ELSEVIER

Energy Economics 23 (2001) 371–386

Energy Economics

www.elsevier.com/locate/eneco

Allocation of carbon permits within a country: a general equilibrium analysis of the United Kingdom

T. Huw. Edwards[a,1,*], John P. Hutton[b]

[a] *Centre for the Study of Globalisation and Regionalisation, University of Warwick, Coventry CV4 7AL, UK*

[b] *University of York, Heslington, York YO1 5DD, UK*

Abstract

The Kyoto agreement includes international trade in carbon permits from 2008. We have used a CGE model to evaluate methods of allocating permits within the UK. Auctioning is broadly similar to a carbon tax, with revenues recycled to reduce other distortions. 'Grandfathering' some permits free to large firms would mean a loss of recycling and, possibly, give windfall profits to foreigners. Alternatively, regularly revised allocation, using 'best practice' estimates, would be similar to recycling revenue as an output subsidy. Such a system could allow much of the potential 'double dividend' to be realised, though an auction system might still be preferable.

JEL classifications: D58; Q25

Keywords: Carbon permits; General equilibrium

1. Introduction

The high potential costs of controlling pollutants by quantitative means[2] has led to growing interest in economic instruments. There is a considerable literature on

* Corresponding author.

[1] Formerly honorary research fellow, University of Birmingham.

[2] A sample of US studies of command and control policies for sulfur, nitrogen, particulates, aerosols and noise pollution, surveyed by Tietenberg (1990), showed costs ranging from 1.72 to 22 times the least cost solution. Only one study showed costs 1.07 times the hypothetical least cost level.

0140-9883/01/$ - see front matter
PII: S0140-9883(00)00077-3

both the theory and practice: for example on the development of trading schemes for sulfur emissions in the USA from the 1970s onwards[3,4] and over potential sulfur emission trading in Europe.[5] Smith (1998) discusses the Swedish scheme for controlling NO_x emissions.

Tietenberg (1990) stresses that economic controls are much more straightforward for uniformly mixed pollutants, such as carbon dioxide. The early literature[6] concentrated on carbon taxes, and carbon or carbon/energy taxes have been introduced, or are under discussion, in many European countries, following the 1997 Kyoto agreement on limiting greenhouse gases.[7] However, following pressure from the USA, Kyoto also includes provisions for countries or firms to trade their agreed quotas in an international market, following on an international scale the example set by sulfur trading in the USA.

For a global pollutant, such as carbon dioxide, a system of auctionable permits works in many ways like a carbon tax, although it is the total volume, rather than the marginal abatement cost, which is fixed. However, a permit scheme has various advantages, particularly if it allows for international trading.[8] Unlike a carbon tax, permits can be saved for future use — which makes sense given that carbon is a long-lasting global pollutant — allowing users greater choice over the intertemporal path of consumption, and making possible a futures and options market (see Cramton and Kerr, 1998).

This paper examines various internal economic instruments for a country to control carbon emissions: these include a carbon tax, a fully-auctioned permit system, or systems of allocating tradable permits to certain energy users. We concentrate on the United Kingdom, and employ a numerical simulation using a computable general equilibrium (CGE) model. Applicability to other countries will, of course, depend on the economic structure and pre-existing distortions.

1.1. Carbon permit allocation in the United Kingdom: the Marshall report

Lord Marshall's report (Marshall, 1998) to the UK government on *Economic instruments and the business use of energy* recognises that a major argument for a permit scheme is that potential international trading could allow extra cutbacks in pollution to be made in those countries which have the lowest marginal abatement costs, and 'sold' to countries with higher marginal abatement costs. In theory, this

[3]See Baumol and Oates (1971) for a discussion on the relative merits of price- and quantity-based controls.

[4]See, for example, Tietenberg (1999) or the SEO report (SEO, 1998) for a discussion on the practice of such schemes.

[5]See Klaassen's study (Klaassen, 1996). Sulfur trading schemes are more complicated in some ways than carbon permit trading, due to the fact that the location where the sulfur is emitted has a significant effect on the costs it imposes.

[6]See the review in Clarke et al. (1996).

[7]For example the UK government announced in the 1999 budget its intention of introducing a business energy tax from 2000.

[8]Though Barrett (1998) points out there are drawbacks to the international trading of quotas.