Carbon Emissions Trading and the Stern Review

<u>Emission trading</u> is regarded by many as the future of <u>environmental</u> protection and improvement in the UK, European and international economy. <u>Carbon trading</u> is another form of pollution control that uses the market mechanism to change relative prices and the incentives of producers and consumers. There is also growing interest in the idea of <u>personal carbon trading</u>, the UK government is currently <u>looking at the issue</u>.

The basics of cap and trade - emissions trading

- 1. A fixed number of emission permits is allocated each year to polluting factories
- 2. Usual denomination: 1 permit = 1 tonne (e.g. of CO2 emissions)
- 3. Total number of permits is the limit on pollution "the cap"
- 4. Annual emissions of each factory must be less than or equal to permit holdings
- 5. Permits can be traded i.e. "cap and trade"
- 6. Factories which can reduce (abate) pollution for less than the price of a permit can sell spare ones for a profit
- 7. Factories which find it more expensive to reduce pollution can buy extra permits instead
- 8. Gradually the supply of permits is reduced the market price rises. This gives firms who find it expensive to cut pollution, more of an incentive to seek new technologies / process that will reduce their pollution emissions

A marketable pollution permit gives a business the right to emit a given volume of waste or pollution into the environment. Ideally, the number of permits that are issued corresponds with the total level of pollution that is admissible at the social optimum level of output i.e. where the MSB = MSC. Once this has been determined the permits are issued by auction and firms that pollute the environment can bid for them and then buy and sell them amongst themselves.

Pollution permits should, in theory, give firms an incentive to control pollution emissions for less than it would cost to buy permits, and there is evidence from "cap and trade" pollution permit schemes in the UK and the United States that the costs of monitoring pollution reduction and



administration of the permits system is smaller than when an industry is subject to direct regulation. In the United States cap and trade scheme, it was found that many high-polluting businesses invested in fitting new pollution control equipment (e.g. Flue Gas Desulphurisation) and other polluters switched from high to low sulphur coal.

Consequently the use of marketable permits allows the cost of pollution control to be minimised. Another advantage is that the revenue from a traded pollution permits scheme can be re-cycled into other schemes for <u>environmental</u> improvement.

Incentives matter – create a market in the "right to pollute" - The basic idea behind traded pollution permits is to through the incentive to cut pollution directly to the producers themselves. Companies can then make their own decisions about the costs and benefits to them of

particular routes to emission reductions. In other words, market forces are brought to bear on the issue of pollution and potential market failure.

Emission trading is likely to be most effective when

- 1. There is an easily measurable pollutant
- 2. The government sets a clearly defined and stable emissions target
- 3. There are a large number of participant firms, with companies sufficiently sophisticated to deal with the technicalities of trading at auction
- 4. Wide variation in costs of reducing pollution so that trading of surplus permits can take place
- 5. The transactions costs of trading permits are low and there is clear pollution data availability at the start and during trading
- 6. Strict enforcement of permits (i.e. a high compliance rate among participating businesses)

Carbon trading and government failure

The EU's flagship carbon trading scheme may be failing to achieve the objectives set for it. Coal production is on the increase in the UK and around Europe. But this is the sort of thing that isn't supposed to be happening! Even with the potential for clean coal technology, it is widely regarded as a dirty source of energy and a major contributor to C02 emissions. Why are the power stations turning back to coal? Because the price of carbon emissions is low and coal has become price competitive against oil and gas.

Europe's carbon trading scheme started in January 2005 with carbon allowances being bought and sold. The largest C02 emitters were brought into the cap and trade system. The cap places a limit on the total pot of emissions that can be released by industry - the aim is to progressively reduce this cap over time and therefore mitigate <u>climate change</u>. The original caps set by the EU are now seen as being set way too high and some people believe that this was not an accident, companies and businesses may have been deliberately given more allowances than they needed, creating surplus permits that could be profitably sold onto to other businesses.

Carbon Trade Watch believe that the EU has been captured by strong corporate lobbying who themselves knowingly over-estimated their "business as usual" C02 emissions when they submitted them to national governments ahead of the launch of the carbon trading scheme. The surplus of C02 emission allowances has meant that scarcity in the market has disappeared leading to a collapse in the price of carbon - prices now are 20-30 Euro cents, effectively the price of polluting is close to zero. The market thus provides little incentive for businesses to invest money in reducing their emissions.

For firms with plenty of surplus C02 emissions (given away free of charge in the first place!) there has been a huge windfall gain. "Polluter pays" seems to have been replaced with "polluter earns"! The major power generators have been given a free block of pollution rights which they can then sell onto the market and make a profit. DEFRA, the UK environment agency has estimated that the windfall profits for the electricity generators in the UK might have been as high as £1.5bn.

One criticism of the EU carbon trading scheme is that the EU allocated initial allowances free rather than using a market-based auction system.

As coal production expands, so C02 emissions are rising, and the power stations have to buy extra emissions credits, but the price of credits is low so the consequences for the power generators are not significant. Emissions from coal fired power stations in the UK in 2006 alone increased by 8%! Consumers are paying the price of higher energy bills but they are not getting

the environmental pay off in terms of reducing carbon production as a contribution to controlling climate change.

Adapted from Economics in the News, Tutor2u, June 2007

Mini Case Study: Drax feels the heat of rising carbon prices

It is impossible to miss - the giant <u>Drax coal-fired power station</u> that straddles the A1 near Ferrybridge in Yorkshire and dominates the landscape for miles around is the largest in Western Europe and supplies about 7 per cent of the UK's electricity. Of course generating electricity from coal necessitates plenty of carbon emissions - figures show that every six months Drax creates nearly 10 million tonnes of CO2 and, under the terms of the EU's carbon trading scheme, it must not only pay for coal but also purchase emission allowances. It has announced that the combined cost of coal and CO2 permits has nearly doubled over the last year from £222m to £413m.

Drax was given fewer 'free' emissions allowances this year and it has had to go to the carbon market and purchase permits to emit 6.5m tonnes of CO2, compared with just 3.6m tonnes last year. At the same time the market price of carbon has risen from £3 to £16.50.

Putting a price on carbon is a **market-based strategy** designed to change the **incentives** for polluting businesses. If carbon trading works, it ought to provide - over time - an incentive for polluters to invest in more **pollution efficient production processes and technology**.

There is some evidence that Drax is rising to the challenge - in recent months the business says that it has refitted turbines to make its generators more efficient and also taken steps to increase its 'co-firing capacity' a process that allows the power station to burning **organic matter** such as pellets made from straw to create power in alliance with coal. Their **capital investment** programme is scheduled to be worth over £40m this year.

For Drax the key to operating a profitable power station is to charge a higher price to its customers than the cost of generating the electricity. Their half year financial statement offers a window on the challenges facing the business. In the six months to the end of June 2008 the figures were as follows:

- Average achieved price charged to electricity buyers = £53.6p per mega watt (11% higher than at the same time last year)
- Average fuel cost (excluding CO2 allowances) = £23.6/MWh (34% higher than at the same time last year)
- Average fuel cost (including CO2 allowances) = £31.8/MWh (72% higher than at the same time last year)

Unit costs have risen much more quickly than the final output price leading to a reduction in operating profits. Drax has been hit hard by the surging price of coal on world markets - a tonne of coal was selling for \$218 in June 2008 - driven higher by the inability of countries such as South Africa to expand production sufficiently quickly to meet strong demand from China, India and many other emerging market countries.

Source: Tutor2u Blog, August 2008

Kyoto

Emission trading was a key feature of the <u>Kyoto Protocol</u> as a strategy to address some of the threats posed by <u>climate change</u> in 1997. Kyoto allows trading of permits for carbon dioxide between industrialised countries but the United States withdrew from the agreement in 2001 and since the USA represents 32% of emissions amongst developed countries with emission

targets, the absence of the USA from an embryonic trading system will seriously reduce demand for permits and therefore drive down their price and effectiveness.

Pollution regulation

Instead of relying on intervention in the market mechanism by using taxation, subsidies or pollution permits, the government and its appointed agencies can regulate the level of output and pollution in a market. In theory, the government could set a quota so that output is set at the social optimum. More frequently, **minimum or environmental / emission standards** are widespread in many industries. This requires **regulatory bodies** to monitor (inspect) and fine firms that do not meet the standards set for water and air quality. The 1989 Environmental Protection Act for set standards on emissions for firms that carried out chemical processes, waste incineration and oil refining.

Compliance with <u>environmental</u> regulations can be very costly to enforce and it may be impossible to monitor all firms accurately because of **imperfect information**. Regulation also does not bring in any direct tax revenue flows that can be used to fund environmental improvement schemes or compensate those who have been negatively affected by pollution.

The Stern Review on Climate Change

The <u>Stern Review</u> is an important piece of work despite it having come under attack from various quarters. It is a report that calls for action – so called **mitigation policies** – to reduce carbon emissions now to first stabilise and then reduce the effects of climate change.

Selected quotes from Sir Nick Stern

"Global warming is the greatest market failure that the world has ever seen."

"What is going to happen to our climate in the next twenty or thirty years is already determined."

"The physical geography of the world transforms the human geography of the world."

The Stern Review concludes that the social cost of carbon today, if the world continues to travel along a 'business as usual' path, is much higher than the very low (and possibly zero) marginal costs of undertaking the cheapest forms of mitigation now. It rationalises the case for **action now** including the case for deep cuts in carbon emissions. Societies that choose to behave myopically often shorten their expected lifetimes!

No laissez-faire solution

"The economics of climate change has the economics of risk and uncertainty at its core. The unmitigated accumulation of greenhouse gases in the atmosphere poses ever-greater risks, and the policy challenge is to find the most cost-effective, efficient and equitable way to reduce the risks. It is worth re-emphasising that the problem is not going to be solved without international collective action: there is no laissez-faire solution.

Source: <u>http://www.hm-treasury.gov.uk/media/B6F/58/paper_a.pdf</u>

According to the <u>Stern Review</u>, "The world is already <u>irrevocably committed</u> to further climate changes, which will lead to adverse impacts in many areas. Global temperatures, and therefore the severity of impacts, will continue to rise unless the **stock of greenhouse gases is stabilised**. Urgent action is now required to prevent temperatures rising to even higher levels,

lowering the risks of impacts that could otherwise seriously threaten lives and livelihoods worldwide."

A Question of Risk

<u>Environmental</u> policy is basically about the **economics of risk** – we are dealing with <u>very long</u> <u>time horizons</u> and there are many uncertainties involved when modelling the effects of <u>climate</u> <u>change</u>

Externalities

Global warming is an **externality** pure and simple. It does not matter who creates the CO2 greenhouse gases, a tonne of Co2 is a tonne of Co2. But the effects on the physical and human geography of the world are **not equitable**. Indeed Stern talks of a **double inequity**, 75% of emissions come from the rich advanced nations, but the consequences of global warming will fall disproportionately on the poorer nations, many of whom lack the resources to adapt to some of the effects.

Measuring the **social cost of carbon** (SCC) social cost = private cost + external cost – the Stern Review calculates the social cost of carbon to be \$85 per tonne of CO2 and that this figure rises over time. However, strong and effective mitigation policies can reduce the SCC to around \$25-\$35 per tonne of CO2

Pollution abatement – not a free lunch

<u>Emissions</u> reduction is <u>not a zero cost option</u> – we use the concept of **marginal abatement cost** – i.e. the cost of reducing emissions by one tonne– acting now to cut emissions effectively imposes a cost on current generations – that cost can be expressed in terms of lost growth through higher prices.

The <u>Stern Review</u> estimates that the cost of reducing CO2 emissions along a path consistent with stabilising the concentration of CO2 will be in the region of 1% of GDP by the middle of this century - global GDP is likely to be around \$100 trillion by 2050, so this would mean annual costs in the order of \$1 trillion by then – this figure is roughly the same amount as is spent worldwide on advertising, and half what the World Bank estimates a full-blown flu pandemic would cost



The power of technology and innovation

Technological change arising from innovation and invention has the power to reduce marginal abatement costs – policy therefore needs to promote innovation at all levels. But there is no guarantee that relying on a laissez-faire market approach will yield the innovations required in time.

Valuing the environment today and long distances into the future

- The effects of climate change today and the near term raise issues of **intra-generational equity**
- How much economic growth needs to be *sacrificed today* to protect future generations?
- How should we value *today* the welfare of *future generations*?

The Stern Review chooses to give future generation equal ethical weight by choosing a very low discount rate to value the importance of the environment to future generations.

Mitigation policies

What are the main options for mitigation - i.e. reducing emissions?

- Put a price on carbon: An externality requires a price for <u>emissions</u> this is the first task of mitigation policy – internalise the externalities for example through the use of carbon taxes and/or carbon trading to create the right <u>incentives to change behaviour</u>
- 2. **Promote research, development and deployment of new technologies**: Note here the importance of secure property rights since inadequate property rights can prevent investors reaping the full return to new ideas. Businesses need the incentive to take the risk of sinking costs into research projects.
- 3. **Regulate where necessary and seek to educate**: Effective regulation and tough emission standards can work and there is a key role for government to seek to deepen public understanding of responsible behaviour.

Stern: "the mitigation of externalities from CO2 emissions is a global public good" – but there are some risks of people / countries free-riding on the positive actions of others?

Suggestions for further reading on carbon trading and the Stern Review

Airlines included in EU CO2 plans (BBC news, July 2008)

Articles on climate change from the Independent

At-a-glance: The Stern Review (BBC news, October 2006)

Australian carbon emissions plan (BBC news, July 2008)

California passes emissions law (BBC news, September 2006)

Carbon market's value hits \$64bn (BBC news, May 2008)

Carbon Positive

Carbon Trade Watch

Clean Development Mechanism is working (BBC news, May 2008)

Cost of tackling global climate change has doubled, warns Stern (Guardian, June 2008)

MPs back personal carbon credits (BBC news, May 2008)

Oil sands - an environmental catastrophe (Guardian, July 2008)

Tim Harford on carbon negativity (Financial Times, July 2008)

UK's first emissions zone begins (BBC news, February 2008)

<u>What is carbon trading? Can it save the world from global warming?</u> (Independent, October 2006)