

3. ARE TRADABLE EMISSION PERMITS THE WAY TO GO?

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3.1 Introduction

When we first began work in the early 1990s on the economics of global warming there was still considerable scientific doubt as to whether the phenomenon posed a real and serious danger to the world (Fitz Gerald and McCoy, 1992). However, over the course of the last ten years, new research and evidence of very rapid warming have greatly strengthened the case for intervention by countries throughout the world. While the magnitude of the problem is still clouded in scientific uncertainty, its reality is now widely accepted. The Earth has warmed by 0.5°C in the last century while atmospheric concentrations have increased by over 30 per cent in the same timeframe. The United Nations Intergovernmental Panel on Climate Change (IPCC) have drawn a connection between these trends by concluding that ... *the balance of evidence suggests that there is a discernible human influence on global climate.* The recommendation is a world-wide reduction in greenhouse gas emissions.

The international response was the 1997 Kyoto Protocol (see Box 3.1) where industrialised countries agreed to legally binding emission reductions, subject to individual country ratification, on the basis of 1990 greenhouse gas levels by the period 2008-2012. The decision by the incoming Bush administration in the United States to abandon the Kyoto protocol, while not surprising, has raised major fears elsewhere in the world, especially in Europe. However, even without US participation, it was agreed in Bonn this year that the EU and many other signatories will proceed with implementation of the Kyoto Protocol. The fact that the participants are confined to the developed world is seen as a major obstacle to its potential success in the very long run. This was one of the main arguments put forward by US opponents of the protocol.

It means that in the long run economic activity that generates major greenhouse gas emissions could migrate from countries imposing costly restrictions on emissions to parts of the world that have not signed up.

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While in the short term, which in this context is over the next decade, the degree of potential diversion of economic activity to countries where emissions of greenhouse gases are unrestricted is likely to be small, in the longer term such diversion could be very substantial. Many studies, such as those by the OECD (Burniaux *et al.*, 1992), indicate that in the very long run no satisfactory control on emissions is possible if major economies such as India and China are not participating. To this extent the US arguments have some validity.²

However, the developed world emits massively more greenhouse gases per head of population than the third world. In this light, the decision in the Kyoto protocol to go ahead first with practical measures to control emissions in the developed world seems both just and sensible. A start has to be made somewhere. However, the US is the most prolific emitter of greenhouse gases per head of population of any major country in the world, and their adoption of a free-rider approach poses significant dangers for other potential signatories. It would allow the possibility of major diversion of economic activity that is polluting from other parts of the developed world that impose costly restrictions, to the US. While some diversion to the less developed world might be acceptable to signatories, granting such an advantage to the US is likely to be less acceptable to electorates elsewhere in the developed world.

In spite of this setback, the EU, along with other developed economies, now proposes to proceed with the Kyoto protocol and implement restrictions on emissions within its own borders. In beginning the process of policy implementation it may hope to lead from the front. However, unless some mechanism can be found to bring the US on board over the course of the decade, there will remain doubts about the ability of the EU and other participating states to proceed unilaterally. As enforcement becomes increasingly costly the potential for diversion of business activity to the US will increase. With such diversion the pressures to either slow implementation or to enter into a trade war with the US could increase.

From Ireland's point of view it seems best to proceed on the basis that the Kyoto protocol and the related emissions limits for Ireland will enter into force in 2008. At least initially, the cost of compliance will probably not be unacceptable to the citizens of the EU as a whole. However, there remains the possibility that for individual countries, sectors of industries, or particular groups in society that the cost of implementation could prove unacceptably high.

This paper first considers in Section 3.2 the magnitude of the problem facing Ireland in reaching the targets for greenhouse gas emissions set as part of the Kyoto protocol. We then consider in Section 3.3 the likely policy instruments that will be used to achieve the targets in

² Game theory can throw some light on this problem. The nature of the environmental problem is global and displays public good type characteristics of non-excludability and non-rivalness in relation to the benefits of abatement. In this context "free riding" behaviour will overcome the capacity for a self-enforcing agreement. A self-enforcing agreement can only be maintained when the global "net" benefits are about the same as no agreement. When a complete agreement cannot be reached which would deliver the greatest total abatement, a partial agreement where some countries do a lot and others free ride may deliver less than in a complete non co-operation outcome. The rationale of "virtuous" European behaviour in the current geopolitical context requires serious consideration unless it clearly provides other beneficial outcomes.

as efficient a manner as possible. In Section 3.4 we discuss the likely distributional impact of the policies needed to achieve the necessary reduction in emissions. In Section 3.5 we describe an alternative eco-tax solution, and Section 3.6 presents our conclusions.

Box 3.1: The Kyoto Protocol on Climate Change

A meeting of over 150 countries was held in Kyoto, Japan in December 1997 at the third Conference of the Parties (COP-3) to the United Nations Framework Convention on Climate Change (UNFCCC). The end result was the adoption of a legally binding international agreement for climate protection – the Kyoto Protocol. Over 160 countries at the 1992 Earth Summit in Rio de Janeiro signed the first international climate change treaty, and the Kyoto Protocol represents the culmination of years of negotiations to fortify this agreement. The main points of the Protocol are as follows:

- Article 3 sets out the Targets and Timetables. It provides that thirty-nine of the most developed countries should reduce greenhouse gas emissions by an aggregate 5.2 per cent from 1990 levels between the period 2008-2012. Each nation has a different target, ranging from an 8 per cent reduction (the European Union) to a 10 per cent increase (Iceland). Table 3.1 details the requirements for some of the world's largest economies. Each party must show verifiable progress towards meeting its target by 2005.
- The gases covered by the Protocol are carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆). These six gases are treated as a “basket”. This allows a degree of flexibility in reaching the target as reductions in one gas can be substituted for reductions in others.
- Article 4 allows Parties to join together in order to meet their target. This provision satisfied the demand from the EU that it should be permitted to comply as a group or multi-country “bubble”. In this case, the burden of its required 8 per cent reduction is shared between countries based on forecast growth rates, with converging countries permitted some increase in emissions (see Table 3.1).
- The Protocol allows for Carbon Sinks, i.e. land and forestry practices that remove carbon emissions from the atmosphere. They represent a low-cost option to governments, but are defined ambiguously in the Protocol and will prove difficult to measure.

The Protocol also introduced three “flexible mechanisms” that are intended to facilitate cost-effective implementation.

1. Emissions Trading (Article 16). Polluting entities in individual countries are allocated permits for their emissions of greenhouse gases consistent with the government's target, and these can be traded on the international market.
2. Joint Implementation (Article 6). This is where one nation gets credit for implementing a project to reduce emissions or enhance sinks in another country.
3. Clean Development Mechanism (Article 12). Similar to Joint Implementation but with additional safeguards and provisions, this

allows developed countries to gain reduction credits for investments in appropriate projects in developing countries.

There are many issues still to be resolved. No agreement was reached on the participation of developing countries, yet it is predicted that they will produce the largest share of carbon emissions by the middle of the century (especially China and India). Furthermore, the Protocol has left specifics on emission trading, the clean development mechanism, carbon sinks and compliance and enforcement to be defined at a future date.

Table 3.1: Quantified Emission Limitation or Reduction Commitment (Percentage of Base Year)

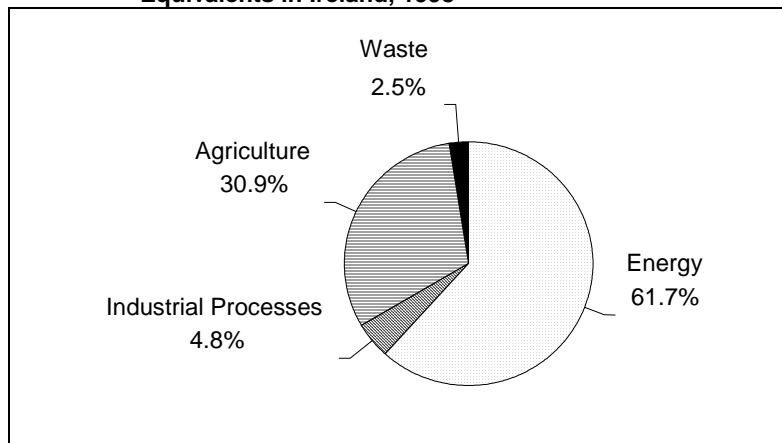
Party	%	Party	%
Australia	108	Ireland	113
Canada	94	Germany	79
USA	93	France	100
Japan	94	Greece	125
Russian Federation	100	Spain	115
Total EU	92	UK	88.5

Source:

3.2 The Magnitude of the Problem

The main source of emissions of greenhouse gases in Ireland is the burning of fossil fuels (oil, coal and gas) and agriculture. When fossil fuels are burned, either directly in boilers or fires for heating purposes, or indirectly to provide power (cars or electricity), the carbon in the fuel combines with oxygen in the air to produce carbon dioxide (CO₂). In the case of agriculture, the single biggest source of emissions is the cattle herd, which produces methane (CH₄) as part of the digestive process. Figure 3.1 shows the sources of greenhouse gas emissions in Ireland in 1998.

Figure 3.1: Sources of Greenhouse Gases in Carbon Dioxide Equivalents in Ireland, 1998



The use of fossil fuels for energy purposes is the biggest single source of emissions in Ireland. Within this broad category, around a quarter of emissions are accounted for by each of three sectors: transport, the household sector, and industry (excluding emissions from industrial

processes). The most rapidly growing sector is transport, and over the next decade it could come to account for up to a third of emissions of carbon dioxide.

Figure 3.2: Greenhouse Gas Emissions in Ireland to 1990-2010

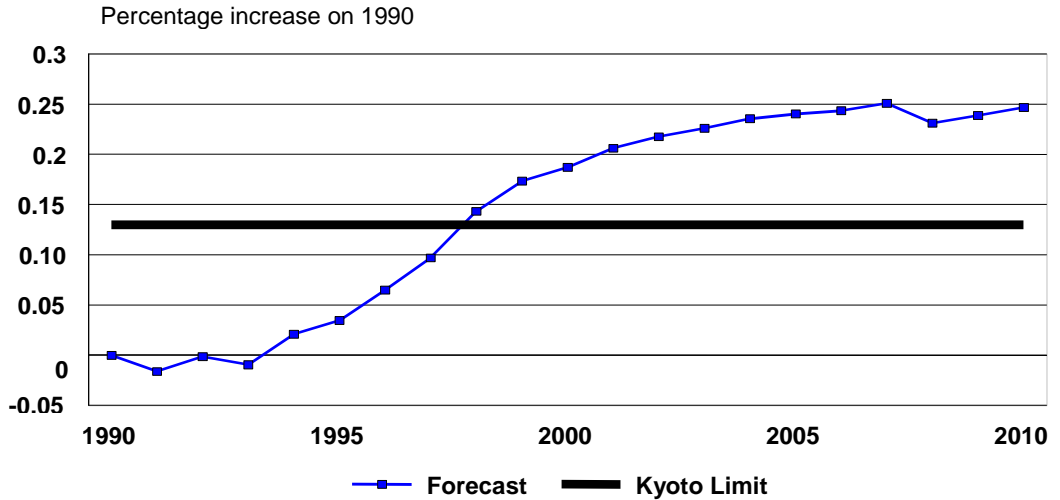


Figure 3.2 shows our forecast of likely future emissions of greenhouse gases over the next decade if no major policy changes are introduced. Already Irish emissions exceed the limit agreed by the EU as part of the Kyoto protocol. That agreement requires Ireland to limit its emissions over the period 2008-2012 to no more than 13 per cent above the 1990 level. While the demand for energy has risen more slowly than GNP over the past decade, without major policy changes, continued economic growth will see a further increase in energy use and, consequentially, in greenhouse gas emissions. It seems likely that on unchanged policies Ireland's greenhouse gas emissions could be up to 25 per cent above their 1990 level by the end of this decade.

There have been some positive developments in this context in recent years. The rise in oil prices from two years ago has reversed the fairly steady fall over the previous decade. This alone will have some effect on slowing emissions. However, it is neither likely nor desirable³ that this will continue. The prospects are for only moderate rises in primary energy prices on world markets over the rest of the decade. The increases in world prices that have occurred, especially the increase in European gas prices, have changed the incentives within the electricity-generating sector. Whereas in the 1990s significant subsidies were needed to encourage investment in non-polluting wind energy, technical progress and market forces now make such investments commercially attractive.

³ Because the outflow of oil revenues from Ireland and other energy importers will tend to put downward pressure on growth outside the OPEC area.

The changing environment for agriculture within the EU has the potential to make a significant contribution to the task of reducing emissions. The combination of EU Common Agricultural Policy reform and the impact of the BSE crisis have together made cattle rearing extremely unattractive from an economic point of view. The returns to farmers from this type of agriculture were never great but they are now very low. While income supports from Brussels and the Irish government to some extent ameliorate the problem, there remains the possibility that future CAP reform could provide an economic opportunity to protect both farm incomes and the environment. A change in incentives to encourage farmers to move away from cattle to other forms of land use could result in a reduction in Irish greenhouse gas emissions. For example, a gradual shift from cattle rearing into forestry could provide a double benefit – a reduction in methane emissions together with an increase in the quantity of carbon fixed in trees (which further reduces net emissions of greenhouse gases).

While the magnitude of the problem facing the Irish economy in meeting the Kyoto emissions limits is clear, there is less certainty about how this target is to be reached in an efficient and fair manner. We still lack much of the scientific and economic information necessary to quantify the costs and benefits of alternative policies. While work has been done on the electricity generating sector, such as Conniffe, Fitz Gerald, Scott, and Shortall (1997), we have much less understanding of how policy changes would affect the transport and the agriculture sectors. As a result, while the magnitude of the task facing Ireland over the coming decade is clear, the likely cost of achieving the target is much more uncertain.

3.3. Efficient Economic Solutions

Given the uncertainties surrounding the causes and impact of global warming, the costs and benefits from the abatement of greenhouse gas emissions are consequently also uncertain. The implementation of cost effective, risk reduction strategies in such a context becomes of central importance. While the arsenal of economic solutions for environmental problems is broad, ranging over prohibitions, issuing of standards, application of subsidies, the use of charges, taxes, fees, the creation of quasi-markets for tradable permits: they essentially boil down to price or quantity based solutions.

An efficient solution in the economic context is not just an explicit least-cost solution for a given target (or emission reduction), it also has to account for additional costs and benefits in terms of society's well-being or welfare. The impact of any environmental policy will give rise to a host of spill-over effects that can only really be best captured by a modelling approach.⁴ The use of models can provide fresh insights not available from other sources but by their nature they are often impenetrable, making their conclusions less intuitively appealing.

The distinctive difference between quantity and price based solutions is that while as a regulator one is fairly sure of the outcome with quantities,

⁴ See Fankhauser and McCoy (2000) for a description of the various models used to analyse the economic impacts of environmental policies. These include traditional macroeconomic models, resource allocation models like input-output models and computable general equilibrium models, and integrated assessment models that combine economic and ecological components.

such as permits, one is unsure at what cost this is achieved. The alternative with price based solutions is that the outcome in terms of quantity is uncertain but the costs are likely to be minimised as individual agents make informed decisions given the price facing them. When permits are tradable among participants they also possess the efficiency properties of price based mechanisms (Baumol and Oates, 1988). Under conditions of certainty about costs and benefits the tradable permit system is equivalent in efficiency terms to a price based system (taxes).

One relatively simple model presented by Martin Weitzman (1974) in a seminal contribution showed that price and quantity based solutions could be equivalent under conditions of uncertainty. The Weitzman theorem had an intuitive appeal, allowing policy-makers to choose either a price based approach, like carbon taxes, or a quantity based approach, like emission quota trading, to dealing with problems, such as greenhouse gas abatement. Given its significance it is worth exploring what it says.

Weitzman demonstrated that when there is uncertainty about the marginal⁵ benefits of pollution abatement (that is, uncertainty about the damage being done by the pollutants) there is no difference in terms of economic efficiency between a quantity or price based approach. When there are uncertainties about the marginal costs of abatement (that is the regulator is uncertain about the economic costs faced by agents in reducing pollution) then the relative sensitivity of marginal benefits and marginal costs will determine which system is preferred. When the marginal benefits are more sensitive than marginal costs to additional abatement, the quantity based system is preferred.

The logic in the Weitzman theorem in the context of international global warming emission reduction agreements runs as follows. The scientific uncertainty about the impact of greenhouse gas emissions means that the damage function is not clearly known and consequently the position of a marginal benefit curve is also uncertain. This does not give a clear guidance on whether permits or taxes are preferred just that both are likely to be equally wrong in terms of welfare.

When the regulator in addition is uncertain about the marginal costs facing the economy being regulated then it is a matter of “merely” determining the relative slopes of the marginal cost and benefits curves. The quantity based approach is preferred when the marginal benefits are steeper than the marginal cost curve, consistent with the situation when there are threshold effects and getting quantity right is important. When the potential costs of abatement can be quite high then price based systems offer advantages.

The result coming from Kyoto, as with preceding attempts at international climate agreement, is that price and quantity based instruments cannot be viewed as alternative mechanisms for obtaining the same outcome. Price mechanisms lead to uncertain emission outcomes while quantity mechanisms give rise to uncertain cost considerations. It has been shown that the nature of the uncertainty is such that price mechanisms are preferable in this context. Pizer (2000) estimates that

⁵ Marginal in economic terms is an additional unit of activity, in this case an additional unit of abatement effort.

price mechanisms generate up to five times the net expected benefits associated with a prudent quantity control. The magnitudes in favour of prices also held sway a decade earlier after the 1992 Earth Summit but, in the guise of eco-taxation or carbon taxes, did not find acceptance (McCoy, 1997).⁶

The price mechanism need not take the form of a carbon tax. Indeed to ensure acceptability and to encourage implementation, the offshoot from Kyoto was to opt for a tradable permits component backed by some form of charges.⁷ The main feature of a price based mechanism is to allow the polluter to pay the fine if abatement costs turn out to be much higher than expected. A hybrid system would allow the use of a quantity based tradable permit system with the safety valve of allowing agents to opt to pay a fine if costs turned out higher than expected. This idea was first put forward by Roberts and Spence (1976) but has been championed in recent months by the influential Washington based institute Resources for the Future.

The EU has also taken to the idea of tradable permits as it gets around the sensitivities with individual member states' rights to decide taxation. In addition, tradable permits seem to confer a valuable property right, viewed at least implicitly as a gain rather than a loss as with taxation.⁸ The revenue from trades does accrue to the owner, the State only gets revenue if it decides to allocate initially through auction. The idea of marketable or tradable permits was first put forward by Dales (1968) and these have been successfully implemented in the US for trading in lead and sulphur emissions. This success has prompted the renewed international interest in permit systems. Given the intention of the EU to proceed with the Kyoto protocol and to use tradable permits at a pan-European level, there is a compelling case for implementing the national quota for Ireland using a similar framework. The main implementation issue will be acceptability of this system and for this distributional features are paramount.

3.4 Distributional Consequences

Given that it seems likely that tradable emissions permits will be a major part of the policy package adopted at the EU level, and hence in Ireland, we focus first on this policy instrument. Here we consider the likely distributional impact. However, as discussed at the end of this section, the effects of a carbon tax strategy would in practice be very similar to that of tradable permits.⁹ Four different distributional effects

⁶ Carbon taxes in addition to providing an incentive to reduce emissions were also capable of providing significant on-going revenues to governments. The potential to use the revenues to remove other distortions in the economy were described by Pearce (1991) as a "double dividend" from environmental taxes. Fitz Gerald and McCoy (1992) indicated that the recycling of the revenues to reduce pay related social insurance was capable of providing a substantial additional dividend in terms of reduced unemployment at that time.

⁷ Charges or fees are less emotive terms than taxes but are basically the same as any hypothecated tax.

⁸ The notion of differing perceptions about gains and losses are quite important for valuation purposes as environmental economists have found out. The expected theoretical equivalence of willingness to pay to secure a benefit with the willingness to accept compensation for incurring a loss is often found not to hold in practice.

⁹ We do not deal with some special mechanisms such as *Joint Implementation* that are also likely to be part of the international programme to tackle the problem of global warming.

arising from tradable permits are considered. First, the direct implications for the distribution of income between EU member states. Next we consider the impact on the distribution of incomes within Ireland – between consumers and producers, and then between rich and poor. Finally, we discuss the possible impact of such measures on different sectors and different companies.

In the case of the distribution of income within Ireland a crucial factor will be how the right to emit greenhouse gases is allocated. This allocation decision also has far reaching implications for the cost of policy implementation. If the right to pollute is appropriately charged for then the revenue can be used to reduce other distortionary taxes elsewhere in the economy. On the other hand, if it is given away free to existing polluters there will be no funds available to reduce existing distortions.

3.4.1 DISTRIBUTIONAL EFFECTS IN THE EU

The EU have agreed an allocation of emissions rights for the period 2008-2012. In the case of Ireland it is agreed that emissions over that period can amount to 13 per cent above the 1990 level. In the case of some countries, such as Germany and the UK, they are required to actually cut emissions compared to the 1990 level. Under a tradable permit regime each country will be deemed to have received permits to emit the specified tonnage of greenhouse gases over the period 2008-2012. These permits can then be sold or given away within each country. For individual companies or households they will be only permitted to emit greenhouse gases if they have acquired or been given a permit for the requisite amount. In principle it will be left up to individual countries to decide how they allocate the permits.

The allocation of these permits across the different EU members has been done in an essentially arbitrary manner. It is based on historical emissions levels rather than an auctioning process. This process is often referred to as “grandfathering” or “grandparenting”. At the time the decision was made the information was not available on how difficult it would be for each country to reach its required target. As a result, if there were no provision for a reallocation of these permits or quotas between countries, then the EU would find that some member states are carrying a heavy burden and some a lighter burden after 2008. If there were no possibility to trade these permits between countries (or companies) the result would be a loss in aggregate activity at the EU level. This would represent a significant efficiency cost when compared to an alternative allocation that left the costs of meeting the Kyoto limits equal (per tonne of greenhouse gases avoided) across the EU.

In the absence of detailed information on costs of abatement, the most efficient solution is to allow countries or individual holders of emissions permits to trade them within the EU. If the price on the international market for the right to emit a tonne of gas is higher than its value to the individual holder then the holder will sell it. The resulting international price will reflect the lowest cost method of reducing greenhouse gas emissions. This would ensure that the marginal cost of abatement is equalised across member states and that aggregate economic activity is maximised.

While such a regime will deal with the efficiency costs involved in the arbitrary allocation of emissions permits, it will still involve significant net transfers between different EU members. Unless, by some miracle, the allocation proves *ex post* to have equalised marginal abatement costs across member states, some countries (or their citizens) will be net buyers of quota and others will be net sellers. Such an outcome would represent a transfer of resources between member states, in the same way that the structural funds or the EU budget represents a transfer.

While the transfers between member states will initially probably be small, as such a regime moves beyond 2012 they could grow in magnitude. As a result, it is important that the EU builds in a review process to ensure that the aggregate income transfers from emissions trading do not grow too large and that they do not negate the EU's other objectives, in particular the cohesion objective.

3.4.2 A TRADABLE EMISSIONS REGIME IN IRELAND

In considering the appropriate policies to adopt to ensure that Ireland meets its target for emissions, an important consideration is the level at which emissions are monitored and at which policies to control emissions are imposed. For instance, in the case of sulphur dioxide (which is not a greenhouse gas), emissions regulation generally takes place at the level of the plant which actually releases the sulphur into the atmosphere. But, in the case of sulphur dioxide, the number of significant emitters is small and the location of the emission is also important.

In the case of greenhouse gases neither of these considerations applies. Every car, every household that uses an open fire, every business that uses a central heating boiler, emits carbon dioxide. In the case of agriculture every cow and sheep is also an emitter. It is clearly not practical to monitor and control emissions at such a dis-aggregated level in a modern economy. If, instead, it were decided to regulate, for example, the top fifty plants in Ireland, this would leave uncontrolled the bulk of emissions. It would also provide a major incentive for firms to reduce plant size so as to fall below the threshold. This would cause serious distortion in the economy, especially if such a regime were in place for many years.

The obvious solution in the case of carbon dioxide is to monitor and regulate the import and production of fossil fuels. Already, in the case of oil, this is part of the arrangements for excise taxes. An extension of this to cover gas and coal would not involve a major number of market players. As a result, for administrative reasons, it seems certain that in Ireland the only practical way to implement policies designed to ensure compliance with the Kyoto limits will be through monitoring the importers and producers of primary energy. This will involve monitoring the behaviour of the existing oil and coal importers. In addition, as power generators, including the ESB, are also likely to import primary energy (in the form of coal, oil and gas) on their own behalf, their behaviour will also have to be monitored.

Obviously, where firms use primary energy in a production process which fixes that energy in a form which does not leak directly into the atmosphere (as is the case in some chemical processes), exemptions could be made, provided that these companies' use of fossil fuels was also independently monitored.

While this approach to monitoring and regulation is the only practical one in an economy such as Ireland's, it has certain disadvantages. In particular, it makes it difficult to exempt particular firms or businesses unless their activities are subject to special monitoring. Notwithstanding the strong economic grounds in a global context for arguing against exemptions for any firms or sectors, the partial nature of the Kyoto protocol (especially if it excludes the US) may require some limited exemptions for very intensive energy users in the tradable sector.¹⁰ However, such exemptions may be difficult to implement if such energy users are not themselves importers or producers of primary energy. It is the case that they will be buying from importers who are subject to quotas and so will be indirectly paying. In such a case it might be necessary to use an imputation system, which allowed for costs incorporated into domestic inputs. A fuller version of such an imputation scheme is discussed in Poterba (1991).

In spite of these minor problems, given the industrial structure of the Irish economy, the imposition of monitoring and regulation (be it quotas, taxes or voluntary agreements) on importers and producers of primary energy seems the only practical solution. The advantage of this design is that it would greatly simplify the cost of implementation and it would provide the appropriate incentives to all users of energy to minimise emissions. A scheme where the output of the electricity industry was regulated, rather than requiring firms to buy permits or pay taxes on their inputs, would significantly reduce the incentives to reduce emissions and significantly increase the cost of meeting Ireland's emissions targets.

This is because the price rise of carbon rich inputs into electricity generation would encourage substitution away from those inputs whereas a price rise (or other regulation) on electricity produced would discourage electricity consumption but would not encourage more environmentally attractive types of generation. In addition, the essentially arbitrary nature of the regulatory approach could provide a strong disincentive to new entrants into the market, reducing or eliminating the prospect of competition.

In the case of the agriculture sector a more simplified approach to monitoring and regulation of emissions will have to be taken. Clearly metering the emissions from animals is not a viable, nor attractive, option. Instead a more indirect approach where numbers of ruminants are monitored and where the incentives under the EU Common Agricultural Policy are restructured to meet the environmental needs of the EU economy is likely to prove the most practicable. The change in incentives (taxes or subsidies) for cattle production should reflect the likely market value of the abatement of a tonne of greenhouse gases.

Allocation of Permit Quotas

There are two different methods of allocating quota (the right to emit greenhouse gases) within Ireland. In the first, the permits can be given to

¹⁰ Failure to provide for such limited exceptions would see such businesses move to unregulated locations, with no net improvement in global emissions.

existing polluters on the basis of their current levels of emissions. Alternatively, the permits can be auctioned off to the highest bidders and the resulting revenue can be used to reduce taxes elsewhere, or to increase government expenditure, for example on welfare transfers or investment in research on energy efficiency.

One of the primary reasons why this type of approach has been favoured by existing industry is that they see the prospect that quotas would initially be allocated to those who are already emitting (polluting). This would have a number of advantages for them over taxation:

- The cost to them of conforming to the specified amount of pollution would be offset by the value of the quota granted to them.
- It would guarantee the position of incumbents against new entrants into the market, preventing competition.

The issue of whether the rights to emit greenhouse gases are handed out to existing emitters and the implications of the regime for competitive markets is central to the question of the long-term economic impact of any greenhouse gas abatement policy.

A clear conclusion can be drawn from economic research that “grandparenting” of greenhouse gas emission rights is likely to have a serious adverse impact on the economy (Parry, Williams and Goulder, 1997). This adverse impact arises from the fact that all restrictions on production and consumption, such as taxes, have serious negative effects. However, in the case of taxes or auctioned quotas, the revenue is available to the state to reduce distortionary taxes elsewhere, offsetting the damaging effects of the regime. However, if, as with “grandparenting”, the revenue is foregone, the state has no means of offsetting the negative effects.

In addition to the negative effects on economic efficiency, giving the potential revenue away to existing polluters is likely to have serious negative income distribution implications. The solution to this particular problem is to auction off the right to

emit.¹¹ In this case the revenue would accrue to the state and could be used to reduce other distortionary taxes, to compensate those on low incomes hit by higher prices, and to fund investment in areas such as energy efficiency. In the US, to date, while accepting that this is the best solution in terms of national welfare, the “grandparenting” route has been followed because of the strength of the lobby of incumbents. The fact that the US has adopted a seriously sub-optimal solution in the face of political pressures should not be taken as a desirable precedent for the EU.

¹¹ If all of the 2008-2012 quota is sold at once there will be complicated issues in terms of the management of the public finances and how they are treated under the terms of the Maastricht treaty. For example, if all of the quota for the 2008 to 2012 period were sold off in 2008, then the revenue received should be applied to reducing other taxes evenly over the whole period. However, in terms of the government accounts, it would show a big surplus in 2008, with corresponding small deficits in future years. If the total value of the quota was large, and the regime was applied at an EU level, the overall financing implications of such a regime and the implications for the EU financial system would need to be considered. The example, of the mobile phone auctions in the EU over the last two years is instructive in this regard.

Distributional Effects Within Ireland

If a tradable emissions regime is implemented in the EU and Ireland participates fully in it then all importers or producers of primary energy will have to acquire permits for each tonne of carbon equivalent fuel that they import. Even if they are granted these permits free through a “grandparenting” process they will be free to use the permit either to buy fuel or to sell the permit within Ireland or abroad to other businesses. If the holders of the permits choose to continue to import and sell energy in Ireland they will then charge Irish consumers the usual price for the energy they import *plus* the price they could get for the emissions permit on the EU market. If they did not pass on the value of the permit in higher prices they would be worse off than if they had gone out of business and sold on the permits.

In the case of an auction where importers have to buy the permits on the EU market to allow them to import, it is equally clear that they will pass on the cost of the permit to consumers through higher prices. Thus, whether tradable emissions permits are “grandparented” or auctioned, the full EU market price for the permits will be charged to consumers. This process will be identical to the current excise tax regime where importers pay a tax (rather than buying an emissions permit) when they import the energy and then pass on the cost of the tax to consumers in higher prices.

Where there is a potential difference is that in a “grandparenting” regime the owners of the companies importing energy receive a major windfall gain, a gain that is paid for by consumers through higher prices. If, on the other hand, the firms involved have to buy the permits, they then do not receive any benefit from the new regime. However, under an auction regime the state has the benefit of the revenue from the permits, revenue that will ultimately be paid by the household sector anyway, and it can use the revenue to reduce taxes elsewhere or to improve services for households.

It is only where firms are selling an energy intensive product on a world market where many countries are not signatories of the Kyoto protocol that they will not be able to pass on the cost of permits to the buyers of the product. In this particular case the incidence of the cost of the permits will fall on the owners of the relevant firms, or possibly on its employees if they accept lower wages to keep the firm competitive. Even if such firms receive permits free they will still be able to sell the permits on the world market and move their operation out of Ireland to a location where energy costs are lower. Any attempt to restrict firms from selling on the permits will only increase inefficiency (Hagem, 1998).

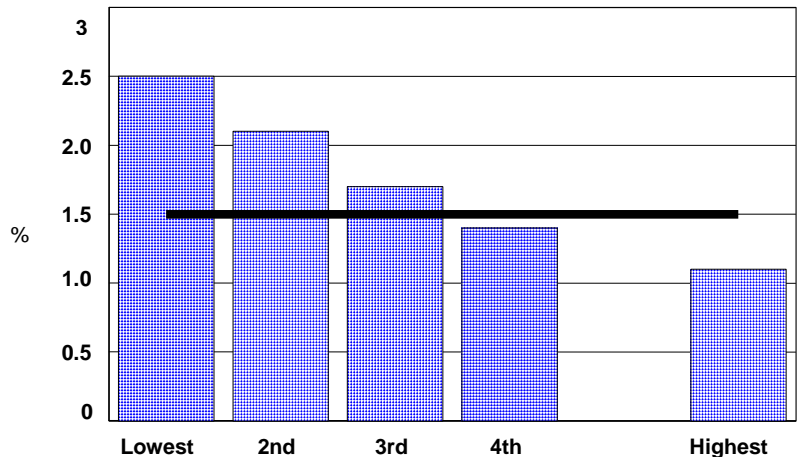
This latter case, where firms can not pass on the cost increase, is likely to be quite exceptional, being confined to a few cases where firms are operating a very energy intensive process. In a very open economy, such as Ireland’s, the ultimate impact of taxes or charges imposed by the state will tend to be on those living in Ireland. In a competitive market it is difficult for trading firms to pass on such costs as higher prices to the outside world. The study by Fitz Gerald and McCoy (1992) showed that the effect of carbon taxes (excluding the effects of revenue recycling) would be to reduce household income.

Thus the ultimate impact of any measures to combat global warming will be primarily on domestic households. Very similar conclusions were

reached in analysing the potential effects of an emissions trading regime on the US (Congressional Budget Office, 2000). If permits are auctioned (or carbon taxes are levied) then the revenue to the state can be used to offset this cost to households. If such revenue is given away through “grandparenting” then the cost on the household sector will be greatly increased and the economic efficiency costs of the measures will also be significantly augmented (Parry, Williams, and Goulder, 1997).

Within the household sector the cost of any measures to combat global warming is likely to fall disproportionately on poorer households. Scott (1992) has shown that poorer households spend a significantly higher proportion of their income on energy than do richer households. Figure 3.3 shows what would have happened if the original EU proposals on carbon taxes had been implemented in the early 1990s. The taxes would have cost the poorest households 2.5 per cent of their income while it would have cost the richest households only 1.1 per cent of their income.

Figure 3.3: Carbon Taxes (Permit Costs) as Per Cent of Household Income



This is illustrative of the kind of burden that tradable emissions permits would also impose. However, if the permits were auctioned (or carbon taxes levied) then the revenue would be available to the government to offset the excess burden falling on poor households. However, if there is no revenue because the permits are “grandparented”, then the poorest households would suffer while the owners of the existing polluting firms would receive a windfall gain from the state.

The fact that poor households spend a higher proportion of their income on energy makes them more vulnerable to the inevitable rise in costs that action on global warming will entail. This situation also prevails in the UK (Smith, 1992). However, for some countries, such as Norway (Birkelund *et al.*, 1993) the opposite may be the case. Thus there is no EU

norm on how these measures are likely to affect economies and who is likely to carry the ultimate cost of necessary adjustment.

Effects on Specific Sectors and Companies

Any action on global warming, whether it be in the form of emissions trading or carbon taxation, will inevitably lead to higher costs of pollution. This will have an asymmetric impact across sectors, with energy-intensive sectors being relatively worse off. A report commissioned by IBEC's Climate Change Working Group considered the competitiveness implications of an increase in energy prices (Boyle, 2000). They constructed an index of energy costs as a percentage of the value of gross output. In 1997, while most sectors had a ratio of under 2 per cent implying a low degree of energy cost sensitivity, over 40 sectors had a ratio in excess of 2 per cent. In the same year, these sectors accounted for 16 per cent of industrial turnover, 27 per cent of industrial employment, 75 per cent of industrial energy use by value and 28 per cent of the industrial wage and salary bill.

It is possible to identify the five sectors that will be most affected by environmental policy, each with an energy cost ratio in excess of 10 per cent:

1. Production and Distribution of Electricity.
2. Manufacture of cement, lime and plaster, plaster products for construction purposes, mortars, fibre cement and other articles of concrete, plaster and cement.
3. Manufacture of basic precious and non-ferrous metals.
4. Manufacture of bricks, tiles and construction products in baked clay.
5. Manufacture of basic iron and steel and of ferro-alloys (ECSC), tubes; other first processing of iron and steel and productions on non-ECSC ferro-alloys.

Three of the above sectors are not very tradable internationally (electricity, manufacture of cement etc, and manufacture of bricks etc.). Assuming a tradable emissions policy is implemented on an EU-wide basis they would not be disadvantaged relative to other firms in the EU. The size and weight of the products produced by two of these sectors implies that it would not be attractive to relocate production in a country outside the EU, and export to Ireland. However, the other two sectors are internationally tradable, and the substantial increase in energy costs will prove problematic for them. Given the small size of the domestic market and the openness of the Irish economy, it is likely that the price elasticity of demand for these products will be quite high. Hence, if firms attempt to reflect the increase in energy costs with higher product prices, they will lose market share. Obviously, there is a limit to the magnitude of profit loss that firms will accept, and they will be left with the choice of relocating production to a country not covered by environmental regulation, or ceasing production altogether. Under these circumstances it could be necessary, with EU agreement, to extend special treatment to these sectors in the recycling of revenues, which was not taken into account in the IBEC study.

It is necessary to indicate that a few firms selling on an international market would require exemption or compensation. However, just because

a firm is a heavy energy user does not warrant special treatment. The issue is whether a sector or a firm faces serious competition from firms located outside the EU in locations where measures are not likely to be taken to deal with the global warming problem. However, such exemptions or compensations are likely to breach EU competition law, and it may prove difficult to obtain authorisation for these schemes.

It is too early to say how the distribution of income within farming might be affected by measures directed at that sector. What is clear is that many of the farms that are currently producing cattle already have low incomes and there remains the possibility that their incomes might rise if the appropriate incentive structure were put in place and they were able to shift production to alternative products offering superior returns.

If an emissions trading regime were introduced on a purely domestic basis, the competition implications would potentially be severe. In the current Irish situation over 40 per cent of carbon emissions come from the ESB and a very few other major firms. If emission rights were “grandparented” then, without trade, there would be no possibility of new entrants to the electricity-generation market and entry to other markets, such as cement, could also be restricted. Even if the quotas are auctioned and there is a possibility of trade, within the very restricted Irish market there still remains the “Bunker Hunt” possibility.¹² It could well be worthwhile for incumbents to pay over the odds for emission rights because, in so doing, they could prevent new entry into the market.

As discussed above, in the Irish context, the appropriate level at which to restrict emissions is likely to be the producers and importers of primary energy – the oil companies, BGE, the ESB, Bord na Mona etc. However, given the small size of the market and the distribution of trade across the existing major importers and producers, our conclusion is that it would not be possible to have a regime of tradable quotas purely restricted to an Irish market. So long as the limited number of market participants knew that the auction would involve a fixed total amount of quotas, there would remain the likelihood that, as well as restricting emissions, the regime would limit competition, with a potential serious additional unnecessary loss of welfare to the community.

The reason why such a quota regime potentially gives rise to anti-competitive practices is that the publicly available knowledge that the quota is fixed allows market participants to know that they can “corner” the market. Under a regime based on carbon taxes, where the state sets the tax and allows any quantity of emissions, provided that the tax is paid, it is not possible to “corner” the market – the market is open-ended. The best safeguard against such anti-competitive practices is to make the market sufficiently large that no individual player can afford to “corner” the market.

The situation will be very different if the regime involves a simultaneous introduction of EU wide (or world-wide) tradable emissions permits. This could involve either trading between governments or trading by authorised individual legal entities (such as importers or producers of primary energy). By extending the pool of potential traders, the potential

¹² Bunker Hunt tried to capture the world market in silver in the early 1970s in an attempt to drive up prices.

for a small number of individuals to capture the market would be greatly reduced.

In addition, by greatly increasing the number of players, the liquidity of the market would also be improved. In a purely Irish market, to ensure availability of adequate quotas over the full 2008 to 2012 period, many firms might feel that they would have to overbuy quota to ensure that they could meet all future eventualities. In a much larger and more liquid market firms would know that they could buy and sell quota as needed; there would always be sellers and buyers.

However, even at the EU level, there would be some substantial firms, such as the oil majors and some major energy utilities, which would be significant players in the market. As a result, there would probably still be some concern about dangers to competition and market liquidity. In particular, if the regime involved permits to emit which must be exercised within a certain time-scale (e.g. 2008 to 2012), the period coming up to the end of the regime could see possible disruption as a result of unexpected tightening (or weakening) of the market for permits.

Apart from the dangers of market dominance there is also an important issue relating to whether permits are auctioned or “grandparented”. Where they are auctioned throughout the EU the common market will ensure that all firms pay the same price. However, if some countries “grandparent”, or otherwise exempt particular industrial sectors or firms, this could operate as a very significant state aid. Such a development could prove a serious distortion to trade and seriously damage the single EU market. Thus it would seem important that where auctions are not the preferred allocation mechanism (or exemptions are granted), at an early stage in the implementation within the EU of the Kyoto protocol, state aid guidelines should be agreed that guard against this possibility.

3.5 An Alternative Eco-Tax Solution

There is a popular misconception about a tax based regime to control carbon emissions that it would involve higher prices for consumers and businesses than a quota based regime. As outlined above, a regime where quotas are required to import or produce primary energy and where these permits themselves are auctioned, would appear identical to a tax based regime for all households and all but a tiny minority of businesses. The cost of buying permits would be passed on to consumers and businesses in just the same way that the cost of taxes is. This is apparent in the case of excise taxes on oil where the vast bulk of consumers, businesses or households, just see higher prices. They never need be aware that the Customs and Excise authorities exist. Thus for nearly all economic agents the choice of regime will not be of any direct significance to them in their daily lives.

A regime in which the quotas applied to emissions in an individual year would appear very similar to a tax regime. In both cases there would be a substantial payment to the State and in both cases the cost of this payment would be paid in higher prices to final consumers of energy. However, there would be some significant differences:

- In the quota regime there would be a reasonable certainty of achieving a precise target reduction in emissions within a particular

year. In the case of a tax regime, uncertainty about the precise response of the economy in a particular year to a change in price (tax) would make it difficult to hit the target exactly. Depending on the penalties to be imposed for overshooting on emissions in a particular year, it might be necessary to aim to continually undershoot through raising taxes. However, the margin of error from one year to another is unlikely to be very great and, over a five year period it should be possible to approach a target level of emissions reasonably precisely through varying tax rates at least once or twice over the period.

- The administration for excise taxes is already in place, well understood and cheap to run. The administrative costs of any quota regime are likely to be higher, not just because it is new, but because of the need to develop and supervise a market in emission rights. The compliance costs for participants – the costs of making the market work – are also likely to be much higher than for an excise tax regime.
- Under a quota regime there will always be the danger that major players may be able to use undue market power. However, by providing some flexibility in the regime, making it impossible to “corner the market”, the danger could be significantly reduced.

Leaving aside the costs of administering and participating in any policy to reduce emissions and the potential for market distortions, for a given reduction in emissions, the cost to consumers (businesses and households) will be similar whether a tax or a quota regime is used.

3.6 Conclusions

The problem of global warming by its nature requires a multilateral co-operative solution. Despite the apparent breakdown in the multilateral agreement arrived at in Kyoto, due to the declared intention of the US not to ratify the Protocol, the European Union seems intent on pursuing “early action” by continuing with the agreed emission reduction targets. While Ireland has been given what appears to be a softer constraint than most other EU member states, reflecting its stage of development, the rapid economic growth during the last decade has meant that emissions of greenhouse gases have already greatly exceeded the target. The reconciliation of economic growth with environmental sustainability poses a significant challenge at any stage of development, but it is quite pronounced in Ireland at this juncture (see Clinch, 2001).

Sharing the burden of international action need not necessarily be viewed as a negative cost for Ireland, but rather as an opportunity to pursue policies that enhance the economy’s competitiveness, a critical determinant of living standards for a small open economy. International obligations have allowed desirable domestic policy actions to be undertaken. Examples include the liberalisation of markets under the EU Single Market and the prudent medium-term focus now given to fiscal policy as part of the single currency project. It is important for a country of Ireland’s size not to behave King Canute-like in trying to stop the waves but go with the flow.

The flow internationally is moving towards tradable permits as a mechanism to achieve emission reductions. This is a departure from the price based, environmental tax approach advocated for over a decade in Europe, and in particular in Ireland by the ESRI. This, however, is not a radical departure but is rather swapping one type of market mechanism approach for another. Indeed these need not even be mutually exclusive

approaches in practice, but for now a modest introduction of the proposal on permit trading would seem most fitting.

It is important that any scheme of tradable emissions permits be introduced on at least an EU-wide basis. An independent Irish scheme could seriously damage competition in important markets within Ireland. Such an international scheme should apply only to importers or producers of primary energy as it would be very inefficient to require all businesses to participate in such a market. It is important that any trading regime should cover all sectors of the economy. However, special provision would be needed for sectors that are both very energy intensive and face serious international competition. It is important that the tradable permits be sold rather than given away (“grandparented”). The revenue can then be used to reduce other taxes and to ensure that poor households, that may be adversely affected by an emissions trading regime, are effectively compensated.

Early mover advantages can accrue to national permit trading systems in influencing the design of the advocated pan-European trading system and by giving domestic firms the opportunity in a transition period to configure activities appropriately. If the required actions are part of a “no regrets” strategy, that is the adjustments were worth pursuing for other reasons anyhow, then this approach is a limited risk one. The main concerns will relate to the distribution of the costs and benefits but also to the impact on the economy’s competitiveness. These are not insurmountable constraints with careful design and implementation of a sensible emission reductions policy (Bohm, 1999).

Changing behaviour is the key to success of any policy intervention. Even the advocates of a “wait and see” approach as part of a policy of optimal inertia realise that there comes a time when decisive action is desirable. Such a time may be upon us in Ireland to trade in the old model and start anew with a tradable permits approach. However, as this paper has tried to highlight there are issues that need more research before any radical departure is undertaken.

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