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Non-market values of forest biodiversity and the impact of informing the general public: Insights from generalized multinomial logit estimations

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ABSTRACT

Apart from the ethical argument around trade-off that individuals have to make between monetary and non-monetary value, application of stated preference method was exposed to another criticism related to the complexity of biodiversity issue and the capacity of the general public to provide accurate responses to willingness to pay elicitation survey. This paper tests how providing information about the ecological processes underlying forest management scenarios affects public preferences and their valuation of biodiversity in publicly owned forest land in France. The generalized multinomial logit models applied to choice experiment data suggests that all respondents adopt the same heuristics based on easily visible aspects of forest landscape, to reveal their use and nonuse values of biodiversity. However, when they receive additional ecological information, only those who are familiar with the biodiversity concept, have awareness of issues at stake, and have a regular use of forest tend to attach higher values to less known biodiversity component (fallen deadwood in this case). The paper concludes that "mass media campaign" has to be completed by environmental literacy programs, to improve people's awareness and understanding of what biodiversity means from ecological functioning, then making economic valuation a useful tool from a conservation perspective.

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1. Introduction

Since the Millennium Ecosystem Assessment report was published in 2005 (MEA, 2005), many research and policy initiatives have been undertaken to further develop the concept of ecosystem services as a coherent framework and suitable tool for decision-making in the fields of biodiversity and nature conservation. More recent evidence can be seen in the MAES project (Mapping and Assessment of Ecosystems and their Services), within which economic valuation of ecosystem services is a recognized part of national and European natural capital accounting, a process designed to prepare member states for the implementation of the European biodiversity strategy by 2020. Increasing adoption of economic valuation as a framework and suitable tool for decision-making for nature conservation has however raised concern within the conservation community. Many within that community believe that by emphasizing the social, cultural, and economic importance of ecosystems for people, there is a risk of overlooking the protection of species, habitats or ecological processes and functions not directly related to socio-economic uses and practices (Ingram et al., 2012). In economic literature, economic valuation of biodiversity has also been the object of theoretical and methodological controversies (Salles, 2011). Although, the approach is a promising one (Pascual et al., 2010) to give visibility to the benefits of nature preservation, it has to struggle to gain its credibility in order to be policy relevant (Laurans et al., 2013; Lienhoop et al., 2015).

The fact that the benefits of biodiversity protection are invisible in the socio-economic system means that current management policies tend to favour supply for ecosystem services of immediate use value at the expense of long-term ecological health (Turner and Daily, 2008). Therefore, one way to include in the natural capital accounting system, the value of changes in biodiversity that is not necessarily attached to the direct use of ecosystem services, is to assess directly the general public preferences for conservation policy through an empirical survey. A large majority of non-market values of biodiversity are inferred from stated preference (SP) methods. However, where SP techniques are most useful is also where they have the potential to be less convincing for decision-

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making analysis (Atkinson et al., 2012). If the individuals taking part in the study are not sufficiently well informed about the benefits of protecting the environment, they will underestimate the importance of protection policies, meaning that estimations of benefit will be lower than they are in reality (Spash and Hanley, 1995).

Given the complexity of the concept, testing the impact of information on public preferences for biodiversity conservation has thus become a fairly well documented research question. The information process that sustains environmental valuation within stated-preference method questions one of the key principles of a utilitarian approach to environmental values, namely the stability of the willingness to pay (WTP) estimates, since all individuals are supposed to handle pre-existing well-defined preferences. However, environmental preferences are exceptions to this rule. This is especially the fact when individual did not make direct use of the natural environment under valuation (Bishop and Welsh, 1992). Wherever the provision of information is shown to have a significant impact on the valuation process, this is simply because individuals as non-users have not previously any reason to improve their knowledge. Referring to the concept of non-use value, however, raises another issue, the ambiguity of the impact of information on preferences when these are mainly guided by social and ethical concerns (Randall et al., 2003). One of the implications of the line of reasoning found in this last argument is that providing additional information would not affect individual preferences since they are based on social values and positional ethics. Respondents may show lexicographic preferences irrespective of their prior knowledge about what is at stake, displaying a non-compensatory decision process during the survey.

Findings from empirical research are also mixed, indicating that the effect of information is dependent on its framing process. Building on a sophisticated protocol survey, authors such as Shapansky et al. (2008) or Christie et al. (2006) found no impact on WTP when additional information was provided to respondents. However, early empirical investigations (Bergstrom et al., 1990; Hanley and Munro 1994) have established that specific information does influence the accuracy of the WTP estimates. Information can reduce the variance of WTP distribution by narrowing the gap between familiar respondents who are insensitive to information and unfamiliar respondents who adjust their WTP based on the added information. Individual's awareness of environmental issues has a role to play—the effect of new information provided as part of a survey depends on how much it differs to the respondents' prior knowledge (Hoehn and Randall, 2002; Tkac, 1998).

The development and implementation of ecosystem-based management of nature conservation, as well as the role played by economic valuation, raise new empirical challenges for disentangling the main arguments regarding the impact of providing information on the stability of economic values of biodiversity obtained with stated preferences method. This article provides an update of the value of benefits for conserving biodiversity within the publicly owned forestland in France, one of the most heavily forested countries in Europe (ranked in third place behind Sweden and Finland). Analysing public preferences for forest biodiversity in the country can give new insights for a more general concern about the management of publicly owned forest in developed countries.

This study implements a choice-experiment survey in order to capture the impact of providing ecological information on the value that individuals attach to forest biodiversity. The empirical investigation analyses French people's preferences obtained from two versions of a questionnaire based on the attributes of public forest biodiversity preservation programs. For the first version, no specific information was provided to respondents, while in the second version, respondents were presented with much more detailed descriptions regarding the contribution made to biodiversity and ecosystem functions by each of the preservation programme attributes under consideration. Each respondent was randomly assigned to one of these two versions, through an online survey in October 2012.

Generally, choosing the appropriate econometric method of estimation to deal with heterogeneity of individual choices is a difficult task for practitioners. With regard to biodiversity preservation, there are a number of possible explanations for individual preferences. We chose to apply G-MNL—generalized multinomial logit (Fiebig et al., 2010) for three reasons. G-MNL model is better able to account for the presence of "extreme" behaviour, i.e. respondents who exhibit almost lexicographic preferences. G-MNL estimations investigate both unobserved individual preference and scale heterogeneity. This modelling approach thus allows information processing to affect preferences for attributes as well as individual-specific scale parameters.

The remainder of the paper is organised as follows. Section 2 gives details on the survey. Section 3 introduces the model specification and the econometric method of estimation. Section 4 analyses the results. Section 5 is dedicated to discussion and some policy recommendations.

2. The survey

2.1. The study case: biodiversity conservation in publicly-owned forests in France

The goal of this study was to provide socio-economic indicators to French public forest managers ONF (*Office National des Forêts*—French forestry commission). These indicators relate specifically to the types of forests most likely to achieve high biodiversity values (from a socio-economic point of view), as well as the potential impact of different management options on those values. ONF manages state and local municipality-owned forests, which currently account for some 25% of forest cover in mainland France. An evaluation of the characteristics of public forests carried out in 2011 (ONF, 2011) shows in particular that: over 92% of these forests have two or more tree species, the volume of standing dead wood is increasing (estimated at around 5 m^3/ha), the amount of fallen dead wood is approximately 17 m^3/ha, and the area dedicated to maintaining old trees as habitat represents about 10% of the forest area. In this context, the motivation for economic valuation was to provide additional sources of legitimacy and support for the maintaining of state funding to develop biodiversity-friendly forest management practices of public forests, by highlighting public values for different components of forest biodiversity.

The questionnaire was made up of five sections. The first section introduced the survey. The second section contained questions dealing with respondents' general attitudes towards forests and the environment, as well as their familiarity with and sensitiveness to biodiversity issues. The third section explained the choice task and provided the definition of the attributes for the choice experiment followed by choice sets. The fourth section developed preferences' consistency-check questions (Bennett and Adamowicz, 2001). The last section consisted of questions about the demographic and socio-economic characteristics of respondents.

2.2. Scenario attributes

The more specific the change in terms of biodiversity, the more reliable the estimated value (Nijkamp et al., 2008). For this reason, it is becoming more and more common to focus on precise elements of forest biodiversity (Czajkowski et al., 2009). This approach was used in our study to assess whether or not information affects individuals' preferences regarding different

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