Choice Experiments Informing Environmental Policy: A European Perspective

Concluding remarks and future directions

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SUMMARY OF THE CHAPTERS

This book has gathered the most recent state-of-the art choice experiment studies undertaken in various Europe Union (EU) countries, with the aim of revealing the wealth, diversity, quality and usefulness of choice experiment applications for informing environmental policy in Europe. To this end, case studies are presented covering a wide geographical area, from Greece to Ireland and from Finland to Spain, on a broad array of environmental, agricultural and natural resource issues, ranging from landscapes, biodiversity, cultural heritage, noise pollution, forests and water resources to food labelling. The values of several important attributes of these resources are captured as they accrue to various stakeholders, including local residents, the national public, tourists, visitors and food consumers. Furthermore, the implications of the value estimate results of these applications are discussed for informing the efficient, effective and equitable design, implementation and adaptation of various EU-level regulations, directives, schemes and plans related to environmental, agricultural and natural resources. Among the various EU policies that chapters of this volume inform are the EU Forest Action Plan, the Agri-Environmental Regulation, the Water Framework Directive, the Habitats Directive, the Food Labelling Directives and the Environmental Noise Directive, to name a few.

Chapter 2 presented a thorough review of choice experiment applications to the valuation of environmental, agricultural and natural resources in EU countries. This chapter, which has brought the reader up to date with the current status of the choice experiment method in Europe, was followed by four case studies on valuation of the various vital attributes of European landscapes. These case studies estimated the benefits generated by several attributes of landscape management throughout Ireland, in hilly and

mountainous areas of England, in Brittany, France and in Galicia, Spain. The valuations of various stakeholders, including the general national

public, the regional public and local residents as well as visitors to these landscapes were estimated. Overall, the results of these chapters disclosed valuable information about the different stakeholders' preferences for various attributes of the landscapes, whose production should be supported through EU Agri-Environmental Schemes.

Chapter 3 compared the benefits of landscape improvements with their costs to reveal that agri-environmental schemes contribute substantial benefits to rural landscapes. Chapter 4 estimated the values of benefits generated by landscape attributes to inform the revision of payments made to farmers. Chapter 5 found that the preferences of all stakeholders (local residents and visitors) for landscape attributes were the opposite of what the current policies are aiming to achieve. The final chapter on landscapes, Chapter 6, revealed that visitors value environmental attributes of landscapes more than cultural and historical ones, alluding to the use of market-based instruments (such as EU food labelling schemes of Protected Designation of Origin) in addition to agri-environmental payments for provision of efficient levels of all of these attributes.

Chapter 7 presented a case study investigating the UK food consumers' preferences for several food production methods, including genetically modified organisms (GMO). Consumers displayed considerable differences in their preferences, especially with respect to GM food. The findings of this study are not only informative for the development of EU-level GM food labelling and food security regulations, but also have implications for the EU's trade with other countries.

Chapters 8 through 10 reported case studies on forest resources management in Southern Finland, Catalonia, Spain and seven forests located in Great Britain, respectively. These chapters estimated the general public's and recreational visitors' valuations of several forest management attributes. The results of Chapter 8 indicated that in Finland, where forests are privately owned, the public exhibits considerable heterogeneity in their preferences for attributes of forest management. The Finnish public, however, are in agreement with regard to the choice of policy instruments which should be employed for conservation of forest resources. The findings of Chapters 9 and 10 revealed that the recreational benefits that forests generate are significant and large. Chapter 9 captured the values of important environmental functions of forests, such as erosion control and CO_2 sequestration, in addition to their recreational values. Chapter 10 provided value estimates for forest management attributes by recreational activity group (cyclists, horse riders, nature watchers and general visitors). These chapters provided evidence for the contribution of forests to welfare benefits, especially those associated with recreational uses of forests, thereby enhancing people's quality of life, in accordance with the EU Forest Action Plan.

Efficient management of water resources is investigated in Chapters 11 and 12. First, the Greek public's preferences for sustainable management of the Cheimaditida Wetland were explored. Trade-offs between quantitative and qualitative, ecological (for example, biodiversity and water area) and social and economic (education, research and employment) attributes of the wetland were analysed. The results showed that the use and non-use values the Greek public derive from the attributes of the wetland are substantial. A thorough cost-benefit analysis revealed that net total social benefits of sustainable management of the wetland are strictly positive and large. Following this, local residents' trade-offs between management of rivers for flood risk reduction versus biodiversity conservation and recreational activity provision were investigated in the Upper Silesia Region of Poland. It was found that the local residents who have suffered considerable damage from floods value river management plans that minimise flooding risk the most, whereas those who are wealthier are more concerned about the provision of recreational activities and biodiversity conservation in the catchment. These chapters aimed to inform several EU policies, most notably the Water Framework and Habitats Directives.

The final case study presented in this volume aimed to inform policies and projects for environmental noise reduction in accordance with the EU directive on the assessment and management of environmental noise. This chapter investigated Trento residents' preferences for different levels of noise and noise management strategies, namely investments in improving trains and track technology versus building high trackside barriers, and found that the residents preferred those noise abatement policies which focus on 'at the source' noise measures based on technological investments.

THEORETICAL ADVANCEMENTS

In addition to the wealth of information these case studies generated for informing European environmental, agricultural, natural resource management and food policy, they also presented several advances in the design, application and analysis of the choice experiment method.

Firstly and most importantly, possible sources of heterogeneity in the preferences of the populations studied were investigated in almost all of the case studies reported in this volume. As is well known, the standard workhouse model for choice experiment analysis, the conditional logit (CL) model, assumes homogenous preferences across respondents in a given population. Preferences, however, are heterogeneous and accounting for

this heterogeneity enables unbiased estimates of individual preferences and enhances the accuracy and reliability of estimates of demand, participation, marginal and total welfare (Greene, 2000). Furthermore, accounting for heterogeneity enables the prescription of policies that take equity concerns into account. Information on who will be affected by a policy change and the aggregate economic value associated with such changes is necessary for efficient and equitable policy making (Boxall and Adamowicz, 2002).

Consequently, in this book various methods were employed to investigate preference heterogeneity. Chapters 3, 4 and 12 employed the random parameter logit (RPL) model (a specification of the mixed logit model), which accounts for unobserved taste heterogeneity by allowing model parameters to vary randomly over individuals (for example, Train, 1998). Even if unobserved heterogeneity can be accounted for in the RPL model, the model fails to explain the sources of heterogeneity (Boxall and Adamowicz, 2002). One solution to this, while accounting for unobserved heterogeneity, is by including the interactions of respondent-specific social, economic and attitudinal characteristics with choice-specific attributes and/or with the alternative specific constant in the utility function. Thus, in Chapters 4, 5, 12 and 13, the interactions of the choice attributes or the alternative specific constants with the social and economic characteristics of respondents (for example, age, gender, income, education, whether or not they have children, number of times the sites are visited) were included in RPL and CL models.

A recent model that investigates preference heterogeneity is the latent class model (LCM, another specification of the mixed logit model). In LCM, the population consists of a finite and identifiable number of groups of individuals (that is, segments), each characterised by relatively homogenous preferences, whereas each one of these segments differs substantially in its preference structure. This approach accommodates preference heterogeneity while allowing the number of segments to be determined endogenously by the data (Wedel and Kamakura, 2000). Chapters 7 and 11 employed the LCM to identify the different segments within consumers of GM food, and users and non-users of Cheimaditida Wetland, respectively.

Finally, heterogeneity in preferences can also be investigated by separating the respondents into various groups (segments or clusters), and by estimating the demand function for each group separately. Chapter 5, for example, divided the users of the landscape into main residents, second home residents and visitors, whereas Chapter 8 split the population into two groups according to their responses to attitudinal questions, and Chapter 10 divided the forest users into four groups according to the recreational activity they undertake in the forest. All these chapters estimated

separate CL models for each of these groups and found that their preferences structures indeed differ.

Recently, choice experiment practitioners have been making use of psychometric data, that is, information on respondents' motivational, attitudinal and behavioural characteristics, in order to explain choice (see for example Boxall and Adamowicz, 2002). Psychometric data and factor analysis method were employed in Chapters 7 and 8. In Chapter 7, attitudinal indices were created from consumers' answers to several questions which revealed their attitudes, perceptions and behaviour towards GMOs in particular and food consumption in general. These indices were in turn used as explanatory variables in the LCM. In Chapter 8, factor analysis of the psychometric data on the respondents' attitudes towards conservation and management of forests enabled segmentation of the population into two groups, as explained above.

The main aim of the environmental valuation methods is to generate benefit or cost estimates to be used in cost-benefit analysis (or in other decision tools) relating to different policy options. In Chapters 4, 5 and 11, value estimates of attributes were taken a step further by either calculating the compensating surplus (CS) of various alternative policies or by carrying out a cost-benefit analysis after the calculation of the CS. In Chapters 4 and 5, CS values were calculated for various landscape management scenarios. While aggregating landscape improvement benefits across various stakeholders, Chapter 5 took equity concerns into account by weighting the value estimates of each stakeholder group according to their size and length of visit in the area. Moreover, Chapter 5 applied two social choice rules, namely Borda and Condorcet rules to determine the landscape management policy that maximises social welfare (Martin *et al.*, 1996). Chapter 11 demonstrated how the results of a choice experiment study could be used in a thorough cost-benefit analysis of policy changes. In that chapter, CS values of various wetland management scenarios were weighted against their corresponding costs. Finally, Chapter 3 contrasted individual-specific value estimates of improvements in landscape attributes with the average cost of the policy that produces these improvements.

The important role of experimental design in affecting parameter estimates and variances in error terms is well known (see Adamowicz and Deshazo, 2006). Chapter 3 took advantage of the recent advances in experimental design in the field of market research by implementing a sequential experimental design with an informative Bayesian update to improve the efficiency of estimates.

Although a crucial aspect of the policy design and appraisal process, the choice experiment method is a costly means of information generation, as are other environmental valuation methods (Pearce, 2005). To this end,

Chapter 9 proposed a novel and unique method of inferring values from existing ones, akin to the benefits transfer method. However, unlike benefits transfer, which transfers value between sites, the value inference method involves inference of values between goods and attributes at the same site. Chapter 9 demonstrated how the contingent valuation method can be employed to provide the value of a specific change in the management of the environmental good, and the choice experiment method can be employed to derive values of particular attributes of the good, in order to infer the values of a range of other alternative management outcomes.

FUTURE DIRECTIONS

Recent advances in the choice experiment method have highlighted the importance of investigating heteroskedasticity (Swait, 2007). Even though almost all of the published choice experiment studies carried out in the EU tackled the biases that might arise from taste heterogeneity, very few of them have investigated the consequences of heteroskedasticity in the error terms. It is expected that the forthcoming choice experiment studies carried out in the EU will be focusing on the treatment of heteroskedasticity along with taste heterogeneity.

As mentioned above, similarly to the other applied environmental valuation methods, the choice experiment method is a costly means of generating useful data for policy formulation. One way of minimising the costs of environmental valuation studies, while still generating valuable information for environmental policy, is the use of the benefits transfer method, which relies on information obtained in previous studies. As pointed out in Chapter 1, the choice experiment method is suitable for benefits transfer due to its ability to estimate the values of multiple attributes of an environmental good, which can allow for differences in improvements in the levels of environmental attributes between sites. The choice experiment method can also allow for differences in the social, economic and attitudinal characteristics of the populations when transferring value estimates. Even though there are only a few noteworthy studies in EU countries that employ choice experiment estimates to transfer values from a study site to a policy site (see for example, Hanley *et al*., 2006; Colombo *et al*., 2007), the cost-effectiveness and usefulness of the benefits transfer method for informing environmental policy and the advantages of the choice experiment method for this purpose call for further investigation of this issue.

Finally, for those environmental, agricultural and natural resource management issues that concern all or several EU countries at a time, there is a need to carry out pan-European choice experiment studies. Scarpa *et al*. (2005)

state that in the case of food labelling schemes (such as Protected Designation of Origin and Protected Geographical Indicator labels) pan-European studies may help explain the role of consumer preferences for certain products on the patterns of trade between Member States and inform future EU policies relevant to food and agriculture. This argument is also applicable to other food and agricultural issues, such as regulations pertaining to GMOs, which have implications for agriculture, food production and trade within the EU. Similarly, for resource management issues that concern several EU Member States at a time, choice experiment studies should be undertaken in all those countries. For example, the EU Water Framework Directive calls for water resources management at the river basin level. Several river basins in the EU are shared among multiple EU countries, so choice experiment studies should be implemented in all of those EU countries that share the river basin in order to inform their efficient management. Pan-European choice experiment studies could also help inform the meeting of certain EU level targets, such as the greenhouse gas emissions reduction targets of the Kyoto Protocol, in an efficient and equitable manner.

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