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Analysis

Public acceptability of personal carbon trading and carbon tax

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ABSTRACT

Climate change is one of the greatest challenges confronting the international community requiring action to achieve deep cuts in carbon emissions. The implementation of potentially uncomfortable but necessary policy measures is, though, critically dependent upon public acceptability. This paper reports a novel application of stated preference techniques to explore the influence of key design attributes on the acceptability of a personal carbon trading scheme in isolation and when compared to a carbon tax. Illustrative forecasts from the models developed indicate the importance of design attributes, especially the basis of the initial permit allocation for personal carbon trading and the use to which revenues are put for carbon tax. Results indicate that the "best" scheme designs could be acceptable to a majority of respondents.

1. Introduction

In the light of compelling evidence of the need to make very deep cuts in greenhouse gas emissions (IPCC, 2007; Stern, 2006), the UK Government has committed to an 80% cut by 2050 relative to 1990 levels (Climate Change Act, 2008). Transport and domestic energy are the only sectors where emissions in 2006 exceeded those of 1990 (DECC/Defra, 2009) and together personal transport and domestic energy account for 42% of UK CO_2 emissions (DTI, 2007). This scenario is typical of the challenges facing many developed countries.

Personal carbon trading (PCT) offers a potentially powerful and innovative instrument with which to achieve demanding reductions in carbon emissions and has aroused interest at national government level in the UK (Defra, 2008a). PCT is a downstream trading mechanism normally understood to involve an initial allocation of carbon permits to individuals based on carbon reduction targets, with individuals able to buy and sell permits according to their desired carbon consumption and prevailing permit prices. However, the precise structure of a scheme could vary considerably given the potential range of additional design features including management of individual carbon accounts, market operation, regulation, permit allocation, scope of coverage and transaction costs. Policy makers would be interested in which scheme designs have the greatest acceptability amongst the general public.

PCT's natural downstream comparator policy instrument is the conceptually familiar carbon tax (CT) applied to consumer products. In accordance with Weitzman (1974), tradable permits and taxes are theoretically equivalent in terms of both efficiency and effectiveness. It is better to fix the price through a tax where there is uncertainty over the cost function and to fix the quantity through a tradable system when there is uncertainty over the damage function (Montero, 2002; Pizer, 2002). Recent work on trading and tax has looked at political economy aspects and concentrated on welfare effects and political acceptability (e.g. Babiker et al., 2003; Brannlund and Nordstrom, 2004; Crals and Vereeck, 2005; Dinan and Rogers, 2002; Parry and Small, 2005; Pezzey, 2003; West and Williams, 2004). The use of collected revenues and the way permits are allocated have been identified as the main determinants of distributional impacts and consequent political acceptability.[1]

In the specific case of personal transport and domestic energy usage the theoretical case for permits over tax might then depend upon: the presence of a steep damage function where the costs of error are high, relative sensitivity to price and quantity signals, heterogeneity amongst consumers and the relative acceptability of different measures (Raux, 2008).

In the context of climate change the damage function is uncertain and potentially steep with high costs of missing abatement targets; price elasticities of demand for both vehicle fuel and domestic energy are low (Baranzini et al., 2000; Brons et al., 2008; Dimitropoulos et al., 2005). There is a high degree of variation in emissions levels within as well as between countries (Brand and Boardman, 2006; Druckman and Jackson, 2008; Ermoliev et al., 2000). All these aspects combine to push the arguments towards tradable permits. Whilst the set up, administration and management costs of such a scheme are

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[1] For a complete account of theoretical differences and equivalence between the two schemes please see Pezzey (2003) and Crals and Vereeck (2005).

anticipated to be high, they might be expected to fall over time as in the case of road user charging systems (Raux, 2008), but are still likely to be higher than the costs of implementing a CT. The arguments in favour of CT generally focus on the clarity of the price signal, the ease of implementation and the generation and use of revenues for distributional purposes (Baranzini et al., 2000).

Individual involvement in environmental policy has been advocated in various recent studies (Ahlheim and Schneider, 2002; Israel, 2007; Malueg and Yates, 2006; Rousse, 2008; Shammin and Bullard, 2009). A PCT scheme appears to have the potential to target individually generated carbon emissions by taking into account source heterogeneity and providing visibility to fuel and energy consumption.

However, whilst theory might provide some insights into the attractiveness of PCT and CT, it is ultimately personal preference that determines their acceptability and the impact of specific scheme features on this acceptability. Some PCT scheme designs might be regarded as fairer (for example, with respect to the way permits are allocated) and allowing more personal choice (for example, the ability to bank permits for the future or retire them) but at the expense of lesser privacy and being administratively more burdensome. Perceived effectiveness might also influence acceptability.

These are empirical questions that this novel research seeks to answer through the application of stated preference (SP) methods in what, as far as we are aware, is the first study of its kind. We note that the statement of Roberts and Thumin (2006) that "little study (if any) appears to have been devoted to exploring more fundamental questions such as the basis on which the public might judge the acceptability of a scheme" has since been echoed by the UK Environmental Audit Committee (House of Commons, 2008) and Kerr and Battye (2008).

2. Experience to date

Researchers have examined the potential for the introduction of tradable permits in the transport and/or domestic energy sectors and in some cases economy wide (Defra, 2008a; Dresner and Ekins, 2004; Fleming, 2005; Harwatt, 2008; Hillman, 2004; Niemeier et al., 2008; Raux, 2008; Starkey and Anderson, 2005; Verhoef et al., 1997; Wadud et al., 2008; Zanni and Bristow, 2009). These studies have focused on theory, implementation, distributional effects, scheme design and to a lesser extent behavioural response.

A small but growing number of studies, largely in the UK, have addressed the acceptability of PCT and in some cases CT (Bird et al., 2009; Capstick and Lewis, 2009; Energy Saving Trust, 2007; Harwatt, 2008; Howell, 2008; Jagers et al., 2009; Owen et al., 2008; Von Knobelsdorff, 2008; Wallace, 2009; YouGov, 2006a,b). Approaches vary from highly qualitative focus groups and in-depth interviews to postal and internet surveys and national polls. Support for PCT lies in the range 25 to 47%.[2] Most of these studies do not use hypothecation or revenue recycling in the CT option nor do they mention the higher costs of PCT. Nevertheless, this level of expressed support for what is after all a very unfamiliar idea provides a promising base from which to explore acceptability. Polling evidence suggests that support for green taxes increases with hypothecation of revenues, especially if directed to tax cuts and environmental or energy expenditures, when support can exceed 70% (BBC, 2007; Green Fiscal Commission, 2007; Ipsos Mori, 2006; YouGov, 2006c). However, most work to date on the acceptability of PCT or CT has asked for responses to fixed designs. No studies to date have systematically explored the impact of varying design features on acceptability.

It therefore seems sensible to draw from and build upon the experience accumulated over many years from studies of public acceptability of road user charging schemes (Jaensirisak et al., 2005). Here the key lesson is that SP methods are highly suitable, since 'policy packages' can be composed as a selection of clearly specified, relevant scheme attributes whose levels are varied in a controlled manner to allow, through appropriate statistical analysis, the estimation of how the different levels of each of the scheme attributes influence overall acceptability.

3. Survey design

We here provide a brief description of the SP method which involves a series of choices between two hypothetical PCT scenarios or hypothetical PCT and CT scenarios, and then we set out the attributes and levels used to characterise PCT and the CT within these SP experiments and the reasons for their selection. We then detail the experimental design. The initial scheme descriptions presented to respondents are shown in Appendix A.

3.1. SP methods

SP experiments offer respondents a series of hypothetical scenarios each made up of two or more options. In turn, these options are composed of relevant attributes and the evaluation of the options, by the respondent expressing a preference for one option over the other(s), indicates the importance attached to each attribute. The statistical analysis of the responses supplied serves two broad purposes. It reveals the utility weight attached to each attribute, which is central to decisions relating to product design and willingness to pay, and it underpins the forecasting of behavioural response to new products or amended designs and prices.

SP methods can take the form of ranking, rating or choice exercises, with the latter now dominating and typically offering between 8 and 12 choices between two options each characterised by between 3 and 5 attributes. Their background lies in marketing research and over the past 40 years there has been extensive application to consumer goods and services in a wide range of market settings, with increasing application in recent years to non-traded products such as environmental goods and general 'quality of life' factors. We are here interested in its novel application to non-market products, in this context relating to policy measures which were also the subject of early applications (Donnelly et al, 1976; Eberts and Koeppel, 1977; Hoinville, 1971). However, we are not aware of any previous application of SP to assess the acceptability of PCT or CT schemes.

3.2. PCT design attributes

Some elements of scheme design were fixed, including the free annual carbon allowance of 4 tonnes of CO_2 per person, similar to the actual average level of 4.25 tonnes (DTI, 2007). All respondents completed the "ACT on CO_2" carbon calculator (Defra, 2007a) to estimate their emissions from domestic energy and transport.[3] Thus all respondents were aware of their starting point with respect to emissions and hence the impact of the proposed scheme on them personally.

The attributes and levels selected to compose PCT schemes, with the wording used in the survey, are given in Table 1. Note that in many cases we have no a priori expectations of the relative importance of the different attribute levels due to the novelty of the schemes and since individuals' circumstances vary as will the extent to which individual or social considerations might influence preferences. In determining the levels for different attributes we sought to capture the range of proposals in the literature and in some cases to offer more extreme variants to generate a wide range of attribute levels and responses.

[2] This excludes two highly qualitative pieces, with non-representative samples that report very high levels of support at 77% and 91% and a national poll with 61% support where the question was perhaps not sufficiently representative of PCT.

[3] The carbon calculator does not include bus, rail or tram emissions, but as these amount to only 2% of total transport emissions this was an acceptable limitation.