. With this in mind, scientists and business leaders have sought cleaner-burning car fuels.

One category of these fuels is called biofuels because their primary source is some form of biomass, as liquid, solid or gas. One such plant fuel, ethanol, is an alcohol added to normal gasoline by government requirements. In the US, up to 10% of gasoline bought at the pump is ethanol. In Brazil, 25% of all gasoline is ethanol. But ethanol may be more expensive to produce than gasoline. Recent debate has focused on the environmental costs of the extra corn production used in the production of ethanol. Often these crops are subsidized as well, adding to their overall costs.

Increasingly, environmentalists point out that the use of fertilizers and degradation of soil resources may outweigh the benefits of the cleaner fuel.

The food price crisis of 2007 and 2008 revealed another problem with ethanol: it reduces the amount of food available for human consumption. Ethanol can be made from corn, sugar cane, potatoes and other common foods, and ethanol markets may pay more for such crops than the food markets. The amount of land available for growing food crops is also reduced.

As prices for food rose during this period, nutrition levels reached critical levels in some countries. This has led some economists to note the conflict between food and fuel needs. If current trends continue, it is possible that the world will go from producing a net surplus of food to a net deficit. Experts worry these policies will result in a humanitarian disaster.

i The world's largest producer of ethanol is Brazil, where the large sugar cane harvest is used to produce a cheap, clean substitute for petrol. In the US, most ethanol comes from maize, which is far less clean and more inefficient as a fuel source. Despite Brazil's clear comparative advantage in ethanol production, the US imports little or none from Brazil. This is due to protectionism (Chapter 21).

EXERCISES

- 1 Using an appropriate diagram, explain the externality associated with car emissions.
- 2 Using an appropriate diagram, explain the externality associated with food production.
- 3 Evaluate the dilemma and solutions posed by ethanol use for biofuels.

i To access Worksheet 6.1 on the market and pollution reduction, please visit www.pearsonbacconline.com and follow the onscreen instructions.

6.3 Positive externalities

Learning outcomes

- Explain, using diagrams and examples, the concepts of positive externalities of production and consumption, and the welfare loss associated with the production or consumption of a good or service.
- Explain that merit goods are goods whose consumption creates external benefits.
- Evaluate, using diagrams, the use of government responses, including subsidies, legislation, advertising to influence behaviour, and direct provision of goods and services.

Positive externalities of production

The production of some goods creates positive spillover effects, creating benefits for third parties. At first glance, these may appear to be rather rare compared to the other types of externality.

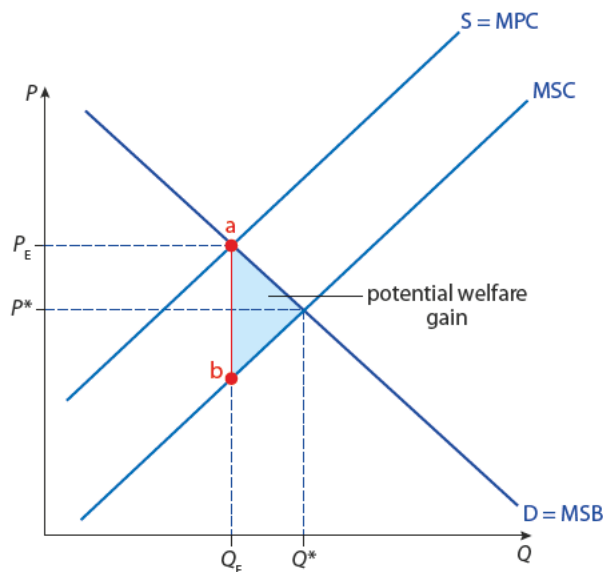
- Tree farms created for the production of wood oxygenate the atmosphere to everyone's benefit.

- A school placed in a neighbourhood may improve the property values of families with no children in school.
- Workers trained by one company can be hired by another which enjoys the benefits of the training.
- Research and development by one firm can be used by another to make further advances in a particular field.
- Software companies create new technologies that may not succeed on their own but inspire others to create valuable new products by imitation.

In all of these cases, the company, in producing one good, benefits others beyond itself and the customer.

In Figure 6.8, the positive externality of production is shown as a gap between social costs and private costs on the supply side of the transaction. Marginal social cost, the true cost to society, is lower at every point than the private cost experienced by firms. Thus, at the market equilibrium of P_E , there appears to be too little being produced. At P_E , the MPC indicates private costs at point a, where the MSC indicates costs to be much lower at point b. This suggests that more could be produced, and society would enjoy the extra benefits of that production, shown by the blue triangle as 'potential welfare gain.' As production continues beyond Q_E , the gap between private costs and social costs narrows, to the point of P^* and Q^* , where $MSC = MSB$, and output is at its optimal point.

Figure 6.8
Positive externality of production.



Potential solutions

Subsidies

The government can actively encourage extra production by the payment of subsidies. This may occur in the form of a lump-sum payment to the industry, or more commonly as a per-unit subsidy (Chapter 5, page 108). The goal would be to push MPC outwards towards the production of the socially optimal Q^* units of output. The subsidy, however, is paid by tax revenue, and is drawn from other areas of the government budget. So again the opportunity cost of using these resources must be considered. Subsidies of this kind can be very expensive.

In Figure 6.9, the subsidy shifts MPC to the right by exactly the amount sufficient to encourage production to the optimal point, Q^* . This lowers the price to P^* and allows more consumers to enjoy the product. This example is dependent on an accurate assessment of

the value of the positive externality, as well as the expert designation of the subsidy amount. Furthermore, the granting of such subsidies can create a political problem. Other firms may see an opportunity to be subsidized, which may lead to a barrage of appeals to government for subsidies on the basis of the external benefits their product creates.

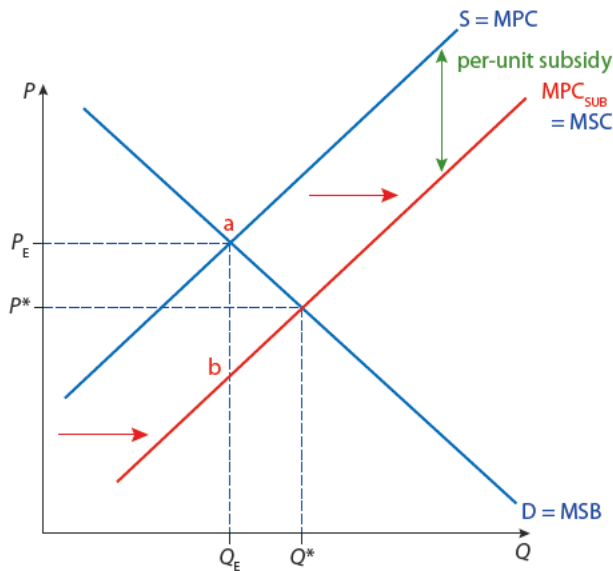


Figure 6.9
Subsidy solution to positive production externality.

State provision of the article

In the case of worker training or tree farming, the government may decide to provide directly the good creating the positive externality. For example, states can build and staff worker-training centres to provide the same training experience that private firms offer. However, this can be costly and depends on government accurately predicting the needed training shortage areas. Governments can devote large areas of public land to oxygen production through tree farming or the protection of national forests or national parks, but these decisions are subject to the same questions about the true value of the externality, and the opportunity cost of using resources in such a fashion.

Positive externality of consumption

The consumption of some goods can create benefits to third parties. Additional years of education, it is said, create strong spillover benefits for the rest of society. With more education, a person is more likely to be a skilled and productive member of the workforce. Their income will provide tax revenue, and they are relatively less likely to engage in criminal activity. Since these are benefits potentially enjoyed by the whole of society, we can say that the social benefits of education exceed the private benefits. In other words, MSB will be greater than MPB. This is shown in Figure 6.10.

Left alone, the market will produce Q_E worth of education at a price of P_E . The optimal production, however, appears to be at Q^* with a price of P^* , where social costs and benefits are equal. Thus, the free market will not produce enough education by itself. And, if society's true value for education were included, if demand were reflected in the MSB curve, the demand

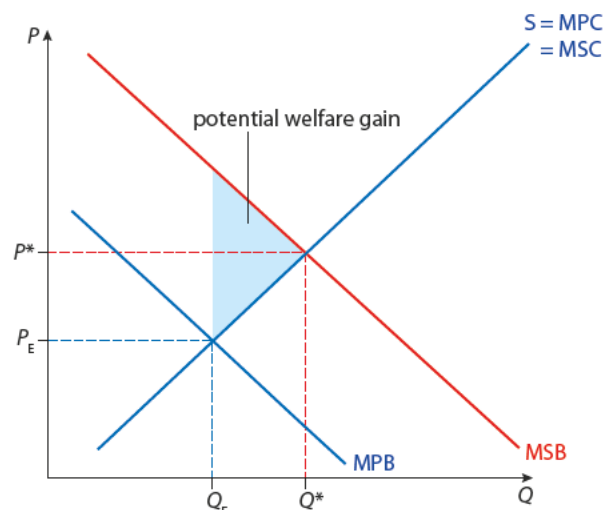


Figure 6.10
Positive consumption externality.

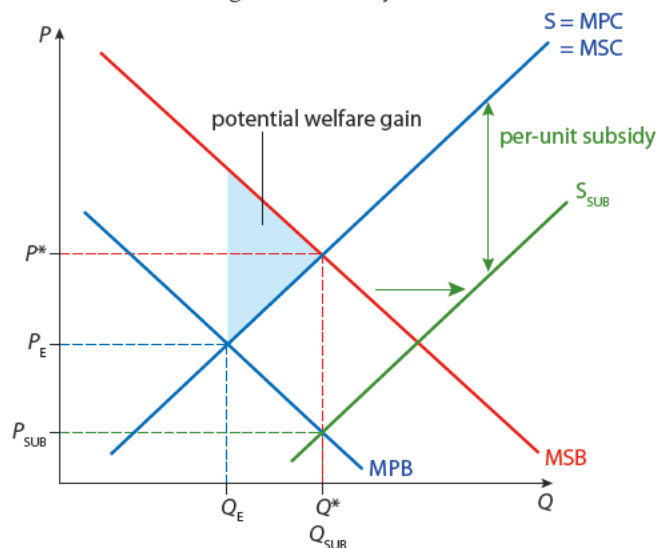
and, therefore, the price would be higher than it is. Society would gain considerably by consuming more education. The amount of the potential gain in welfare is shown by the shaded triangle.

Potential solutions

Subsidies

Governments might subsidize the good to make it more affordable. They can and often do subsidize education. Public education of children to a certain age is common in many countries. In this case, government directly provides the good. A less extreme approach encourages education by paying for the majority of costs, leaving extra costs to be paid for by families. In any case, the effect of this government intervention is to subsidize education, shifting the private supply curve (MPC) to the right. Figure 6.11 demonstrates the effect of a subsidy on private consumption externalities. If we assume the subsidy is paid to schools on a per-unit basis, MPC shifts right by the amount of the subsidy, lowering the price of education and increasing its availability.

Figure 6.11
Subsidy of education.



The new equilibrium is at the socially efficient quantity of students, Q^* . Schools receive revenue equal to what would be received at P^* , but the difference between P_{SUB} and P^* is provided by the per-student subsidy. Subsidies to education are popular. Their expense is considerable, however. Political debates over education often revolve around the amount of the subsidy rather than whether or not to subsidize at all. Thus, the opportunity costs of such subsidies must be weighed against the relative merit of the good.

Education subsidies can also be delivered to consumers in the form of tuition ‘vouchers’ that allow families to spend their subsidy on the school of their choice, private or public. In this case, demand (MPB) would shift to the right, encouraging more consumption of education.

Advertising

To encourage consumption, governments can advertise the benefits of positive consumption externality goods. For instance, the consumption of most healthcare goods tends to benefit the rest of society. This is most acutely true in the area of communicable disease and illness, but society also benefits from increased overall general health levels by raising productivity. More specifically, vaccinations against diseases such as polio offer dramatic benefits to third parties by reducing the spread of disease even to those who are not vaccinated. On a more routine daily basis, the use of condoms reduces the spread of sexually transmitted infections and prevents unplanned pregnancy.

In many such instances, governments attempt to persuade the public to use such goods through advertising and public campaigns. The effect would be to change consumer tastes, shifting MPB to the right, with the goal of pushing it nearer to the socially efficient quantity (Figure 6.12). With private demand increasing, society reduces the size of the externality, in effect absorbing or enjoying at least part of the potential welfare gain. The effects of such advertising vary considerably, depending on the type of good being advocated, as well as the strength of cultural attitudes. Condom use, for example, is more difficult to encourage in countries where public discussion of sexual behaviour is considered offensive.

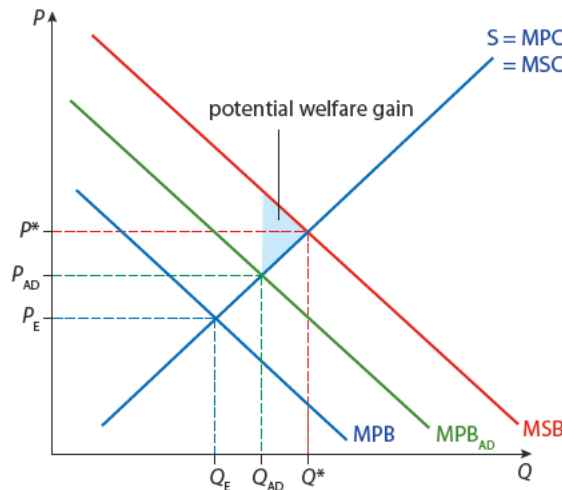


Figure 6.12
Advertising solution to positive consumption externality.

Legal requirements

Governments can legally mandate behaviour that it deems to be in the public benefit. It can require children go to school to a certain age, or to get vaccinations. However, unless the good is publicly provided, full compliance is unlikely. Furthermore, mandates without reasonable government support will foster resentment of government policy.

A critical consideration when formulating such policy is the size of potential benefits. In other words, government intervention is most likely in areas where the benefits are large, as they are with education and healthcare. The measures enacted for less demonstrably 'positive' behaviour are lighter. While governments may sponsor libraries in recognition of the benefits derived from them, for example, they are less likely to require their adult population to read the books contained inside.

W To learn more about externalities, visit www.pearsonhotlinks.com, enter the title or ISBN of this book and select weblink 6.2.

6.4

Lack of merit goods and public goods

Learning outcomes

- Using the concepts of rivalry and excludability, and providing examples, distinguish between public goods (non-rivalrous and non-excludable) and private goods (rivalrous and excludable).
- Explain, with reference to the free-rider problem, how the lack of public goods indicates market failure.
- Discuss the implications of the direct provision of public goods by government.

Under-supply of merit goods

A merit good is one for which the marginal social benefits exceed the marginal social costs when sold on the open market.



Merit goods or services are those that create positive spillover benefits, and are under-produced by the free market. Economists and governments advocate policies that encourage the consumption of these goods to capture potential welfare gain that would not be enjoyed without such intervention.

Governments encourage the consumption of lesser merit goods with a combination of persuasion and incentives. Advertising and public opinion campaigns may encourage consumption. Governments can subsidize merit goods, either by direct payment or reduced taxation. Religious schools, for example, may be actively subsidized, as they are in many countries, or implicitly subsidized by reducing or eliminating taxes for religious organizations themselves. The degree of government provision or encouragement is directly related to the amount of spillover benefits provided by the good.

Under-supply of public goods

A public good is a good that is non-rivalrous and non-excludable, and is typically provided by the government.



Public goods are extreme examples of merit goods, and are typically provided entirely by the government. Typical examples include roads, prisons, streetlights, and public theatre and arts. Public goods are both non-rivalrous and non-excludable.

- **Non-rivalrous.** A good is non-rivalrous if one person's consumption of it does not prevent others from enjoying it. National defence is provided by a nation's military, and the security it offers is enjoyed by every individual in the country. One person's consumption does not infringe on any other individual's, so national defence is non-rivalrous. On the other hand, when one person is eating an ice cream, others are prevented from enjoying its benefits (Table 6.1).
- **Non-excludable.** A good is non-excludable if the producer cannot prevent particular individuals from enjoying its benefits. Streetlights are non-excludable because once installed and turned on, it is impossible to prevent particular people from benefiting from them. In contrast, an ice cream is completely excludable by its producer. If you don't pay for it, you don't get to benefit from it (Table 6.1).

Only goods that are both non-rivalrous and non-excludable are declared public goods. Streetlights can be enjoyed by one and all without rivalry, and even those who do not pay (children, tourists) will enjoy the good.

TABLE 6.1 TYPES OF GOOD

	Excludable	Non-excludable
Rivalrous	Private goods: clothing, food, electronics	Common goods: fish, seafood, coral, timber, air
Non-rivalrous	Collective/club goods: movie theatre, internet websites	Public goods: national defence, police and fire departments, lighthouses

Oversupply of demerit goods

A demerit good is one for which the marginal social costs exceed the marginal social benefits when sold on the open market.



Demerit goods are those that create negative spillover costs to third parties. Negative externality goods are generally considered to be demerit goods. Because of their extra costs to society, they are considered to be over-produced and over-consumed. An optimal allocation of society's resources would reduce their use. Goods like cigarettes, alcohol, gambling, and addictive drugs are examples of such goods, and governments often attempt to reduce the consumption of them.

Public persuasion, taxation, regulation, and banning of the good can all be employed, depending on the perceived severity of the problems associated with the good. Cigarettes are heavily taxed and are often labelled with large warnings and photographs to discourage consumption. Normally, alcohol and cigarettes are restricted to adult use by law. Bans against the consumption of demerit goods rarely destroy the market. Instead, bans drive the market underground to the black market. Demerit goods are most often associated with personal health habits, but the term can arguably be applied to any good with accompanying spillover costs, including automobiles, golf courses (environmental costs) and the consumption of meat (environmental and healthcare costs).

W To learn more about public goods, visit www.pearsonhotlinks.com, enter the title or ISBN of this book and select weblink 6.3.

6.5

Common access resources and the threat to sustainability

Learning outcomes

- Describe, using examples, common access resources.
- Describe sustainability.
- Explain that the lack of a pricing mechanism for common access resources means that these goods may be overused/depleted/degraded as a result of activities of producers and consumers who do not pay for the resources that they use, and that this poses a threat to sustainability.
- Explain, using negative externalities diagrams, that economic activity requiring the use of fossil fuels to satisfy demand poses a threat to sustainability.
- Explain that the existence of poverty in economically less developed countries creates negative externalities through over-exploitation of land for agriculture, and that this poses a threat to sustainability.
- Evaluate, using diagrams, possible government responses to threats to sustainability, including legislation, carbon taxes, cap and trade schemes, and funding for clean technologies.
- Explain, using examples, that government responses to threats to sustainability are limited by the global nature of the problems and the lack of ownership of common access resources, and that effective responses require international cooperation.

Common access resources such as fisheries often result in over-exploitation, due to their non-excludability. Recent attempts to 'privatize the commons' have helped achieve a more sustainable level of fish harvest in certain countries.

The tragedy of the commons

The tragedy of the commons is a dilemma posed when common resources are used or degraded rapidly by private individuals who enjoy the short-term benefits of the resource, but who are ignorant or neglectful of its long-term depletion. The most common example is that of a herd of cows using a common pasture. Each cow owner has a strong private incentive to place his or her cow in the pasture for feeding. The cumulative effect of this, however, is the long-term destruction of a once lush resource, as more and more cows eat up the field. All users will eventually suffer this loss. Economists and environmental scientists have also applied the idea to the world's common fishing waters, citing the dwindling of fish stocks everywhere.



The critical problem is that common access resources are essentially 'free' to the user, but use of them depletes the availability of the resource to everyone else. Economists and scientists call these subtractable resources. Because users do not pay a market price for use of the good, they have little incentive to ration it wisely. Economists call this behaviour the free-rider problem: those who benefit and draw from a resource but do not have to pay for it. Examples are abundant.

- Water sources in nearly every country are receivers of toxic waste, thus diminishing ecosystems.
- Forests are slashed for wood and to make way for farming, which reduces oxygen production and erodes the soil.
- The atmosphere is infused with pollutants generated from industry, cars, and the methane output of animals that are kept for meat production.

Originally articulated by Garrett Hardin in the journal *Science* in 1968, the tragedy of the commons points to the likelihood of ruin in a world of common access resources such as fisheries, forests and pastures: 'Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all.'

The goal of sustainable development is to avoid resource depletion and encourage environmentally benign forms of economic progress. Recognizing the obstacles to sustainability posed by the tragedy of the commons allows us to better assess the ability of society to grow and develop in a sustainable manner.

EXERCISES

- 4 List two other commonly held resources that may be subject to this dilemma.
- 5 To what extent does each situation fit the category of the tragedy of the commons?
- 6 Speculate on some ways that better management of the resource may be possible.

Fossil fuel consumption

One of the most acute problems of sustainability is the consumption of fossil fuels. The production and burning of natural gas, petroleum and coal emits the largest share of greenhouse gas emissions. It also produces many air pollutants, such as volatile organic compounds, nitrogen oxides, sulfur dioxide, and heavy metals. It is blamed for acid rain, as well as for threatening water and vegetation habitats in many parts of the world.

Clearly, fossil fuel use is creating significant negative externalities (Figures 6.3 and 6.5, pages 127 and 129). Among the more challenging questions is exactly how severe the problem is – that is, how large the external costs are (how large is the externality triangle?). This knowledge problem is typical of market failure, and of externalities in particular. But in the case of fossil fuel consumption, the scale of the problem is global. This makes estimates of the damage imprecise, but it is generally agreed that the problem is widespread, with potentially extraordinary consequences.

Poverty in less developed countries

Less developed countries (LDCs) are more desperate than others for income. Most LDCs sell goods for which the demand is not increasing especially fast (Chapter 25). As global incomes rise, the demand for advanced goods, which these countries must import, is rising

Debate about global warming continues between political leaders, but most scientists and economists acknowledge the role fossil fuel consumption plays in climate change. Several economic schemes for mitigating the effects of industrial activity on the environment have been proposed, and most rejected. It can be argued that the atmosphere is a common access resource, and that until a value can be placed on its protection, human industrial activity will continue to exploit it unsustainably.





much faster. This is worsening the terms by which poorer countries trade with richer ones. In simple terms, incomes in poor countries are rising more slowly than in rich ones.

One result of this is that LDCs must sell more of their agricultural or primary goods to keep up. This puts pressure on their resource base. For agriculture-based economies, it means more intensive cultivation and the potential to deplete the soil of its nutrients. It could also mean the widespread slashing of forests to make way for farms and livestock. For extractable resources, it might result in mining and drilling operations without regard for the effect on the landscape, or on soil and water resources.

The pressure on resources in an LDC is intensified if the country carries a significant international debt burden, as many do. Among the first requirements of foreign lenders is for debtor countries to maximize their export earnings. It is for this reason that lending institutions like the World Bank and International Monetary Fund are blamed for indirectly encouraging environmentally unsustainable development policies.

Potential solutions to sustainability problems

Extension of property rights

In the case of common access resources, the lack of a price mechanism leads to a depletion of resources. Economists have proposed that these cases call for an extension of property rights to encourage the protection and management of the scarce resource. The idea is that if the users of the resource had a long-term interest in survival of the resource, their incentives would be balanced between short- and long-term goals. Some success has been achieved on limited, smaller projects. In practice, the extension of property rights depends on a number of factors, and the concept has proven difficult for policymakers to enact effectively on large-scale projects.

Carbon taxes

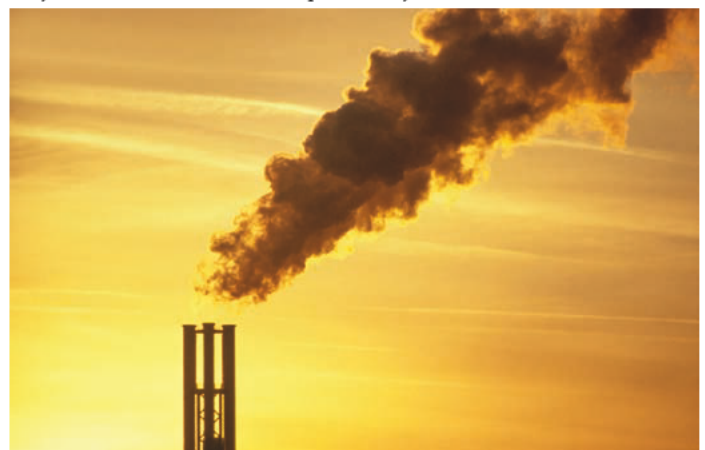
A carbon tax is a charge levied by government on firms burning fossil fuels in their production processes. It is the burning of carbon in all fossil fuels that creates carbon dioxide. One approach proposes to tax fuel by carbon level, thus 'internalizing the externality' with the consumer and producer. This is done with a specific tax, the effects of which are shown in Figures 6.4 and 6.6. Ideally, the tax would decrease the amount consumed or produced to be in line with the allocatively efficient level of output, where $MSC = MSB$. The tax acts as a disincentive to use fossil fuels, and encourages the demand for (and development of) non-carbon-emitting substitutes.

Of the largest carbon dioxide producers, none have comprehensive or 'harmonized' carbon tax systems. The US and China, in particular, have failed to enact such policies, primarily on the grounds that they would harm economic growth. Many EU countries have independently enacted such schemes, to varying levels. However, an EU-wide policy has been stalled because of the reluctance of former Eastern Bloc countries. They have argued that they will be unduly penalized for 'starting late' to modernize and re-equip the technologically dated energy systems of the communist years: they need more time to catch up with the West.

Tradable permits

The rules for tradable permits seek to avoid the adversarial relationship seen with tax and regulation policies. They aim to do so by using market forces

Policies such as carbon taxes and tradable permits are meant to internalize the external costs of burning fossil fuels.



A tradable permit scheme is a system for taxing pollution levels where pollution licences are exchangeable between firms on a secondary market.

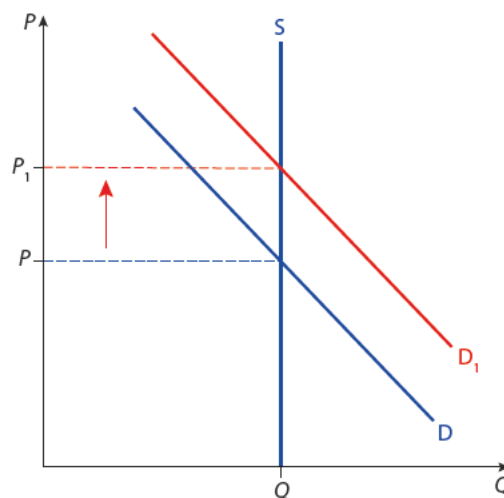


to encourage clean production and reward innovation. Also called cap-and-trade policy, tradable permits can be applied locally, nationally or internationally. The governing body determines the acceptable level of pollution derived from the production of the good. It then licenses the permitted amount of pollution in shares or permits. The policy works much like a tax because firms effectively pay for the 'right' to pollute. The licence payment does, however, act as an incentive for firms who might be able to produce more cleanly. If they can get their production below the licensed amount, they can sell their permits to other firms.

Alternatively, if a firm expects to exceed the licensed pollution amount, they can try to buy up extra permits from other firms. This creates a market for such permits, where high demand makes polluting expensive. This would further encourage firms to take another approach, to innovate and reduce their own pollution levels. Economists favour these schemes because they create incentives to reduce pollution, but also compel polluters to pay more as they pollute more.

Figure 6.13 shows how a tradable permit scheme may look. Q represents the total licensed amount of pollution, and is perfectly inelastic because it is established by the government. This quantity of allowed pollution is then sub-divided into smaller quantities for which permits can be issued. Companies buy the permits to pollute up to the level allowed by the permits. An increase in production might increase the demand for such licences to D_1 , and cause the market price to increase. This would give relatively clean firms an incentive to further innovate and reduce their pollution levels and sell their permit to the high polluters. Over time, to reduce the overall level of pollution, the government could gradually reduce the allowable Q , or quantity of pollution, moving the supply curve to the left. This would increase the price of permits and compel firms to seek out cleaner technology or pay the higher permit fees. Critics argue that such an approach relies heavily on enforcement and heavy fines to reinforce the policy, and that it does not sufficiently discourage polluting.

Figure 6.13
The market for tradable pollution permits.



The most famous tradable permit scheme has been the United Nations Kyoto Protocol, developed and ratified by several dozen countries in the year 2000. This agreement placed limits and agreed reductions in the amount of greenhouse gas (GHG) emissions on the basis of regions, development categories, and country-specific factors. Under the scheme, countries would pay penalties for missing their targets, and countries that beat their reduction goals might potentially receive credits. Developed countries may buy carbon permits from lesser developed ones, which have little or no emissions restrictions.

Significant conflict arose over the strictness of emission levels, the difference between the tougher restrictions on rich countries and the more lax ones on poor countries, and the severity of enforcement penalties. In effect, since 2005, over 160 countries participate in



the system. The US, the largest *per capita* emitter of GHGs, participated in negotiations and signed the treaty, but has not ratified it and operates outside Kyoto rules (Table 6.2).

TABLE 6.2 TOP 10 GREENHOUSE GAS EMITTERS BY COUNTRY, 2005

Country	% share of global GHG emission	Tons of GHG <i>per capita</i>
China	17	5.8
US	16	24.1
EU	11	10.6
Indonesia	6	12.9
India	5	2.1
Russia	5	14.9
Brazil	4	10
Japan	3	10.6
Canada	2	23.2
Mexico	2	6.4

Problems of cooperation

A common difficulty with solutions to sustainability problems is the difficulty of enforcement of policies to encourage sustainable growth. In the case of polluting industries, nothing is solved when companies can move from place to place, in search of lax rules and enforcement. In the case of carbon taxes and tradable permits, countries which move first towards implementation are at a competitive disadvantage when attempting to lure industry and encourage business growth. All of which suggests that the critical ingredient in solutions to sustainability is international cooperation. Whatever the details of the specific policies, only with common agreement and coordinated enforcement can these environmental issues be addressed effectively.

EXERCISES

- 7 What might the government do if it wanted to raise the price of pollution?
- 8 If the scheme works and firms do innovate for cleaner production, what could happen to the market?
- 9 Why do you think the Kyoto protocol excluded poor countries from its pollution limits? Evaluate.
- 10 Review the list of top GHG emitters. What accounts for the differences in the percentage rankings and *per capita* numbers?

W To learn more about economics and the environment, visit www.pearsonhotlinks.com, enter the title or ISBN of this book and select weblink 6.4.

6.6 Additional forms of market failure

Factor immobility

Market theory operates on the assumption that factors of production gravitate to the places where they are most needed. Capital, for example, moves to where the rates of return are highest. In theory, workers (labour), should do the same, and move to where real wages are greatest. In reality, however, factor resources can be immobile. Workers stay in places where opportunities are slim and wages weak. Family connections and housing

commitments, among other factors, can prevent the idealized free movement of workers. Land or natural resources are in many cases quite locally fixed. For example, space is in demand in Tokyo (where rents are among the highest in the world) but there's little prospect of actually adding more land. Thus, when factors are immobile, market theory becomes more complicated and less easily applicable in all situations.

Inequality

Inequality in income may be a market failure itself. Does the free market allocate enough resources towards improving the lives of the world's poor? These children are working in the Stung Meanchey Dump in Cambodia.



While free markets reward the qualities of risk-taking, innovation, and entrepreneurship, they can also reward anti-competitive behaviour. Furthermore, the rewards vary dramatically depending on the nature of the opportunities being exploited. Because free markets can lead to significant inequality, some economists regard the problems associated with this as a market failure. The inequality created by free markets exists on the current income level as jobs are paid very differently. It also exists at the future opportunity level, where income disparities can lead (in purely free markets) to a block on educational and life opportunities for the youngest members of society, whose situations are dependent on the actions of their families. Governments can act to mitigate the effects of this inequality by redistribution of income through progressive taxes, the creation of welfare insurance for the unemployed, and government support for public and subsidized education.

Government failure or policy failure

Policy failure exists when government action to correct some form of market failure actually creates a worse set of negative outcomes. These outcomes may be a result of policies that have poorly designed incentives or unforeseen consequences, or may be a result of self-interested politics on the part of lawmakers. Examples of policy failure include 'logrolling', where lawmakers trade votes on policy rather than voting from conscience. Also included is 'crowding-out', where short-term expansionary fiscal policy leads to a reduction in the availability of future capital. Crowding-out is discussed in Chapter 17.

Short-termism

Short-termism is how the pursuit of rational short-term objectives can create long-term problems. Short-termism can exist in both the private and public sphere. For example, when corporate chief executive officers (CEOs) are rewarded on stock valuations, they are

encouraged to push for short-term results and perhaps distort those results at the expense of the long-term health of the firm. In similar fashion, politicians may be drawn to create policies for the purpose of election results. For example, the 'political business cycle' of fiscal policy occurs when governments spend and cut taxes for an immediate surge in economic activity and to encourage re-election voting. Over the long term, however, these results have opportunity costs in terms of foregone services or increased debt.

6.7

Asymmetric information and abuse of monopoly power (HL only)

Learning outcomes


- Explain, using examples, that market failure may occur when one party in an economic transaction (either the buyer or the seller) possesses more information than the other party.
- Evaluate possible government responses, including legislation, regulation and provision of information.
- Explain how monopoly power can create a welfare loss and is therefore a type of market failure.
- Discuss possible government responses, including legislation, regulation, nationalization and trade liberalization.


Asymmetric information


Market theory presupposes that all actors are in possession of the same, perfect levels of information regarding market transactions. All consumers, for instance, will know the variety of prices and quality levels available for a particular good. Of course, this is highly unlikely, as consumers are constrained by time and access to such information. Even in the digital information age, when far more information on any product is widely available, consumers make a decision about the opportunity cost of absorbing all the alternatives, and rarely possess anything close to perfect information. With this reality in mind, it is more than likely for consumers to make 'mistakes' regarding purchases, in pure market theory terms.

Today, consumers are also more likely to be subjected to sophisticated marketing techniques that aim to limit information and choice. Another variety of asymmetric information has one party in a transaction holding more information than the other party. For example, the seller of a plot of land might know that neighbouring land will be used for a chemical plant, while the buyer is ignorant of this information. The buyer will pay too much for the land – an example of market failure.

One particular form of information asymmetry occurs when individuals neglect to take full responsibility for their actions. Economists call this phenomenon a moral hazard, and have applied the term to a variety of unethical and criminal behaviours. When polluters dump waste into common resources like rivers, they shun their responsibility for the problems this may cause. In this way, a firm may be acting legally, but is using the absence of specific rules or lax enforcement to offload costs to innocent parties. The term has come back into use recently, during the crisis of 2008 and 2009, when describing the negligent actions of banks, bank regulators, investment bankers and the borrowing public.

 The financial crisis of 2008–09 may have been the result of market failure rooted in information asymmetry. The investment banks which created and sold the complex financial instruments at the heart of the crisis were careful not to convey all the information about the assets from which those instruments were assembled. For example, many of the bonds purchased by investors were rated as AAA (very safe), yet contained loans made to very-low-income households, whose lack of ability to repay should have been conveyed to the investors.

 To access Worksheet 6.2 on market failure, please visit www.pearsonbacconline.com and follow the onscreen instructions.

 To access Worksheet 6.3 on Wall Street and market failure, please visit www.pearsonbacconline.com and follow the onscreen instructions.

Potential solutions to asymmetric information

Legislation to punish 'insider' information use

Laws like this are difficult to enforce as they require proof of insider knowledge.

Active dissemination of information

The promotion of information attempts to fill the market gap and create more efficient outcomes. Some believe that the internet is the best means to address this gap in information and, with this in mind, the United Nations has proposed that internet access be considered a human right. In July 2010, Finland made broadband access a human right.

Monopoly power is the power of a firm to raise the price above the prices of competitors.

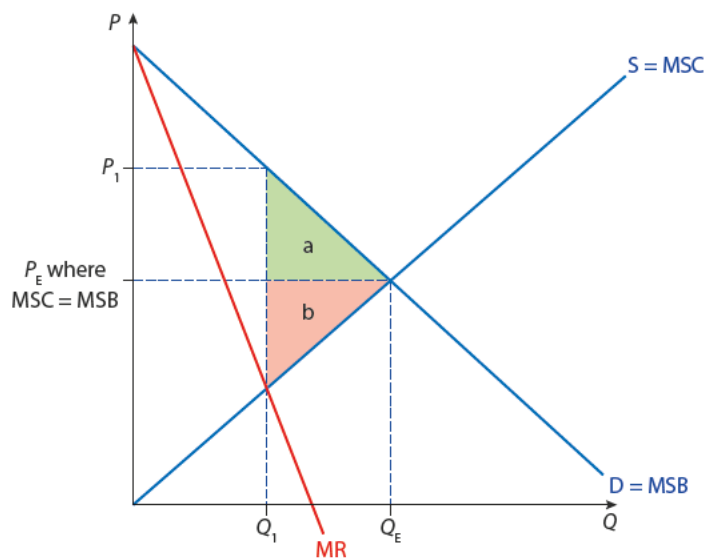


Monopoly power

Monopoly power exists where a firm is able to influence or increase the price they receive to a price above the competitive-market equilibrium. Monopolists and other imperfect competitors will restrict output to increase prices. As a result, they no longer produce where the market is socially efficient. Figure 6.14 demonstrates the effect of a monopolist's output decisions, compared to that of the competitive market.

Figure 6.14

Monopoly power may lead to less output and higher prices.



The monopolist produces less and charges a higher price. If the market were competitive, it would produce where supply and demand intersect, at Q_E and P_E , respectively. However, by producing at Q_1 , the monopolist does not produce the allocatively efficient output. It produces where the firm's marginal revenue (MR) equals marginal cost. Marginal revenue represents the benefit the firm receives from each additional unit of output. From the monopolist's perspective, this is a rational, profit-maximizing decision. Monopolies are discussed in more detail in Chapter 9.

But this is not where society's marginal benefit (MSB) is equal to marginal cost. This is not Pareto optimal, a problem which is demonstrated by the decreased community surplus represented by areas a and b. The decreased production from Q_E to Q_1 , compared to competitive market outcome of Q_1 , means that while the producer gains at the expense of the consumer, the overall community surplus decreases.



Potential solutions

Legislation

Governments can pass 'anti-trust' legislation aimed at preventing the market power from becoming concentrated in relatively few firms' hands. These laws specify the maximum percentages of the market to be controlled by one or a few firms. The legislation is enforced by preventing monopolistic mergers or by breaking up companies that the courts deem too dominant.

Regulation

Governments may choose to monitor and control monopolies with regulatory agencies. Such government agencies track the pricing and production decisions of the firm. For the public interest, the agencies may have some power to enact or recommend changes in the firm's behaviour – for example, by setting prices for the firm.

Natural monopolies

Natural monopolies are granted in some industries because they keep costs lower than a competitive market would. Public utilities of water and power are two examples. However, the market may still under-produce the good for the profit maximization reasons. Governments can address this with a subsidy to increase production, and move output to a more optimal quantity. Remember that the purpose of such monopolies is to provide a necessity good to the public, so a subsidy to encourage production is a logical choice.

PRACTICE QUESTIONS

- 1**
 - a** Using an appropriate diagram, explain how negative externalities are a type of market failure. [10 marks] [AO2], [AO4]
 - b** Evaluate the measures that a government might adopt to correct market failure arising from negative externalities. [15 marks] [AO3]
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- 2**
 - a** What are positive externalities and how do they arise? Illustrate your answer with examples. (10 marks) [AO2], [AO4]
 - b** To what extent should governments attempt to influence markets where positive externalities exist? (15 marks) [AO3]
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- 3** 'National policies and international agreements must be implemented in order to reduce global environmental problems.'
 - a** Using the concept of market failure, explain the statement above from an economist's point of view. (10 marks) [AO2], [AO4]
 - b** With reference to both national policies and international agreements, discuss three solutions that could be recommended by economists. (15 marks) [AO3]
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To access Quiz 6, an interactive, multiple-choice quiz on this chapter, please visit www.pearsonbacconline.com and follow the onscreen instructions.