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Research article

To transfer or not to transfer? Evidence from validity and reliability tests for international transfers of non-market adaptation benefits in river basins

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ABSTRACT

The attempt to design cost-effective adaptation policies incorporating non-market values to inhibit climate change impacts on water resources may increase the interest in applying the Benefit Transfer method. Benefit Transfer is a practical way to consider non-market values using functions and estimates acquired through primary valuation methods from other sites. Among the primary methods, Choice Experiments appear to particularly accommodate Benefit Transfer. Nevertheless, validity and reliability of international value transfers obtained from Choice Experiments have not been adequately examined. To this end, two identical Choice Experiments were conducted in Greece and Italy in the context of river services adaptation, testing validity and reliability of Benefit Transfer. The application of validity and reliability tests for different types of transfers is supportive for the use of Benefit Transfer, at least for the value transfer types. In particular the reliability of value transfer was higher when income adjustments were taken into account. Overall, Benefit Transfer can be attentively considered to evaluate cost-effective adaptation policies across countries experiencing similar climate change trends. The latter gains more importance given that an international Benefit Transfer setting as regards the non-market benefits of adaptation to climate change for river services is absent in the relevant literature.

1. Introduction

Climate change is affecting water bodies with consecutive negative impacts for the natural environment and human well-being (Bates et al., 2008; EEA, 2013). To intercept these climate change-related impacts and retain the threshold conditions of watersheds, adaptation is rendered crucial for local communities. Adaptation policies generate public benefits albeit in some cases may pose disproportionate costs for the local societies (Tol, 2002). Therefore, the field of adaptation economics requires quantification of key inputs and outputs, such as the costs of climate change and benefits of adaptation, before choosing the preferred option (Agrawala and Fankhauser, 2008). Thus, economic valuation is important in order to reveal these non-market benefits towards designing cost-effective adaptation strategies (Stern, 2006). To this end, it may be plausible to employ secondary methods to incorporate non-market benefits in adaptation plans, i.e. the Benefit Transfer (BT) method, which is used as a substitute to time and source consuming primary valuation techniques (Colombo and Hanley, 2008). From a climate policy viewpoint, BT is a technique from the toolkit of environmental and adaptation economics that facilitates policy makers to operate in larger aggregation levels (e.g. inter-catchment basis) and better respond to intensive changes in the natural and social environment (Huntjens et al., 2010). International based BT, in particular, is meaningful and attractive because: (a) the analysts have access on a wider source of primary valuation studies that may be absent in developing or transitioning countries (Ready and Navrud, 2006); and (b) the policy-context changes may have transnational implications.

A closer look at the relevant literature, however, indicates that the test of validity and reliability of international BT remains limited. Ready et al. (2004) carried out five concurrent Contingent Valuation (CV) surveys in different European countries to test the transfer validity of the benefits to avoid health impacts. Rozan (2004) tested the validity of CV willingness to pay (WTP)

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transfers for air quality improvements between France and Germany. Barton and Mourato (2003) applied two identical CV studies in Costa Rica and Portugal to compare benefits to prevent health problems imposed by contaminated seawater, and Abou-Ali and Belhaj (2005) implemented the BT for CV welfare comparisons of reduced air pollution in Egypt and Morocco. To date, the increasing number of analytical work on stated-preference valuation surveys pay particular attention to the use of Choice Experiment (CE) method (Adamowicz et al., 1998), and in turn CEs gained ground in the BT context (Colombo et al., 2007; Morrison and Bergland, 2006). Yet, as regards international BT of CE surveys, validity testing is even more limited. Czajkowski and Scasny (2010) analyzed the validity of value transfer between Czech Republic and Poland regarding water quality improvement of euthrophied lakes. A first attempt to analyse welfare changes of rivers' water deficiencies and to apply BT methodologies was undertaken by Brouwer et al. (2015). In this study, testing for value transfers between Southern European countries and Australia indicated that international BT can be considered as a reliable alternative in getting values for river quality and quantity improvements, especially under socio-economic adjustments.

Social and economic factors are important drivers to enhance adaptive capacity of any region (Iglesias et al., 2011). The nature and complexity of primary economic valuation analytical work to account for these factors, leads to explore transferability of existing estimates of adaptation benefits in order to reduce survey costs (Metroeconomica, 2004). This study endeavours to utilise contemporary developments in BT (extensive validity and reliability testing) and attempts to contribute to existing literature by providing insights on: (a) the transferability of utility functions and of value estimates (both implicit prices and compensating surplus) on an inter-country basis as regards climate change impacts on river systems; (b) best practises to carry-out these transfers by contrasting different transfer approaches; and (c) transferability performance of different type of values (use or non-use values) as well as identification of potential context or site specificity that may characterize estimated transfer values. For this purpose, two identical CEs were conducted to monetize the non-market benefits of adaptation for protecting river services from climate change. Data were gathered from semi-rural communities living in mountain river basins in Southern Mediterranean, namely the Aoos River (Greece) and the Piave River (Italy). The rivers are expected to undergo similar drought trends with subsequent loss of welfare for the mountain communities. The experimental design attempted to comply with the similarity principle of the good to be valued, the characteristics of the sites, the sampled populations and the survey framework as reported in the relevant literature for BT (e.g. Boyle and Bergstrom, 1992; Brouwer, 2000; Scarpa et al., 2007). Our expectations are summarized to the point that the general common design of the two valuation studies will result in some sort of benefit transferral, allowing to commit a uniform study to determine the appropriateness of different transfer methods (Bateman et al., 2011) in the argued context. Nonetheless, at some level both sites may be dissimilar in their characteristics and more notably in the respondents' preferences patterns and hence validity and reliability of such transfers will illustrate the methodological aspects that optimize transfer results.

2. Survey design and data collection

2.1. Study areas

The BT validity and reliability tests for adaptation of river basin management to climate change were carried out using two different case studies. The Aoos River (AR) situated in Greece and the Piave River (PR) found in Italy. Table 1 presents some basic natural characteristics of the study river basin along with climate projection patterns from downscaled models for the broader study areas (Baruffi et al., 2012; Giannakopoulos et al., 2011).

The two watersheds present roughly similar physical and hydromorphological conditions. Climate projection models for both sites present quite similar trends and generally show an increasing drought pattern. As a consequence, considerable depletion is expected for services inextricably linked to these river ecosystems.

2.2. Attributes and levels selection

In the CE framework respondents were presented with policy options (described in attributes and their levels), attempting to reveal the relative importance in welfare terms of different river services and subsequently the welfare estimates of adaptation scenarios accounting for multiple changes in all the examined river services.

The attributes considered to compile the choice sets were: irrigated land, rafting period, hydropower production and ecological state. According to experts from the study areas, these provisioning and supporting river services according to MEA (2005) classification proved to be the most important in terms of use, amenity and intrinsic values and, thus, they should be taken into account in the economic analysis (Pearce et al., 1994). Also, a price attribute was included to facilitate welfare analysis. The ‘price’ was set as a monthly voluntary contribution to an institute delegated to plan and implement adaptation measures and the levels of the ‘price’ attribute were selected to reflect a wide range of monetary contributions (from 2 to 20€ per month). The levels were quantified on the basis of the expected impacts of runoff reduction on river services. Moreover, in order to support the BT context of this study, the two sampled populations from AR and PR were defined on the basis of receiving equal ‘quantities’ of the river services included in the CE (i.e. 1000ha of irrigated land, rafting activities for approximately 7 months per year, existence of large-scale hydropower plants and good ecological state of the river). The levels of the non-monetary attributes refer to the provision of river services in the part of the rivers located in close proximity with the Pederobba municipality (Italy) and Konitsa town (Greece).

2.3. Experimental and survey design

The full factorial design of the choice sets, which in our case for the attributes and levels selected could give rise to 405 (3^4*5^1)

Table 1
Characteristics of study sites.

	Length	Drainage area	Hydro-morphology	Climate projections by 2100: precipitation	Climate projections by 2100: surface runoff
Aoos River	260 km	5700 km^2	Many tributaries and streams. Limited anthropogenic modifications	Decrease by 10–15%	Decrease by 15–20%
Piave River	220 km	4500 km^2	Many tributaries and streams. Some anthropogenic modifications	Decrease by 10%	Decrease by 20–30%