

Emissions trading/Tradable pollution permits

The objective is to get students to understand why an emissions trading scheme can be an effective way of reducing emissions, superior in some ways to carbon taxes or quotas.

It is important to get students to understand a broad outline of what is going on, and this can probably be best achieved via an example led from the front. Generally I choose two students and get the rest of the class to imagine one of them as a chain of power stations and the other as a chain of supermarkets. I then ask which of the two is likely to find it easier to reduce CO₂ emissions. It doesn't really matter what the answer is (although in my mind I figure the supermarkets would find it easier through better insulation, sourcing etc.).

I then ask them to imagine that we asked each of them to cut their emissions by half. What would the problem be? They can spot quite easily that the power stations are going to be in trouble. I then ask – would it be ok for the power station to pay the supermarkets to cut pollution for them. Would the government mind? Generally they are all happy that this seems fair enough. Then you can ask whether this sounds broadly sensible and they will tend to agree. At this stage, you can sum up with them what has happened in this simple example. Hopefully, some of the group will have pointed out that in reality it may be hard for firms to match up with one another. This leads into:

http://www.youtube.com/watch?v=y7veRksc_Yk

This was made at the start of the European emissions trading scheme and although biased (and obviously a bit dated) it gives a really clear run-through of how the scheme works and some of the pitfalls.

After this, you can turn to an exercise which highlights the theoretical benefits (Appendix 1). Divide the students into pairs and run through the start of this exercise with them, so that everyone is clear what is going on. You can do this exercise in two stages:

Stage 1: everyone works out the cost of reducing pollution using a quota.

Stage 2: (explain that in the simple world of the model firms can cut CO₂ to zero if they want). Explain that the price of a permit has been set for simplicity and ask them to work out:

1. who will want to buy permits and who will want to sell;
2. what the total new costs of reducing pollution will be to those who cut (ignore profits on trading).

This is much lower than the cost of reducing pollution using a quota, showing that the pollution has been cut in the most efficient way (question 3 of the exercise).

You can put the calculations up on the board.

Finally ask them (still in their pairs) to come up with:

1. a summary of how these schemes work – key features etc.;
2. the main benefits and costs (as they see it) of trying to reduce emissions in this way.

You can then get pairs to feed back their findings to the group and write them up on the board as they emerge.

See Appendix 2 for answers and suggested points.

Appendix 1

Emissions trading exercise

Imagine a country had five major power plants operating with the following emissions:

	A	B	C	D	E	Total
Current emissions (tonnes of Co₂)	800	2000	2000	700	1500	7000
Cost of reducing emissions by 1 tonne	£1	£1.50	£0.80	£0.50	£2	
New emissions						
Cost of reduction						

The government has a target of reducing emissions by 50%. One way of doing this would be to insist that all operators reduce their emissions by half.

1. Calculate the costs of emissions reduction under this method.
2. Suppose instead that each firm is issued with a permit to emit CO₂, and that each firm is given a total number of permits equal to 50% of their current emissions levels (therefore firm A would have 400 permits, allowing it to emit 400 tonnes of CO₂). Firms may either buy permits or sell surplus permits that they do not need – the government sets the price at £1.25 per permit.
 - (a) How much pollution will each firm make under this scenario?
 - (b) What is the cost of pollution reduction (assuming that the permit scheme itself has no cost)?
3. You should find that the costs of emissions reduction in the second case is lower. Why is this?

Appendix 2: Answers

Quota scheme (all cut):

	A	B	C	D	E	Total
Current emissions (tonnes of Co₂)	800	2000	2000	700	1500	7000
Cost of reducing emissions by 1 tonne	£1	£1.50	£0.80	£0.50	£2	
New emissions	400	1000	1000	350	750	3500
Cost of reduction	£400	£1500	£800	£175	£1500	£4375

Permits scheme:

A, C and D will cut because they can reduce CO₂ for less than £1.25 per unit and then sell permits to B and E who would prefer to buy permits for £1.25 than to reduce emissions themselves at the higher cost of £1.50 and £2/tonne respectively).

	A	B	C	D	E	Total
Current emissions (tonnes of Co₂)	800	2000	2000	700	1500	7000
Cost of reducing emissions by 1 tonne	£1	£1.50	£0.80	£0.50	£2	
New emissions	0	2000	0	0	1500	3500
Cost of reduction	£800 (800*£1)		£1600 (2000*£0.80)	£350 (700*£0.50)		£2750

Therefore total emissions have been reduced by the same as under the quota scheme, but the cost of resources used to do so is much lower (£2750 vs. £4375) – the economic damage is much less.

How the scheme works:

The government imposes a cap on emissions and then sells or allocates permits to firms relative to their existing emissions/size – big firms get more permits, small firms get fewer. These permits can gradually be reduced in number over time.

Laws are passed which mean that either you have as many permits as your pollution or you pay a huge fine (so large that nobody would be prepared to pay it). Therefore firms have three choices:

- cut pollution to the level of their permits;
- cut pollution below the level of their permits and sell surplus permits on the market;
- don't cut pollution and buy permits from the market.

Therefore a market needs to be created and an enforcement mechanism needs to be in place.

Main costs and benefits:

Benefits

Firms are made to pay for the pollution that they create – this internalises the external cost, and should help to reduce the output of polluting good closer to the socially optimal level.

All firms have an incentive to cut. Those who find it easy have an incentive to cut more in order to be able to sell permits for a profit. Those who find it hard have an incentive to at least implement quick wins so that they need to buy fewer permits.

Pollution will be cut in the most efficient way. Firms that find it easy to cut emissions will do so, those that find it hard effectively pay other firms to do it for them. Therefore the emissions target is hit with the least amount of economic damage.

However

There is the risk of government failure – from the video, the early stages of the ETS got the permits wrong and price was far too low. Also there are heavy administration and bureaucracy costs from establishing the scheme and enforcing it.

This needs to be global or firms will simply relocate to countries outside of the scheme, meaning lots of bureaucracy but no actual reduction in emissions globally.

In the case of some pollutants (such as SO₂) the risk of localised pollution remains if heavy industries are regionally agglomerated.

There are risks of corruption – problems have plagued the ETS.