Module 6 The economics of climate change

MARKETS & MARKET FAILURE

Sometimes markets work well and other times they do not. In the case of climate change they are failing. To address the economics of climate change therefore we first need to understand how markets work and why they fail.

Markets group together buyers and sellers of particular goods or services. When they are working well they allocate resources such as labour, land and natural resources to their best or most efficient use. Markets then produce the optimum amount of each good or service.

However, when markets do not work well government may intervene with policies that make the markets work more efficiently. (Governments may also intervene to make markets fairer, but we are not concerned with that here.)

There are several possible causes of **market failure** including:

1. **Market power:** Here, one or a small number of companies dominates the market for a product and can manipulate its price. For example, in Australia in 2007 card-board manufacturer Visy was heavily fined for engaging in collusion when it agreed to fix prices with the other major producer, Amcor. Consumers had been paying more than they should have, generating excess profits for the card-board manufacturers; and

2. **Externalities:** An externality is the impact of one person's activities on a bystander or third party. For example, if a chemical factory pollutes a river damaging the fish stocks then the effect on the livelihoods of those in the fishing industry downstream is called an externality or an external effect of making the chemicals. If people drink the water and become sick that too is an external effect.

In the case of climate change, greenhouse gas emissions are an external effect of a range of activities that involve burning fossil fuels. These include burning coal to generate electricity, burning petrol to power cars, producing food and disposing of waste. This is because the carbon dioxide and other greenhouse gases emitted into the atmosphere cause, or will cause, damage to other people – i.e. other than those who consume the electricity, transport services or food from these activities (although they too will be affected by climate change). For example, people in poor countries will suffer most of the negative effects of industrial activities in rich countries.

Climate change… is the greatest and widest-ranging market failure ever seen

Stern Review: The Economics of Climate Change, 2007

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Although there are examples of **positive externalities** (benefits to third parties) most externalities are **negative**. In this case the costs to society of the activity are greater than the costs to the private producer responsible for the pollution. In other words, the **social costs** (the damage to the fish stock and drinking water) exceed the **private costs**. If the polluter had to pay for the impacts of the pollution on other parties then less pollution would be produced.

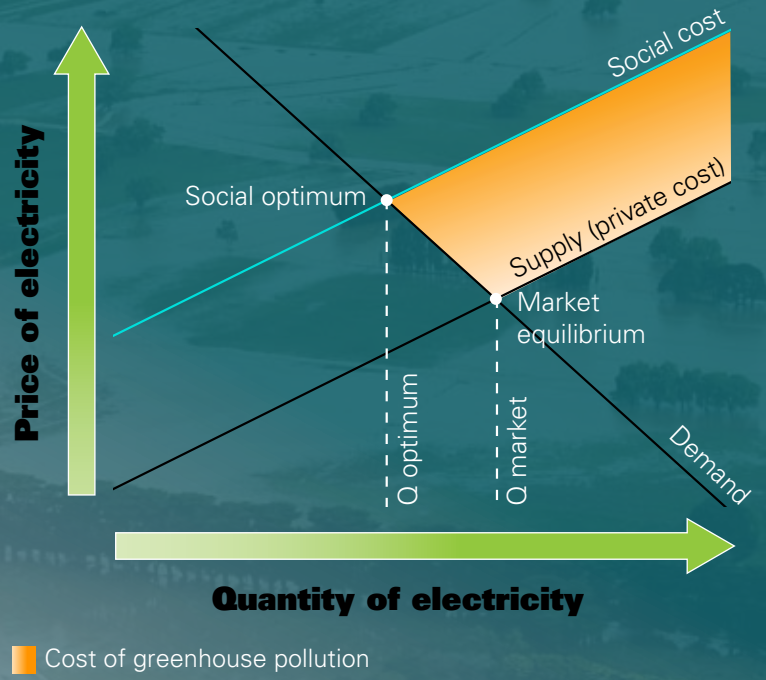
This is illustrated in **Figure 1**. The private cost of generating electricity from coal is the supply curve, which slopes upward. Taking account of the damage from greenhouse gases emitted when coal is burned, the cost to society is higher for any quantity of electricity generated.

With the demand curve as shown, it is apparent that the amount of electricity produced at the market equilibrium is greater than the optimum that should be produced when account is taken of all costs.

Free riding is a concept often related to positive externalities. A free rider is a person who derives a benefit from an activity without having to pay for it. Thus if any country refuses to join global efforts to cut greenhouse gas emissions, then it will enjoy the benefits from reduced global greenhouse pollution without playing its part to cut global emissions. Free riding usually causes resentment.

The reason that emission of greenhouse gases is an externality is that emitting them into the atmosphere is costless to the polluter, i.e. those responsible do not have to pay for the damage. The situation is different with other forms of air pollution. For example, in the United States power companies have to buy permits to emit sulphur dioxide into the atmosphere. Similarly, in Australia certain forms of air pollution are limited by regulation. This imposes an implicit cost because factories have to find ways to limit the amount they emit.

Figure 1 Greenhouse pollution and the social optimum



If there is no price on emitting greenhouse gases into the atmosphere, there is no incentive for polluters to cut back on their emissions. If polluters have to buy a permit to emit or meet legally enforced limits then reducing their pollution becomes one of their costs of production. So one policy approach is to somehow impose a price on greenhouse gas emissions.

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CLIMATE CHANGE & MARKET FAILURE

Considered economically, climate change can be understood as a form of market failure associated with greenhouse gas pollution because the climate change that follows imposes costs on all people (not just the polluters). These costs include damage to their health (for example, from the spread of diseases like malaria to new areas), insurance costs (to protect against increased flooding) or the costs of 'climate-proofing' our homes as the world gets hotter.

There are some unique features to climate change as an externality.

1 **It crosses international borders**. The greenhouse gases emitted in Australia today will be spread around the globe within a few days, so what we do here will affect people in other countries even if they were responsible for zero emissions themselves.

2 **The impacts are long-term and persistent.** Greenhouse gases stay in the atmosphere for hundreds of years, so the pollution we cause now will affect the climate for centuries.

3 **There are uncertainties.** While the connection between a factory polluting a river and dead fish is usually pretty obvious, the effects of increased greenhouse gases in the atmosphere are still uncertain. For example, some scientists believe that sea levels will rise by less than half a metre before the end of the century, others think there is a good chance that seas will rise by several metres.

4 **Effects may be large and irreversible.** In most cases of externalities, increasing the level of pollution increases the negative impacts proportionately. In the case of climate change there may be sudden leaps (known as 'non-marginal changes' in economics or 'non-linear effects' in science). For example, if the Greenland ice sheet melts quickly, sea-levels could rise by several metres. If this happens there is no going back; it may take thousands of years for the seas to revert to their 'normal' levels.

Pasterze Glaicer, Austria, in 1875 (above) and same location 2004
1875 photo courtesy of H. Slupetzky University of Selzberg

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ECONOMIC RESPONSES

We can't stop greenhouse pollution overnight, but we have to reduce it to a manageable level. Reducing emissions by replacing coal-fired power plants with wind power or switching to more fuel-efficient cars often comes at a cost. (Some measures, such as home insulation, are actually economically beneficial.) These are known as **the costs of abatement**.

As a rule, initially the costs of abatement are low – that's when we 'pick the low-hanging fruit'. But the more we want to cut our emissions the more expensive it will be to do so. In the other words, the marginal (or additional) cost of abatement increases.

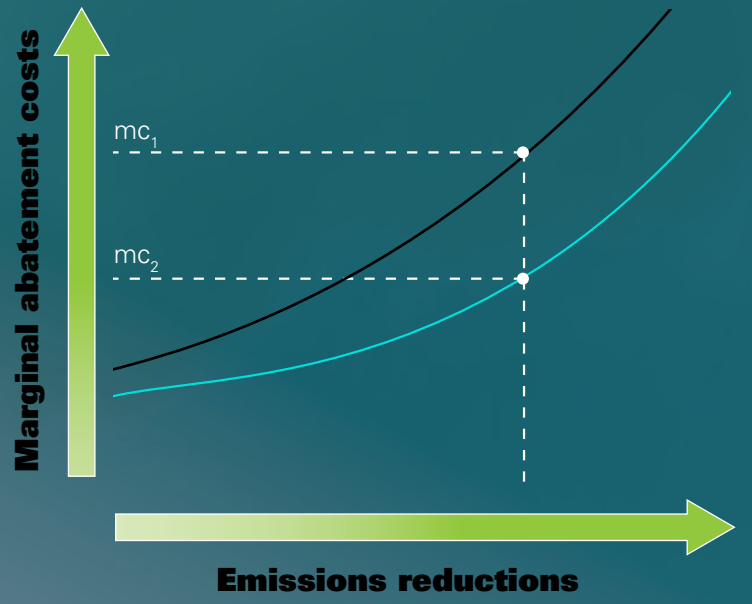
This is shown in **Figure 2**. As the amount of abatement increases along the horizontal axis, the marginal cost of abatement rises. But as new technology is developed that makes it cheaper to reduce emissions then the same amount of abatement can be had at a lower cost. So the marginal cost of the abatement curve is lowered.

Obviously, although the costs of abatement are going up so are the benefits because the more we reduce global emissions the less climate change we will experience.

So the optimum level of greenhouse gas emissions occurs when the cost of further abatement is equal to the additional benefit from reducing emissions. But because there is so much uncertainty about the potential damage from climate change, finding this optimum is difficult. The precautionary principle (defined in **Module 5**) suggests that we should aim to err on the side of caution and aim for deeper cuts in emissions over time.

As we impose limits on greenhouse gas emissions, the market will be working to make it cheaper to cut them even further. This is because as the cost of polluting goes up there will be incentives to find ways to reduce pollution more cheaply. This will make new technologies more attractive.

Figure 2 The marginal cost of abatement



Technical progress in abatement lowers the marginal cost curve

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ECONOMIC SOLUTIONS

If greenhouse pollution is an externality because the polluter is imposing costs on others, then the answer is to '**internalise**' the costs of the pollution; in other words, to bring it back in to the process of economic calculation. Emitting greenhouse gases then becomes a production cost for the polluter. There will be an incentive to reduce pollution and the more expensive it is to pollute the greater the incentive to cut back on emissions.

The policies by which this can be achieved include **carbon taxes** and emissions trading systems. These are described in **Module 8**, *Solutions to Reduce Australia's Emissions*.

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STUDENT ACTIVITIES

Comprehension Questions

- What is market failure?
- What causes market failure?

Analysis Questions

- Give an example of a positive externality and a negative externality. In each case, explain why the market does not bring about an efficient outcome.
- Give an example of free riding. Is it fair? How could it be prevented? Could it be solved by the government providing the good or service in question?

Exercise 1

- Draw a curve illustrating the marginal cost of abatement.

Exercise 2

- In 2003 the **NSW Greenhouse Gas Reduction Scheme** came into operation. It works as an emissions trading scheme for stationary energy producers in NSW, and since 2005 for those in the ACT as well.

  Explain how this scheme works to address the market failure associated with greenhouse gas emissions.