Paying for hot air?

Market failure in emissions trading

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The UK Government is launching a CO_2 allowance trading scheme, and aims to reduce emissions by buying out some of the allowances. Economic theory strongly suggests that trading is more effective and cost-efficient than a system of fixed limits. Theory is backed up by evidence of the success of SO_2 emissions trading in the U.S.A. However, the American experience also shows that the benefits of trading are reduced if participants can "game" the system by selling rights that they had no intention of using. The British Government is in danger of spending over £200 million of taxpayers' money on "hot air".

Emissions trading is an emotive issue, which has bedevilled the global debate on climate change. Most economists see it as an efficient way of achieving targets for emissions reductions, while green activists see it as a way of allowing the rich to go on polluting the planet. This difference of opinion may be philosophical, with one side viewing environmental damage as a practical problem while the other sees it as a moral issue. But debate is hampered by a lack of real knowledge about the design of good emissions-trading systems - which perhaps explains why there is greater awareness of the problems caused by badly- designed ones.

The Kyoto framework allows a limited degree of trading of greenhouse gas emissions permits between governments, while the British scheme provides for the trading of allowances between individual polluters. Both schemes are likely to be improvements on traditional reduction programmes, but also contain loopholes.

Diluting acid emissions

While emissions trading in greenhouse gases is new, schemes for trading "acid emissions" have been around for some time. Sulphur is present in coal (and fuel oil). When the coal is burnt (mainly in power stations), sulphur is oxidised to form SO_2, which is released into the atmosphere as waste gases. The SO_2 can combine with water in the upper atmosphere to form H_2SO_3 and H_2SO_4 (sulphurous and sulphuric acid), which falls as "acid rain".

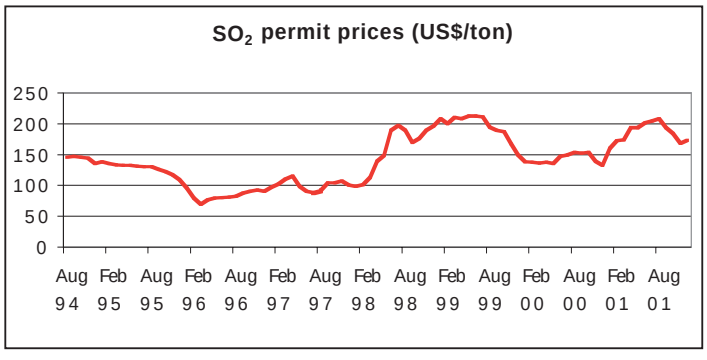
Many things can be done to reduce the effects of acid rain. Most obviously, machinery to remove the SO_2 from waste gases can be fitted to power station chimneys (flue gas desulphurisation, or FGD). However, there are alternatives to simply "cleaning up". Coal-fired stations could be switched out of baseload power generation to provide electricity only for brief peaks; a power station could switch to lower-sulphur coal or a completely different fuel; and new power stations using gas or other zero-sulphur fuels could replace existing coal-fired capacity. Finally, of course, the use of electricity could be reduced. None of these changes, however, will take place unless government creates the appropriate incentives

For SO_2 reduction, the traditional approach to pollution control was to set a fixed limit on each plant. This was inefficient, in two ways. Firstly, when a plant has reduced emissions below the limit, it has no incentive to go further. Secondly, different plants face different costs of emissions reduction, so it is highly unlikely that the lowest-cost way of reducing emissions would be for all plants to reduce emissions by (or to) identical targets.

A system of tradable permits offers one solution[1]. Suppose the Government gives all plants emissions allowances, but allows them to trade these permits. If it is cheaper for one plant to cut emissions than for another, the amount that the owner of the plant with high emissions costs would save by trading exceeds the additional cost that the other plant would incur, and so both have an incentive to trade. Emissions would be reduced to the official limit, but without Government restrictions on how that target is reached.

Such a system has been applied successfully in the United States, under the Acid Rain Program of the 1990 Clean Air Act. In the legislative debate, it was suggested that – using traditional abatement measures - it would cost industry as a whole some $400-$1,000 per ton to reduce SO_2 to the target level. Instead, trading was permitted, allowing the market to find its own solutions.

The price of a permit to emit an additional ton of SO_2 is a good measure of the cost of SO_2 abatement, since a polluter always faces a choice between paying to reduce emissions and paying for a permit. Prices have fluctuated between $70 and $200 a ton, about a fifth of the expected cost (even less, after allowing for inflation).



Source: Cantor Fitzgerald market data, cited by EPA

Most of the cost reduction arises from the use of low-sulphur Wisconsin coal, instead of the expected widespread adoption of FGD. So this scheme has been criticised as too soft on polluters. The fact that the market has achieved emissions reduction more cheaply than expected should be seen as a good, not a bad, outcome. Plainly, the Government could have achieved a still tougher target, if the initial assumption of a cost of $400-$1000 was considered acceptable. But the conclusion must be that Governments should have more faith in the market's ability to control pollution, not less.

This scheme did, however, have a number of flaws. In particular, while participation was mandatory for larger

1 The other is an emissions tax. The two are very similar. Tradable permits achieve a known emissions target at an uncertain price; taxes result in uncertain emissions reductions for a known price.

2 http://www.epa.gov/airmarkt/trading/so2market/prices.html

plants, smaller plants could opt in. On the face of it, this looks sensible – if the scheme is a success, why not extend it? The problem is one of adverse selection (the Groucho Marx problem – never join a club that would accept you). Why should a small plant join the programme? It will be profitable to do so if its owner expects its emission reduction costs to be lower than the expected permit costs – since then it can profit by reducing emissions and selling permits. However, there are many plants whose expected emissions reduction costs are zero: those planning to reduce production. If the owners of small plants can choose whether to participate, only those whose plants can be expected to reduce emissions will opt in. The price of permits – and therefore the incentive to reduce emissions – is driven down without much net reduction in overall emissions from small plants[3].

Carbon trading: Kyoto, Marrakesh and Defra

The Kyoto mechanism for greenhouse gas reduction suffers from a similar problem. Participating countries are committed to targets based on 1990 levels of emissions. Most countries in the former Soviet Union have already achieved emissions reductions well in excess of requirements, as a result of the collapse of Soviet-era heavy industry.

In a system without trading, they would make no more reductions, while Western participants would have to reduce emissions to their own targets. In a system with trading, Western countries can buy the Eastern countries' unused emissions rights rather than reduce their own pollution. Thus, the existence of these unused tradable rights ("hot air") implies that Kyoto participants collectively will not reduce emissions below current levels by anything like the amount implied by the stated targets.

This feature of the agreement has led to vigorous criticism of the concept of tradable rights. However, the real cause of the problem is not the tradability of permits but the decision to make the targets dependent on 1990 emissions levels.

The UK Government's Department for the Environment, Food, and Rural Affairs (Defra) has been setting up a scheme for greenhouse gas emissions trading within the UK . Large producers of CO_2 and other greenhouse gases will be able to trade emissions rights. Of course, such rights only have value if there is a penalty for not possessing them. In general, anyone in the UK can emit CO_2 without penalty, so why will tradable permits have a value? The Government has created this value in two ways:

- Some large producers have signed up to "Climate Change Targets", committing them to annual emissions reductions in exchange for reductions in the climate change levy.
- More radically, the Government intends to create value by buying emission rights. Any business (except power generators) will be able to offer a planned emissions reduction, over five years, in return for Government cash. This exchange will take the form of an auction, in which participants compete in offering reductions in exchange for Government subsidy.

In both cases, companies are committed to targets (in that they will incur costs if they do not meet them). Consequently, they have a real interest either in obtaining more permits to ease those constraints, or in selling excess permits should they beat the targets. Through legislation, and an auction, the Government will have created the possibility of a market where none previously existed.

The worrying feature of this imaginative scheme, however, is its potential for adverse selection because of the voluntary nature of the auction. Just like the US scheme to extend SO_2 permit trading to smaller plants, the scheme would allow owners of plants scheduled to reduce output, or improve efficiency, to earn additional revenue. Those plants expected to increase CO_2 emissions would simply not take part. A fixed amount of government money (£215 million over five years) is on offer. If there is adverse selection - as in the US - the auction will result in very large committed emissions reductions and low permit prices. If this just represents reductions that would have been made in any case, however, the net effect on total national emissions will be much less, possibly even nil.

The designers of the auction are aware of this loophole and have attempted partially to close it. Detailed audits are required of participants in the scheme, to ensure that they are not simply obtaining cash by – for example – including plants scheduled for closure. Rules also cover treatment of multi-plant commitments, transfers of ownership, detailed measurements of emissions and so on.

However, the monitoring arrangements to prevent "gaming" in the scheme have all the appearance of a sequence of interventions to patch up problems as they occurred to Defra and its advisers, adding to the complexity of the system. A poor trade-off between the effectiveness of a scheme and the cost of monitoring it is usually the hallmark of bad design. In this case, the rules appear to be perhaps excessively restrictive; at best, bureaucratic, at worst ineffective or even counter-productive. After all, it might be entirely appropriate (and efficient) to grant emission credits for a closing plant, if it would otherwise have remained open. Most worryingly, perhaps, there is no clear way of measuring the success of the scheme, since there is no definition of "what would otherwise have happened" – a tricky concept to pin down, but one that is essential to a cost-benefit analysis of any regulatory system.

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3 An econometric analysis concluded that "the most powerful inducement to participate was an allocation of allowances above counterfactual emissions", confirming the adverse selection problem (Ellerman, Joskow, Schmalensee, Montero and Baliey, Markets for Clean Air, Cambridge University Press, 2000).

4 http://www.defra.gov.uk/environment/climatechange/trading/index.htm