DESIGNING AND IMPLEMENTING A TEST OF BEHAVIOURAL RESPONSE TO PERSONAL CARBON TRADING AND CARBON TAXES

Abigail L Bristow and Alberto M Zanni

Transport Studies Group, Department of Civil and Building Engineering

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Loughborough University

Structure of the Presentation

1. Introduction, context and objectives of the study
2. Methodology
3. Survey design and challenges
4. Sample characteristics
5. Response to policy options
6. Conclusions and discussion

Context of the Study

- Personal Carbon Trading scheme identified as a potentially powerful tool to achieve reduction in personal carbon consumption
- Recent interest by the UK government
- Comparison with more traditional tax instrument
- Pioneer scheme creating important research opportunities
- Research funded by the UK Royal Society for the Encouragement of Arts, Manufactures and Commerce (RSA)

Objective of this paper

- This paper explores the behavioural response in terms of transport and domestic energy usage to a Personal Carbon Trading and a Carbon Tax scheme
- The main aim of this paper is to identify the behaviours likely to be affected and the potential magnitude of change.

Personal Carbon Trading

Core elements of a PCT scheme are:

- An initial free allocation of carbon to all individuals
- Over time this allocation is reduced in order to meet targets – the time element is not addressed here
- The ability to buy and sell carbon as needed

Methodology

Design of the survey

- Assessment of respondents' current carbon consumption
- Definition of allowance
- Provision of a list of carbon saving actions
- Definition of monetary incentive
- Definition of policies

Data collection

- Citizen Forum
- Computer Assisted Personal Interviews

Analysis of responses

- Descriptive statistics
- Simple econometric tools

Design of the Survey: Carbon Footprint and Allowance

- Assessment of respondents' current carbon consumption ("carbon footprint") employing the UK Department for Environment, Food and Rural Affairs (DEFRA) 'ACT on CO_2' carbon footprint calculator
- Individual allowance set at 4 tonnes of CO_2 per year, lower than the average in the UK
- Consequent identification of below or above allocation respondents

Design of the Survey: List of Carbon Saving Actions

Necessity of pre-defining a list in order to:

- Enable an estimate of potential CO_2 saving for each action
- Avoid respondents suggesting broad range of actions

List was first presented to respondents in order to identify:

- Actions that are not relevant
- Actions in which respondents are already engaged
- Actions that are relevant

Design of the Survey: Definition of Policies and Monetary Incentives

- Three levels of price per tonne of CO_2 (£50, £100, £250), higher than recent estimates but selected to provide a clear price incentive
- Personal Carbon Trading and Carbon Tax mechanisms defined as to create equivalent monetary incentives
- Marginal and total incentives are equal
- ½ respondents receive Carbon Tax, ½ respondents receive Personal Carbon Trading

Implementation of the Survey

- Pen and paper survey with 79 respondents at the Cardiff Citizen Forum (January 2008)
- CAPI survey with 208 respondents in different locations in South – East England (May/June 2008)

Carbon Footprint and Perception

- 5.6t of CO_2 average Carbon Footprint for combined sample (2.3 Home, 0.9 Appliances, 2.4 Transport)
- Respondents perceive reduction in transport energy usage more difficult than in home energy

Actions respondents are already engaged in

- Most respondents already engaged in: turning off lights when leaving rooms (73%), using washing machine for full loads only (64%), switching equipment at the socket (59%) and turning down thermostat in winter (55%)
- 25% of respondents are engaged in reducing their car usage and/or fuel consumption
- Around 15% of respondents are reducing their flying
- Few respondents are already using domestic energy generating devices, more have insulation

Actions that are not relevant

- Most of non-relevant actions are transport related: respondents who do not have a car, respondents who do not fly
- Energy saving technology actions are not relevant for respondents who are tenants

Response to policy option: Stated Intent to reduce/not reduce Carbon Footprint

Respondents were asked (example):

Your current carbon footprint in 6.0 tonnes. The allowance is 4.0. The price for carbon permits above the allowance is £100 per tonne of CO_2

If you do not change your behaviour you would need to purchase permits and pay £200 per year

What would you do?

1. *I would not reduce my carbon footprint and I would buy extra carbon permits for the entire amount*
2. *I would reduce my carbon footprint and reduce the amount of permits I would have to purchase*

Stated Intent: Results (1)

Location and policy	Above Allowance		Below Allowance		Total	
	Change	No change	Change	No change	Change	No change
South East						
PCT	35 (71)	14 (29)	40 (78)	11 (22)	75 (75)	25 (25)
Tax	54 (83)	11 (17)	32 (74)	11 (26)	86 (80)	22 (20)
Cardiff						
Tax	49 (88)	7 (12)	16 (73)	6 (27)	65 (83)	13 (17)

Response to Policy Options: Magnitude of Saving

- Respondents who selected 'I would reduce my carbon footprint' were asked to indicate which actions they would be willing to engage in to do so.
- Only actions which were relevant to them were shown
- Actions they were already engaged in were shown if it was possible to further reduce CO_2 (for example car mileage)
- Their total CO_2 and monetary saving (in terms of permits/tax) were then calculated (in real time in the CAPI version)

Magnitude of Saving: Results - SE Sample

Description	CT	PCT
Initial average carbon footprint	5.59	5.58
Reductions for those who made changes		
In Transport use	0.59 (17.6)	0.91 (40.0)
In Energy in the home	0.61 (21.0)	0.71 (25.1)
Any changes	0.84	1.26
Reductions all respondents		
Transport	0.26 (11.5)	0.36 (15.6)
Energy in the home	0.38 (13.0)	0.44 (15.6)
Overall	0.62	0.80
Average new carbon footprint (all respondents)	4.97	4.81
Average % saving for those who made changes only	16.25	25.4
Average % saving (all)	12.0	16.0
Number who changed	81	65

Fairness and effectiveness

- Respondents believe PCT is fairer than CT
- Respondents believe the two schemes would have similar impact on their behaviour

Acceptability

Acceptability	CT	PCT
Early Question		
Yes	46 (22)	89 (43)
No	109 (52)	43 (21)
Don’t know	53 (26)	76 (36)
Repeat Question		
Yes	71 (34)	90 (43)
No	92 (44)	71 (34)
Don’t know	44 (21)	46 (22)

Summary and Discussion

- Respondents believe it is more difficult to make carbon saving in transport than in domestic energy usage
- A higher proportion of respondents say they will change behaviour in response to CT than to PCT
- But, among those who change, savings are higher (50%) in response to PCT.
- Evidence is therefore mixed

Policy Recommendations

- Small behavioural changes are preferred to large shifts in behaviour or energy efficient products. Large investments require further education with respect to unfamiliar products
- Emissions reduction of around 20% could be achieved. This will require support
- Further reduction will require profound lifestyle and/or technological change

To Conclude

- Study is exploratory, and findings have to be treated with caution
- There is scope to improve the mechanisms of the survey with respect to carbon footprint and energy saving actions
- There is scope to improve realism of survey instrument
- There is a remaining challenge to formulate a Stated Preference design to address behavioural changes

List of Carbon Saving Actions: Transport

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Carbon Saving Actions Information on savings and costs	CO_2 (Tonnes)	Purchase cost (£) + payback	Approximate Saving per year (£)
Reduce your car usage by …miles per year	0.03t per/100 miles	nothing	14 p/100 miles
Reduce your car fuel consumption by around 10% (eco-driving, no aircon, 60mph on m'way, etc.) (saving for average mileage)	0.3t per/year	nothing	125
Buy a more fuel efficient car - (saving for average mileage)	0.6t per/year	depending on model	250
Reduce the number of domestic return flights (UK) by…per year	0.15t per/return fight	nothing	price of ticket
Reduce the number of short haul international return flights (Europe) by…per year	0.3t per/return fight	nothing	price of ticket
Reduce the number of long haul international (Intercontinental) return flights by…per year	1.4t per/return fight	nothing	price of ticket

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List of Carbon Saving Actions: Energy Usage

Carbon Saving Actions Information on savings and costs	CO_2 (Tonnes)	Purchase cost (£) + payback	Approximate Saving per year (£)
Turn your thermostat down by …degrees in winter	0.3t per/degree	nothing	30/60
Switch electrical equipment off at the socket to avoid “stand by” – (saving per year per household)	0.2t per/year	nothing	25/55
Use washing machine for full loads only and dry hanging your clothes (no tumble dryer) – (saving per year per household)	0.2t per/year	nothing	25/55
Turn off lighting when leaving rooms – (saving per year per household)	0.04t per/year	nothing	10/30
Taking shorter showers	0.15t per/year	nothing	20/40

List of Carbon Saving Actions: Energy Saving Technology

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Carbon Saving Actions Information on savings and costs	CO_2 (Tonnes)	Purchase cost (£) + payback	Approximate Saving per year (£)
Install solid wall insulation - external and internal	1.7t per/year	From 3,750 (5 years)	400/600
Install floor insulation	0.3t per/year	From 150 (2 yrs)	30/60
Install solar thermal water heating	0.3t per/year	From 4000	30/60
Install solar photovoltaic panels	1.0t per/year	From 6,500	150/200
Replace old boiler with more efficient one (condensing)	0.8t per/year	From 2,000	75/125
Install double glazing	0.7t per/year	not available	70/110
Install a ground source heat pump	2.0t per/year	From 12,000	500/700
Install a micro wind-turbine	0.6t per/year	From 1,500	75/125

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