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Choice Experiments Informing Environmental Policy: A European Perspective

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Introduction to the book

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Background

The Choice Experiment Method (CEM) is a Stated Preference Method (SPM) of environmental valuation, adopted from marketing and transport economics literature (see for example, Louviere and Hensher, 1982; Louviere and Woodworth, 1983; Louviere 1988; Louviere 1992). Similarly to the other SPM, namely the Contingent Valuation Method (CVM), CEM can elicit the total economic value (i.e., both use and non-use values) of non-market environmental goods, which can in turn be used to inform the design of efficient and effective policies for their sustainable management and conservation.

The CEM has a theoretical grounding in Lancaster's characteristics theory of value (Lancaster, 1966), and an econometric basis in models of random utility (Thurstone 1927; Manski, 1977). Consequently, this method is based on the notion that any environmental good can be described in terms of its characteristics, or attributes, and the levels that these attributes take (with or without a policy change). Once attributes and their levels are identified, experimental design theory is used to generate different profiles of the environmental good in terms of its attributes and levels these attributes take. These profiles are then assembled in choice sets, which are presented to the respondents, who are asked to state their preferences in multiple occasions. Hanley et al. (1998) define the CEM as a highly 'structured method of data generation'.

One of the attributes which is typically included in a choice experiment study is a monetary cost/benefit attribute. The monetary attribute and the random utility framework on which the CEM method is based allow for the estimation of welfare estimates, i.e., willingness to pay (WTP) or willingness to accept (WTA) compensation, for changes in the levels of environmental attributes (Hanemann, 1984). Specifically, the CEM can provide four types of information about the values of environmental goods: (i) which attributes are significant determinants of the values that stakeholders (e.g., local or national public, farmers, visitors to a recreational site) place on environmental goods; (ii) The implied ranking of these attributes amongst the relevant stakeholders; (iii) The value of changing more than one of the attributes at once; and (iv) The total economic value of an environmental good (Bateman et al., 2003).

Since the first application of the CEM to environmental management problems by Adamowicz et al. (1994), there has been increasing interest in the use and development of this method both by academics and practitioners. A vast majority of the earlier choice experiment applications to environmental issues were implemented in North America and Australia (see for example Boxall et al., 1996; Adamowicz et al., 1997; Morrison et al., 1999; Rolfe et al., 2000), as it is evident from the four published books on theory and practice of the CEM by North American and Australian academics (Louviere et al., 2000; Bennett and Blamey, 2001; Hensher et al., 2005; Kanninen, 2007). In the recent years, however, there has been an increasing number of applications of this method in European countries, as presented in this volume, and most recently several noteworthy choice experiment studies have been carried out in developing countries (see for example, Scarpa et al., 2003a,b; Othman et al., 2004; Naidoo and Adamowicz, 2005; Bienabe and Hearne, 2006).

The popularity of the CEM is increasing rapidly as a result of the various advantages this method possesses over the CVM, as well as over the Revealed Preference Methods (RPM, such as the Hedonic Pricing Method and the Travel Cost Method). Advantages, as well as disadvantages of the CEM are discussed in great detail in Hanley et al. (1998), Louviere et al. (2000), Bennett and Blamey (2001), Bateman et al. (2003). The following paragraphs provide a summary of the main advantages of CEM over CVM and RPM.

The main advantage of CEM over CVM lies in its ability to measure the value of the attributes that make up the environmental good. Since environmental policies are generally concerned with changing the levels of attribute quantity or quality, rather than losing or gaining the environmental good as a whole, this advantage of the CEM makes it preferable over the CVM for informing environmental policies. Moreover, the ability of CEM to decompose the value of the environmental good into the value of its attributes, makes this method more applicable to benefits transfer compared to the CVM (Hanley et al., 1998; Bateman et al., 2003).

The CEM also avoids several of the biases prevalent in CVM. Response difficulties in CVM (e.g., 'yeah-saying' bias in dichotomous choice contingent valuation studies and the difficulty of stating a value in a open-ended contingent valuation) can be avoided in CEM. This is because respondents are more familiar with the choice approach; the levels of the monetary attributes are already specified in the choice sets and respondents get repeated sets of choices in which they can reveal their preferences. The strategic bias is also minimised as the monetary values are already defined in the choice sets and hence the respondents cannot over or understate their true valuation. In addition, insensitivity to scope is eliminated, particularly if the choice sets presented the respondents are complete and carefully designed, respondents might not

mistake the scale of the good or its attributes for something else that it could be embedded in. Finally, since levels of the monetary attribute are already predetermined and contained in choice experiments, the large discrepancies between WTA and WTP values found in CVM (Kahneman, et al., 1990) can be avoided in CEM.

The CEM also has several advantages over the RPM. Most importantly, unlike RPM, the CEM can elicit the values of non-market environmental goods that have no related or surrogate markets. A major drawback of using RPM is that because the attributes and attribute levels of the environmental good do not vary over time in a single cross-section, the value of changes in the quality or quantity provided of the environmental good are difficult to estimate. Coefficients on attributes in models estimated from choices in actual settings provide only limited predictions of the impact of changing policies (Louviere et al., 2000). In other words, the new situation (after the change in the quality or the quantity of the environmental good) may be outside the current set of experiences. Thus, simulation of the new situation generally involves extrapolation outside the data range used to estimate the model (Adamowicz et al., 1994). CEM can be designed to cover a wider range of attribute levels in cases where revealed data do not encompass the range of proposed quality or quantity changes in the attributes of an environmental good. In other words, the CEM can be used to consider an array of policy options and states of the world that are fundamentally different than the existing ones.

Another common problem with RPM is the multi-collinearity among multiple attributes, generating coefficients with the wrong signs or implausible magnitudes, and making it difficult to separate attribute effects (Greene, 2000; Louviere et al., 2000; Freeman, 2003; Hensher et al., 2005). Separation of these attributes may be necessary, however, in order to accurately represent benefits and costs in policy analysis

(Adamowicz et al., 1994). The CEM eliminates multi-collinearity among the attributes since in experimental designs attribute levels are designed as orthogonal (Bateman et al., 2003).

The aim of this book is to draw attention to the wealth and diversity of several recent state-of-the-art choice experiment studies that have been undertaken in Europe in the last few years. The main emphasis of the book is to highlight how this method can be employed to inform environmental, agricultural, natural resource management and food policies at the European Union (EU) level. Case studies presented in this volume are from eight countries across the EU, including France, Finland, Greece, Ireland, Italy, Poland, Spain and UK, and cover a wide array of issues ranging from landscapes, biodiversity, cultural heritage, noise pollution, forests and water resources to food labelling. The findings reported in this book reveal that the monetary cost and benefit values captured through the CEM for various stakeholders can be used to inform efficient, effective and equitable design and implementation of various EU level policies and directives, such as Common Agricultural Policy, Water Framework Directive, Forestry Strategy, Habitats Directive and food labelling systems to name a few. Finally, the book also presents some of the most recent developments in the choice experiment theory and analysis, as well as several interesting and cutting edge applications of these developments.

Structure of this book

This book aims to be comprehensive with respect to several environmental, agricultural and natural resource management issues that can be tackled with the CEM, as well as with respect to the EU level environmental, agricultural, natural resource management

and food policies that can be informed using this method. Following chapters of this volume are summarised below.

Next chapter by Birol, Koundouri and Kountouris provides an extensive, however by no means exhaustive review of choice experiment studies undertaken in EU countries to date. The aim of the review is to present the current status of the choice experiment applications in the EU, with details on the environmental goods and their attributes valued; monetary values obtained; implications for the design of EU directives and regulations; econometric models and survey modes employed in each study. To this end, choice experiment applications covering a wide array of environmental, natural resource, agricultural, food and energy issues, implemented in various EU countries are reviewed. Moreover, the EU level environmental, natural resource, agricultural, food and energy policies, directives and regulations, which these choice experiment studies aim to inform are introduced.

Following four chapters present choice experiment studies which aim to inform those EU level regulations and Directives pertaining to rural landscape management. In chapter three Campbell, Hutchinson and Scarpa estimate the benefits the Irish public derives from the Rural Environment Protection (REP) Schemes. REP Schemes were developed following the Agri-environmental Regulation EC No. 2078/92, which states that all EU countries should “support agricultural production methods that are environmentally friendly and aim conservation of the rural areas”. Public WTP was captured for improvement of eight important landscape attributes under the REP Schemes: wildlife habitats; rivers and lakes; hedgerows; pastures; mountain land; stonewalls; farmyard tidiness and cultural heritage. Results of this study disclose that there is a considerable range in the values that the public derive from the landscape improvement measures under the REP Scheme, and overall the attribute most valued is

rivers and lakes, and the attribute least valued is hedgerows. When the individual-specific WTP estimates are contrasted with the average cost of the REP Scheme across the Irish adult population, the results indicate that the Scheme contributes substantial benefits to rural landscapes. The results of this chapter can also be used to inform decisions concerning the allocation of resources for each of the landscape attributes.

In chapter four Johns, Hanley, Colombo and Özdemiroğlu investigate the public's valuation of various landscape attributes of Severely Disadvantaged Areas (SDAs) in England. SDAs are classified under 'Less Favoured Areas', where following the EU Council Directive 75/268/EEC on mountain and hill farming, farmers receive Hill Farm Allowance (HFA) payments. HFA payments aim to compensate farmers for adverse geographical conditions and encourage conservation of landscape attributes. The aim of this chapter is to inform the revision of these payments in England. Consequently, local/regional residents' and visitors' valuations of five landscape attributes are estimated in seven regions, six of which hold SDAs. The attributes included in this choice experiment are heather moorland and bog; rough grassland broadleaf and mixed woodland; field boundaries and cultural heritage. Results of this chapter reveal that overall the public is WTP for improvements in the upland attributes, and the attribute that generates the highest benefits is the cultural heritage attribute. There are, however, significant variations in valuations across the regions, which should be taken into consideration when revising the HFA payments to farmers in these SDAs.

In chapter five Dachary-Bernard examines the tourists' and main home and second home residents' preferences for various landscape attributes to inform agri-environmental schemes in Brittany, France. Landscape attributes including moorland, hedged farmlands and farm buildings are valued. Findings reveal that values derived from these landscape attributes differ across the three stakeholder groups: Tourists have

the highest WTP for modern farm buildings to be well concealed, main home residents prefer moorland with trees the most; and second home residents have a high WTP for dense hedged farmlands. When the valuations of these attributes are aggregated over the relevant stakeholders for various landscape conservation programmes, the programme which promotes densely hedged farmland, well concealed farm buildings and moorland with a lot trees generates the highest total benefits. These results have important implications for landscape management policy in Brittany, which currently promotes clean and trimmed moorlands.

The final case study on landscape management is by Loureiro and López, who investigate the tourists' preferences for various landscape attributes in Galicia, Spain. Tourists' WTP was estimated for four landscape and cultural attributes, namely historical-cultural heritage; traditional customs, food products, and rural settlements; local environment, and agro-forest landscape. The results disclose that tourists derive the highest benefits from protection of the local environment (maintaining rivers clean, cleaning open spaces, and collecting and recycling waste), followed by protection of the traditional agro-forestry landscape (including wine terraces, autochthonous forests, and autochthonous livestock). These findings are informative in formulation of agri-environmental policies, which aim to sustain rural settlements and conserve rural landscapes, in the area.

The choice experiment method is applied to inform food policy in chapter seven

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Dr. Yabe. Consumer preferences for attributes of a food product, namely eggs, are investigated for several production attributes, such as health quality certification label, living conditions for hens and pesticide use in feed production. Specifically, this chapter elicits the preferences of UK consumers for eggs that may have been derived from chickens fed with animal feed that contained varied percentages of genetically modified organism (GM) content. Motivational and attitudinal drivers of food consumer behaviour were also introduced in the analysis. The findings of this study reveal that there is considerable heterogeneity with respect to preferences for GM foods. Three distinct and coherent consumer segments are identified with varying levels of consumer aversion towards GM foods. The authors conclude that there are strong welfare enhancing arguments for extending the EU labelling regime to include food products derived from animals fed with GM feed, as well as for the establishment of viable separate production tracks. These results, however, also imply that there isn't sufficient market segmentation to support a policy change of reducing the percentage of allowable traces of GM foods in non-GM certified foods substantially below the current minimum threshold of adventitious contamination level of 1%.

Following three chapters present choice experiment case studies on various aspects of forestry resources management. In chapter eight Horne assesses the role and acceptability of various policy instruments in forest biodiversity conservation on privately owned forest lands in Southern Finland. Public's valuation of and the trade-offs they make between different elements of forest biodiversity conservation such as the percentage of forest protected, employment impacts and the policy instruments were estimated. Specifically, three kinds of policy instruments were studied: acquisition of private land by the state; conservation contracts with the private land owners and

advising and planning. Similarly to chapter seven, the public is segmented on the basis of their attitudes, this time towards nature conservation, and the impact of their attitudes on their preferences and welfare distribution are examined. Even though results disclose considerable heterogeneity between the different attitude segments' preferences for forest biodiversity conservation, overall there was consensus in the choice of the conservation policy instruments. Those policy instruments based on voluntariness of forest owners, i.e., advising and planning and conservation contracts, were preferred to a more authoritarian approach of land acquisition.

In chapter nine, Riera, Mogas and Bennett estimate the value of several attributes of forests in Catalonia, Spain, to help inform afforestation programmes. Values of recreational attributes, such as picnicking, driving through and mushroom picking in the forest, as well as environmental attributes of CO₂ sequestration and erosion decrease were estimated in this choice experiment. The results of the choice experiment analysis reveal that the public derives benefits from afforestation programmes, especially those which allow picnicking, picking mushrooms, sequesters higher levels of CO₂, does not allow the use of cars in forest ways and decreases the risk of erosion. These findings have important implications for evaluation of afforestation programmes, as forest planners can use the information presented in this chapter to include the public good values of forests in their optimization problems for forest management in Catalonia.

In chapter ten Christie and Hanley study the recreational aspects of forests in the UK. Main forest user groups' valuations of various forest recreation attributes are investigated. Forest user groups studied in this chapter includes general forest users, cyclists, horse riders and nature watchers. For each of these four recreation groups eight attributes were specified: four attributes being activity-specific (for example, for

cycling, the active-specific attributes were type of trail, optional obstacles, bike wash facilities, changing and shower facilities), while the remaining four attributes were identical for all groups and included general facilities, information, surroundings and distance. Preferences of each one of the groups for recreational forest management attributes are investigated. The results disclose valuable information which is expected to inform the development of forest policy in terms of the management of forests to maximise social benefits, and in particular provide evidence in support of some of the key objectives of the EU Forest Action Plan (Commission of the European Communities 2006). As the authors state, the study presented in this chapter (and in chapter nine) provides evidence of the welfare benefits associated with recreational use of forests. Christie and Hanley conclude that these benefits highlight the contribution that forests make towards enhancing people's 'quality of life'; a key goal of the EU Forest Action Plan.

Chapters 11 and 12 employ the choice experiment method to inform water resources management policies in Poland and Greece, respectively. The results of these chapters have implications for the efficient and effective implementation of the Water Framework Directive (WFD, 2000/60/EC), as well as for other EU level Directives, including the EU Birds Directive (1979/409/EC) and the EU Habitats Directive (1992/43/EC). Birol, Karousakis and Koundouri investigate non-use and use values of water resources in chapter 11. In this chapter the authors investigate the benefits the Greek public derives from several functions and services generated by the sustainable management of the Cheimaditida wetland. Wetland management attributes valued in this choice experiment are biodiversity, open water surface area, facilities for research and educational activities and retraining of local farmers in environmentally friendly employment. The analysis of the data identified two different segments in the Greek

population: over half of the sample belongs to the segment which derive significant and positive values from all four of the wetland management attributes, whereas the rest of the sample only value open water surface area and retraining of local farmers significantly. When these benefit estimates are aggregating over the population for different wetland management programmes and weighted against the costs of these programmes, it is found that the programme which generates high levels of biodiversity, open water surface area, research and educational opportunities and re-trains 150 local farmers generates the highest total net benefits.

In chapter 12 Birol, Koundouri and Kountouris apply this method to study local residents' trade-offs between flood risk reduction and biodiversity rich habitat conservation in the Bobrek catchment, located in the Upper Silesia region of Poland. Specifically, local residents' preferences for reduction in flood risk, access to the river for recreational activities and conservation biodiversity in the river catchment are investigated. The findings reveal that the residents of the catchment area derive the highest benefits from reduction of flood risk to a low level, followed by recreational activities and biodiversity conservation in the area, respectively. Moreover, residents whose houses have been flooded in the past are WTP the highest for reduction in flood risk, whereas those residents who are wealthier are WTP the most for conservation of high levels of biodiversity. These results have important repercussions for the design of efficient and effective river management projects and policies in the area, which comply with the requirements of the WFD and other EU level Directives.

The final case study presented in this volume is by Nunes and Travisi in chapter 13. In this chapter the authors estimate the value of noise abatement of the Brennero railway to the residents of Trento, located in the North-East of Italy. Specifically, residents' WTP for reduction in rail noise level, height of trackside barriers and

investment in trains and tracks technology are estimated. Findings of Nunes and Trivasi reveal that the residents strongly prefer a noise policy that relies on investments in improving trains and tracks technology rather than one that increases the height of the trackside barriers. The latter policy in fact generates significant disutility resulting in unacceptable levels of aesthetic and microclimatic costs to the residents. This finding suggests that the railway noise abatement policy should focus on 'at the source' noise measures (based on technological investments) or, at least, that investments in new technologies on train vehicles and tracks should be combined with more standard trackside barriers, that are not excessively high. These findings are informative for adoption of noise pollution regulations of the EU, such as the Directive 2002/49/EC on assessment and management of environmental noise.

The final chapter, chapter 14, by the editors concludes the book by summarising the main findings and policy implications of the case studies presented in this book. This chapter also points out the methodological developments achieved in this studies, and highlights the importance and value of choice experiment studies for informing European level policies pertaining to environmental, agricultural, food and natural resource management issues.

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