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**Efficient and Fair Policies to
Tackle Global Warming**

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Introduction

If the issue of global warming is to be taken seriously then Ireland, along with the rest of the developed world, has a real problem. It is rather different in character than most of the other economic issues that policy-makers have to confront on a daily basis. Firstly, it will play out over a very long time scale – a century or two. Secondly, if it is to be tackled effectively, it will eventually require action on a truly global scale - something never before achieved in the field of economic policy.

The solution that will eventually be found to the problem will obviously involve a mix of many different policies and strategies, most of which are difficult to envisage today. However, a vital element of whatever mix of strategies is eventually adopted will be technical change. While the need for heat has been vital to human survival for millenia, the crucial role of mobility in today's lifestyle must be recognised. Technical change, in tackling how these twin issues can be combined with a major reduction in energy use, will play a central role. If the lifestyle of the developed world is to survive undamaged, side-by-side with a slowdown and eventual reversal in the process of global warming, ways of providing the necessary goods and services, with greatly reduced dependence on fossil fuels, will be essential.

Research and Development

While state directed research and development has a role to play in finding solutions, over the last century most of the successful research in the field of energy and transport has been driven by commercial forces. Research has reacted to price signals that have indicated where society has placed a high priority on future technical progress. If research into energy efficiency is to be given a priority, then researchers will need a clear economic signal that that research is being accorded such priority.

In the late 1970s major research was undertaken world-wide that resulted in very substantial progress in increasing energy efficiency. This research was driven by the massive price increases of the 1970s that were perceived, at the time, to be irreversible. Conniffe, 1993, and Haas and Schipper, 1998, showed that these price increases sent a signal that eventually resulted in a ratcheting up of energy efficiency in the economy. The industrial sector in Ireland shows the effects of this ratcheting up in energy efficiency (Fitz Gerald, Hore and Kearney, 2002). This phenomenon is explored using US data in Popp, 2002.

The importance of research and development in driving technical progress means that the wider the geographical scope of an increase in the cost of emitting greenhouse gases, the greater will be the volume of research, and the more rapid will be technical progress. In the 1970s the whole world was hit simultaneously by the oil price rises. As a result, it gave a huge impetus to research into energy saving in the US, Europe and Japan. The fruits were seen afterwards in the 1980s, with the introduction of new energy saving technology. However, it now seems likely that the first steps to tackling the problem of global warming will be led by Europe. If the coverage of the Kyoto protocol is not eventually widened and extended, this will limit the long-term scope for progress. Problems in maintaining competitiveness in the EU will slow progress and the volume of research stimulated by higher prices will be correspondingly limited.

EU Action

This is the background against which the EU is this week considering the introduction of a limited emissions trading regime. The regime is to cover only certain industrial sectors - electricity and energy intensive manufacturing. If introduced, it is likely to see the price of emissions permits rising gradually on the EU market. Estimates suggest that if the scheme applied to the whole EU economy, the price of such permits would probably settle at around €20 a tonne over the period 2008-2012.

While the EU proposals have many economic drawbacks, it is important that they succeed for it is only with such a scheme that some form of co-ordinated action will take place at the EU level. Co-ordination is necessary for a number of reasons:

- Firstly if there is to be any prospect of the EU leading world action to tackle the problem of global warming, the EU must take action itself.
- Secondly co-ordinated action is necessary to limit the negative competitiveness effects that would arise if countries acted on their own.
- Thirdly, without co-ordination there is a serious danger that different policy measures in each member state (or no policy measures) would damage the internal EU market, providing significant scope for distortions through state aids.

If such an EU-wide tradable-permits regime is introduced it will make it easier to take domestic action affecting other sectors not covered by emissions trading. It will also establish a guide price against which the costs of other measures, such as taxation, can be measured. In the long-run, if the market is to operate efficiently and if the burden of adjustment is to be shared equitably across all sectors, the carbon tax applicable to other sectors should be roughly equal to the price of tradable permits.

The EU proposals, while better than nothing as a policy initiative for tackling global warming, suffer from a serious economic drawback. The proposal to "grandparent" the permits - give a proportion of them free to the firms affected - has serious negative implications for the economic efficiency of the measure. As discussed in Bergin, Fitz Gerald and Kearney, 2002, it will significantly aggravate the negative competitiveness implications of the measure for the European economy.¹ It will also have negative income distribution effects, transferring resources from poorer households to the shareholders in the firms affected. Hopefully, as the scheme is developed, these flaws will be addressed.

Ireland's task

As outlined in the first paper at this conference², Ireland faces a major task if it is to meet its international obligations under the Kyoto protocol through domestic policy action. On a business as usual scenario Irish emissions of greenhouse gases in 2010 could be almost 27% above their 1990 level. Under the Kyoto protocol they must be no more than 13% above the 1990 level over the period 2008-2012. Emissions in 2002 are probably already between ten and fifteen percentage

¹ See also Fitz Gerald, McCoy and Hore, 2001.

² Bergin, Fitz Gerald and Kearney, 2002

points above their 1990 level. This reflects the magnitude of the task facing the Irish economy over a fairly short period.

Because the problem of global warming is growing all the time, and because space must be made for the less developed countries of the world to grow, the targets for the years after 2012 are likely to be tightened further. Thus the task of reducing greenhouse gas emissions is not a once-off project. It is likely to be a continuing problem for Irish policy makers long into the future.

The task of reducing Ireland's emissions of greenhouse gases has already been addressed in the Irish Government's *National Climate Change Strategy, Ireland* published in 2000. This proposed a wide range of measures. Among the more important were participation in any EU emissions trading regime; "appropriate tax measures, prioritising CO₂ emissions"; negotiated or voluntary agreements with industry; changes in building regulations; and a wide range of measures affecting specific sectors.

Carbon Tax

In the recent Budget speech the Minister for Finance announced the government's intention of introducing a carbon tax from the end of 2004. At this conference Bergin, Fitz Gerald and Kearney, 2002 consider the macro-economic implications of such a carbon tax. They estimate that such a tax, if it were introduced in 2003, would bring about a substantial reduction in emissions. With a carbon tax of €20 a tonne of carbon dioxide, by 2010 emissions of greenhouse gases could be reduced from 27% to around 18% above the 1990 level. While still five percentage points above the Kyoto limit, this would leave open the possibility that that limit could be reached by a mix of other policy measures.

The paper found that a carbon tax would add around 0.6 percentage points directly to consumer prices and that it would also directly raise energy costs for industry. However, the ultimate economic impact of the tax would depend on what was done with the revenue.

Bergin, Fitz Gerald and Kearney, 2002 show a clear ranking in the long term for four options on recycling the revenue as tax cuts (or expenditure increases). Using the revenue to cut income tax (or social insurance contributions) would actually lead to a small net increase in output and employment. It would be worth doing even without the environmental benefits of the carbon tax. The negative impact of the carbon tax on competitiveness would be more than offset by the positive impact of a cut in direct taxation.

There would be a small net fall in output if the revenue was used to cut VAT. The difference compared to using the revenue to cut direct taxation would not be very large.

The long-term fall in output would be much greater with a lump sum transfer to households, because there would be no offsetting benefit to the competitiveness loss arising from the carbon tax.

The case of "grandparenting" of emissions permits - where emissions permits are given free to the business sector - must be considered the least desirable option on grounds of economic efficiency. It would provide no offset to the loss in competitiveness and it would probably lead to a significant transfer of resources to foreign shareholders in energy intensive businesses, reducing domestic incomes. It would also have the most negative income distribution implications of the four options.

As shown in the paper by Scott, a carbon tax, on its own, would have significant negative effects on the distribution of income. Poorer households spend a higher proportion of their incomes on energy than richer households. Failure to tackle this issue of fuel poverty in the UK in the early 1990s saw the reversal of a policy decision to put VAT on energy. Scott indicates that if the bulk of poorer households (in the first four income deciles) are to be insulated from the adverse effects of a carbon tax it would be necessary to use some 23% of the revenue from the carbon tax to provide appropriate compensation.

If the beneficial environmental effects of the measure are to be maintained, it is important that the revenue is recycled to low income households in a manner that does not affect their use of energy - preferably through a direct increase in their income. Scott suggests that 23% of the revenue from a carbon tax should be used to compensate households on low incomes through two main mechanisms: through an increase in welfare payments accounting for the bulk of the allocation, and a special subsidy scheme for improving fuel efficiency in the most adversely affected households (those using solid fuel). In addition, the tax cuts should also be targeted at those on lower incomes.

The combination of a carbon tax, with the recycling of the resulting revenue through a reduction in income tax, and an increase in welfare payments, appears to be the most efficient way of reducing carbon emissions. While slightly less desirable from an economic efficiency point of view, using VAT to recycle the revenue could have some favourable effects from a distributional point of view.

The results show that the biggest reduction in emissions from energy use would occur in the electricity sector. The next biggest reduction would occur in the industrial sector. The smallest change would occur in transport. This indicates that the lowest cost of adaptation in the medium term would be felt by the electricity sector and the next lowest by the industrial sector.

From the analysis in the first two papers at the conference it is clear that a carbon tax should be a key feature in Ireland's policy response to the problem of global warming. It can deliver a large reduction in emissions at no net cost to the economy, in terms of lost output and lost employment. The Budget announcement that the government intends introducing such a tax is important. If this announcement is seen as credible, then businesses and households can begin preparing for its introduction now through increased investment in energy efficiency. Early adjustment will minimise the costs.

Agriculture

Ireland is unusual in the EU context in that around a third of all greenhouse gas emissions come from agriculture, in particular from the rearing of livestock. This means that any policy to address the problem of global warming in Ireland must consider the role of agriculture. In the third paper at the conference, Behan and McQuinn of Teagasc analyse the potential impact of extensification on the agricultural sector and on agricultural emissions. They find that the extensification policy option that they considered has the potential to achieve a reduction in emissions of around 0.35 percentage points by 2010. This would be made up of a substantial reduction in cattle numbers, combined with some squeezing out of potential planting of forestry (a carbon sink). Crucially, Behan and McQuinn find that the emissions reduction would be combined with a 4% increase in farm incomes. However, the change in policy would involve a cost to the EU budget (or possibly the Irish budget) of €52 million.

What this paper illustrates is the importance of considering how future reforms in agricultural policy could contribute to reducing Ireland's greenhouse gas emissions. There is the possibility that targeted reforms of the CAP could produce a reduction in emissions at a low cost, while possibly including benefits for farmers. As the methodology has been developed to undertake such analysis, such options should be considered in developing climate change policy in Ireland in the future. This issue should also be considered by the EU Commission as the authority with overall responsibility for the Common Agricultural Policy (CAP).

Other Policy Measures

The results of earlier studies show that certain manufacturing sectors may be especially vulnerable to a carbon tax, due to their energy intensity (Boyle, 2000). However, energy intensity alone does not mean that such sectors should be exempted. For example, the electricity sector, which is the most energy intensive sector of all, can probably adapt with relatively limited cost to a substantial reduction in emissions. It is where firms have a high energy intensity and will also face serious competition from similar firms in countries not taking Kyoto seriously, that special treatment must be considered.

Voluntary or negotiated agreements may have a special role for some of these vulnerable sectors. They can have some advantages over the carbon tax in an environment of uncertainty. For example, because of uncertainty about whether the tax will be implemented or whether the EU trading regime will come into operation, firms may delay investments in measures such as Combined Heat and Power (CHP). Voluntary agreements may be able to provide a more certain basis for such an investment, hastening the adjustment process. Voluntary agreements may also be important where firms might otherwise be excluded from the scope of the tax under EU regulations, ensuring that at least some significant measures are taken.

However, if voluntary agreements are used in anything other than exceptional circumstances, they could be quite damaging. The analysis in the first paper shows that, after electricity, the manufacturing sector is the sector that potentially faces the lowest adjustment costs for reducing emissions in the medium term. If firms can opt out through rather weak voluntary agreements, this could throw the burden of adjustment on the rest of the economy, aggravating the economic costs for the country as a whole. For example, if the current proposals for voluntary agreements in Belgium are implemented (Government of Belgium, 2002) it could severely limit the effectiveness of a carbon tax in that country.

Voluntary agreements, if they are to work, place a very demanding information requirement on the regulatory authorities. They have to understand the cost structure facing each firm, as well as having information on the costs of adjustment for the rest of the economy. These informational problems are emphasised in Goulder *et al.*, 1999.

In the household sector the retrofitting of energy efficiency measures can be expensive and difficult to achieve. However, the rate of house-building is exceptionally high in Ireland. As a result, over the next fifteen years an additional 40% or 50% will be added to the housing stock. This offers an unparalleled opportunity to improve the energy efficiency of the housing stock. This is probably best done by reforming housing regulations, as proposed in the Government's *Climate Change Strategy*. However, regulations are not enough; if they are not enforced they are useless. Experience in countries such as Belgium suggests that even good regulations can suffer from weaknesses in inspection and enforcement.

Bergin *et al*, show that the transport sector is likely to see the smallest adjustment in emissions of any sector as a result of a carbon tax. With such limited adjustment, by 2010 the transport sector could account for 40% of Ireland's emissions of carbon dioxide. This limited adjustment is partly due to the fact that the tax on motor fuels is already very high relative to the damage done in terms of global warming. The high taxes are necessary (and probably not sufficient) to reflect the congestion costs imposed by using motor vehicles. However, the limited adjustment also reflects the fact that mobility is very important to our modern lifestyle. The high price that transport users are prepared to pay for mobility indicates that a carbon tax must be supplemented by a range of other measures, if emissions from transport are to be reduced.

Probably the most important additional measure affecting transport is changes in regulations at the level of the EU. If the Irish authorities were to require a major improvement in fuel efficiency of motor vehicles no manufacturer would pay much attention. However, the size of the EU market is such that EU-wide regulations would have a real impact. There are technologies available that could achieve a major reduction in emissions, without impairing mobility. What is needed is an economic incentive to develop them so that they are used in mass-production.³

The other major avenue for achieving a significant long-term reduction in emissions from transport is to develop our way of life round a denser urban environment, based on availability of good public transport. This would involve a major change in the approach to urban planning (and spatial development). It would also require a simultaneous commitment to the rapid deployment of high quality public transport. While the *National Climate Change Strategy* proposes changes in policy that would contribute to such an outcome, they appear to be too weak to make a major impact.

Finally, the electricity sector probably offers the best opportunity for achieving a significant reduction in emissions at a limited cost. However, as outlined in the first paper, the optimal strategy for electricity, when faced with a carbon tax or a tradable-permits regime, may be rather different than that envisaged in *National Climate Change Strategy*. Firstly, it looks as if it will still be sensible to maintain the Moneypoint coal-fired station on full power out to at least 2012. The most cost-effective response to a tax is likely to include the closure of existing oil stations, the closure of all peat-fired generation, and a higher penetration of wind-power than was previously envisaged. If government policy precludes the closure of the peat-fired generation then more of the adjustment will have to be made by other sectors of the economy, at greater economic cost to society as a whole.

The final set of policies available to Ireland to ensure compliance with the Kyoto protocol is a series of so-called "flexible mechanisms". These include the purchase of emissions quotas from other participating countries. They also include a series of instruments whereby developed countries, such as Ireland, finance investment in energy saving in less developed countries. However, such policy measures are only being developed and very considerable preparatory work would be required, both in the developed and in the developing countries before they could come into effect. As yet, no attention has been given to such mechanisms in Ireland, so that it seems

³ Regulations in California, a much smaller car market than the EU, have had a significant effect on research and development in the US car industry.

unlikely that they could make a significant contribution much before the end of the decade.⁴ Relatively few countries so far have put the necessary investment into developing such mechanisms, offering a prospect of progress in the near future.

Conclusions

A carbon tax of €20 a tonne would achieve a considerable part of the reduction in emissions that is required by 2008-2012 as part of Ireland's requirements under the Kyoto protocol. This reduction would be at no net economic cost. However, the postponement of the introduction of such a tax until the end of 2004 means that its full impact, which takes many years to develop, may be late in coming for the 2008-2012 period.

The EU-wide emissions trading scheme could also make a significant contribution through ensuring that the burden is shared evenly across EU members. Once again there is uncertainty as to whether it will arrive in time to make a difference.

The initial research into agriculture suggests that some significant reduction in emissions from that sector may be achievable at low cost. However, much more research is needed to establish the scope for change in agriculture, what the cost would be, and who would carry any cost.

If some of the other measures envisaged in the *National Climate Change Strategy* were implemented fully, that might be sufficient to reduce emissions to their target level for 2008-2012 without recourse to the "flexible mechanisms" under the Kyoto protocol. However, as a precaution, Ireland should devote more attention to the possibility that additional investment in less developed countries, targeted at energy efficiency, could achieve further important reductions in emissions. Failure to do so while other countries develop such mechanisms, could leave Ireland at a competitive disadvantage in the period 2008-2012.

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⁴ Such mechanisms also carry the danger that the investment from the developed world could be treated as development aid, reducing the commitment by the developed world to the necessary funding for developing the recipient countries economies.

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