Environ Resource Econ (2013) 56:499–519
DOI 10.1007/s10640-012-9572-4

Adjusting for Cultural Differences in International Benefit Transfer

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Accepted: 1 June 2012 / Published online: 22 June 2012

Abstract Values for non-market goods can be expected to be sensitive to variations in the cultural contexts of beneficiaries. However, little progress has been made to date in adapting benefit transfer (BT) procedures for cultural variations. Using information from a study that ranked 62 societies with respect to nine attributes of their cultures, we develop an index that is then used to re-weight multiple coastal ecosystem service value estimates. We examine whether these culturally-adjusted BT estimates are statistically different than simply transferring the income-adjusted mean transfer estimates for each coastal ecosystem service from international study sites to the policy site. We find that once differences in income levels have been accounted for, the differences in cultural dimensions between study and policy sites actually have little impact on the magnitude of our transfer estimates. This is not a surprising result given that the majority of the study site estimates are derived from countries that share many ethnic, linguistic and other cultural similarities to the policy site. However, benefit adjustments based on cultural factors could have a much higher impacts in settings different to that investigated here.

Keywords Coastal zone resources · Ecosystem services · Cultural index · International benefit transfer

1 Introduction

It has often been observed that an individual's income level has a significant influence on what they are willing to pay (WTP) for changes in public goods such as coastal ecosystem services (Jacobsen and Hanley 2009). Benefit Transfer (BT) exercises, which involve

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estimating values for ecosystem services a "policy site" using values for similar services measured at one or more "study sites", have taken this income variation into account in a number of ways (Navrud 2007). However, the cultural surroundings of an individual may also have a strong influence on how that person forms their preferences for these ecosystem goods and services. These cultural differences may be most relevant when one is dealing with international benefit transfers (where the policy and study sites are in different countries), since cultural differences are more likely to be strong than for within-country transfer exercises. As Turner et al. (2000) point out, individual preferences and values do not exist independently of culturally-defined world views. The non-use and use values of a coastal ecosystem service, for example, may be perceived differently across different societies and indeed within cohorts of the same society due to variations in cultural factors. The cultural context in which ecosystems and other environmental assets exists provides an alternative dimension to environmental valuation studies that needs to be considered in international BT exercises.

Cultural differences between and within societies can emerge in terms of dimensions such as the degree to which a society encourages and rewards future-oriented behaviours (such as sustainable, integrated coastal zone planning), the degree to which institutional practices encourage collective distribution of resources, and the extent to which a community accepts and endorses authority and status. Such factors may be particularly important in cross-country BT exercises. Using cultural dimensions from a study (House et al. 2004) that ranked 62 societies with respect to nine attributes of their cultures, we develop a cultural index that we use to re-weight coastal ecosystem service value estimates prior to transfer to the policy site, the Galway Bay coastal zone in the west of Ireland.[1] We examine whether these culturally-adjusted BT estimates are statistically different than simply transferring the income-adjusted mean value estimates for each coastal ecosystem to the policy site. Whilst the empirical context of the paper concerns coastal ecosystem services valuation using BT, the use of cultural adjustments for international BT is of much wider interest, and is thus the primary contribution of this paper.

In what follows, Sect. 2 outlines why accounting for cultural differences between policy and study sites in a BT exercise might be important. Section 3 examines the cultural dimensions used in creating the cultural index, while Sect. 4 describes the policy site in Galway Bay. Section 5 then details the BT methodology used to provide a value for each of the non-market coastal ecosystem services. Section 6 outlines the results of the study and gives ecosystem services flow values on a per hectare basis for each ecosystem type examined in Galway Bay. Section 7 concludes.

2 Environmental Valuation and Cultural Diversity

BT involves transferring value estimates from previously conducted studies of change in an environmental good or service to value changes in the same or similar environmental good or service at a study site. There are a number of methods of transferring values between the study and policy sites, but in this paper we focus solely on unadjusted and adjusted point estimate transfers.[2] We argue that cultural differences between study and policy sites may be an important determinant that should be considered in international BT.

[1] A number of BT exercises have already been reported for coastal zones (Troy and Wilson 2006; Wilson and Liu 2008; Brondizio et al. 2010; Hussain et al. 2010).

[2] Function based value transfers are also very common in the BT literature. Loomis (1992) argues that transferring the entire benefit function may increase the validity and reliability of the transfer. Meta-analysis is a more

Economic valuation studies show that attitudes are linked to environmental values for coastal zone protection (Nunes et al. 2009), whilst cultural values arising from ecosystems have been recognised as important by both the Millennium Ecosystem Assessment (2005) and the UK National Ecosystem Assessment (UK NEA, chapter 22, 2011). More broadly, cultural factors may co-determine preferences and values in multiple ways, for example through factors such a perceptions of landscape history (Hanley et al. 2008) and "the legacies of past and current societies, technologies and cultures" (UK NEA, chapter 16, page 634). Our speculation is that accounting for (measurable) differences in cultural factors should improve our ability to predict values across sites, especially when using international studies in the BT process. Cultural factors have received little consideration to date in the BT literature, despite evidence from other (non-economic) fields of enquiry that such factors are of importance in shaping preferences.

Ronen and Shenkar (1985) and Furnham et al. (1994) indicate that societies may be clustered based on similarities in their cultural identity. Inglehart and Baker (2000) and the World Values Survey Association (2009) highlighted the fact that societies could also be clustered based on their attitudes toward the environment.[3] Elsewhere it has been pointed out that individuals consider their basic cultural values when answering stated preference questions related to ecosystem services (Dietz et al. 2005; Hoyos et al. 2009). In a similar vein of thought, Wilk and Cliggett (2006) point out that economic values reflect the culturally constructed realities, worldviews, mind sets and belief systems of particular societies and/or subsets of society. It has also been argued that preferences are not exogenous, but rather shaped by social interactions as well as political and power relations operating within a system of local, regional, and global interdependencies (Henrich et al. 2001 and Hornborg et al. 2007).

In a particular study of interest, Hoyos et al. (2009) conducted a choice experiment to examine if cultural identity has an influence on the WTP to protect natural resources. Their results show the significant influence of cultural identity on the WTP to protect natural resources. With this in mind, variations in cultural factors may be as important to control for as income levels or demographic characteristics of the relevant populations, particularly in the context of international BT when cultural differences across studies can be expected to be relatively high.[4]

One further debate in the environmental valuation literature which is of relevance is that respondents in referendum-style valuation surveys may express citizen assessments that take into account benefits to others rather than act in a purely self-interested fashion. A number of commentators have suggested that respondents will act as "citizens" and adopt a social perspective rather than adopt a purely self-interested approach based on personal well-being, especially when faced with difficult decisions about environmental goods

Footnote 2 continued
complex form of value function transfer which uses a value function estimated from multiple study results together with information on value determinants for the policy site, to estimate policy site values (Rosenberger and Stanley 2006). The use of spatial micro-simulation techniques for BT is another form of value function transfer that has been recently suggested by Hynes et al. (2007) and Hynes et al. (2010). For practical guides to value transfer for environmental goods, the interested reader should also refer to Navrud and Ready (2007) and Bateman et al. (2009).

[3] We considered using the World Value Survey data in developing the cultural index in this paper but unlike the GLOBE cultural dimensions dataset Ireland, the study site, was not included as one of the societies analysed.

[4] For an in-depth discussion in relation to the socio-cultural context of ecosystem and biodiversity valuation the interested reader is directed to Brondizio et al. (2010). The importance of cultural attitudes and ethical beliefs in stated preference WTP studies has also been highlighted by Stern et al. (1995), Spash (2000), Pouta (2004), Ojea and Loureiro (2007).

(Howley et al. 2010). Individuals with a citizen-orientated viewpoint may take into consideration broad ethical and social considerations when assessing environmental goods, and may have values that differ when expressed as a citizen relative to being expressed by the same individual acting as a selfish consumer (Alvarez-Farizo and Hanley 2006). If, as asserted by Blamey et al. (1995), respondents are expressing social or political judgments rather than personal preferences over consumption bundles, and if these judgements are culturally conditioned, then this further highlights the need to account for cultural and societal differences between study and policy sites in a BT exercise.

3 Developing an Index of Cultural Identify: The GLOBE Study

Given the potential importance of cultural factors in the formation of preferences and values, we developed a cultural dimensions index from a study that ranked 62 societies with respect to a number of attributes of their cultures. GLOBE (Global Leadership and Organizational Behaviour Effectiveness) was designed to explore the effects of culture on leadership, organizational effectiveness, economic competitiveness of societies, and on the human condition of the members of the societies studied (House et al. 2004). GLOBE developed nine "cultural dimensions" that served as its units of measurement of the differences and similarities between the societies studied. The cultural dimensions were calculated based on the responses of 17,000 individuals to a series of Likert scale questions under nine cultural attribute headings. The average rank from the answers to these questions resulted in the final score for each cultural dimension in each country.[5]

These cultural dimensions were developed in order to provide concepts and terminology that would enable researchers "to become aware of, to measure, and to talk knowledgeably about the values and practices found in a human culture—and about the similarities and differences among human cultures" (House et al. 2004, p. 9). The nine cultural dimensions were: Uncertainty Avoidance, Power Distance, Institutional Collectivism, In-Group Collectivism, Gender Egalitarianism, Assertiveness, Future Orientation, Performance Orientation, and Humane Orientation (see Table 1). Each of these dimensions were conceptualized and depicted as a continuum between two extreme poles using a 7-point scale. House et al. (2004) provide a score for each of these dimensions for each of the countries listed in Table 2.

For the purpose of the BT exercise, and following a review of the in-depth descriptions of each dimension provided by House et al. (2004), In-Group Collectivism, Institutional Collectivism and Gender Egalitarianism were deemed not relevant when it came to potential influence on environmental values. Of the dimensions retained for use, a low score in *Performance Orientation* indicated a society that values harmony with the environment rather than control, while a high score indicated a society that values assertiveness, competitiveness and materialism. A high score in *Future Orientation* indicated a society that has a propensity to save for the future, has organisations with a longer strategic orientation, views materialistic success and spiritual fulfilment as an integrated whole, is a society that values the deferment of gratification and places a higher priority on long-term success, while a low score indicated a society that has a propensity to spend now, rather than to save for the future, has organisations with a shorter strategic orientation and sees materialistic success and spiritual fulfilment

[5] The questionnaire reports were complemented by interview findings, focus group discussions, and formal content analyses of printed media. The cultural dimension scores were then validated against independent measures from other sources such as Hofstede (2001) and figures from the World Values Survey Association. The cultural attributes and dimension scores derived for each country were also checked for reliability and construct validity with multi-trait, multi-method approaches (House et al. 2004).

Table 1 The nine dimensions of the culture measurement in GLOBE model

Cultural dimension	Description	Correlation coefficient between cultural dimension and GNI per capita (2007)
Power Distance	Degree to which a culture's people expect power, authority and prestige to be distributed equally	−0.41***
In-Group Collectivism	Degree to which a culture's people take pride in and feel loyalty toward their families, organizations, and employers	−0.62***
Institutional Collectivism	Degree to which individuals are encouraged by institutions to be integrated into broader entities with harmony and cooperation as paramount principles at the expense of autonomy and individual freedom	0.17
Uncertainty Avoidance	Degree to which a culture's people seek orderliness, consistency, and structure	0.52***
Future Orientation	Degree to which a culture's people are willing to defer immediate gratification for future benefits	0.41***
Gender Egalitarianism	Degree to which a culture's people support gender equality	0.06
Assertiveness	Degree to which a culture's people are assertive, confrontational, and aggressive	−0.08
Humane Orientation	Degree to which a culture's people are fair, altruistic, generous, caring, and kind toward others	−0.30**
Performance Orientation	Degree to which a culture's people encourage and reward people for performance	0.26*

In-Group Collectivism, Institutional Collectivism and Gender Egalitarianism were deemed not relevant when it came to potential influence on environmental values and were not therefore used in the final calculation of the Cultural Index employed in the BT process

*** Indicates significance at the 1 % level, ** indicates significance at the 5 % level and * indicates significance at the 10 % level

as dualities. It also represents a society requiring trade-offs, values instant gratification and which place higher priorities on immediate rewards.

A low score in *Humane Orientation* indicated a society where power and material possession motivate people and where values of pleasure, comfort, self-enjoyment have high priority, while a high score indicates a society where values of altruism, benevolence, kindness, love and generosity have high priority. A low score in *Power Distance* indicated a society where civil liberties are strong and public corruption is low and where the correct use of limited resources is valued, while a high score indicated a society where only a few people have access to resources, skills and capabilities, contributing to low human development and life expectancies. A low score in *Uncertainty Avoidance* indicated a society that shows less resistance to change and less desire to establish rules to dictate behaviour while a high score indicates a society that shows stronger resistance to change and a stronger desire to establish rules allowing predictability of behaviour. Finally, a low score in *Assertiveness* indicated a society that has sympathy for the weak and values harmony with the environment rather than control while a high score indicated a society that tries to have control over the environment.

Although the results of the GLOBE study have not been used previously in an environmental economics context, they have been used by other researchers to compare cultural

Table 2 Cultural index for specific countries and societal clusters relative to Ireland

Country	Culture index	GNI PPP index	Country	Culture index	GNI PPP index	Country	Culture index	GNI PPP index
Albania	1.05	5.27	Indonesia	1.03	11.22	South Korea (1)	1.17	1.34
Argentina	1.14	2.98	Iran	1.12	3.60	Spain	1.17	1.24
Australia (1)	1.02	1.12	Ireland (4)	1	1.00	Sweden (3)	0.91	0.99
Austria	1.02	1.04	Israel	1.04	1.47	Switzerland	1.01	0.89
Bolivia	1.04	9.52	Italy (2)	1.12	1.23	Taiwan	1.05	1.42
Brazil	1.12	4.07	Japan (1)	1	1.12	Thailand	1.04	5.25
Canada (2)	0.98	1.03	Kazakhstan	1.1	4.08	Turkey (1)	1.13	2.82
China	1	6.94	Kuwait	1.03	0.49	United Kingdom (12)	1.03	1.08
Colombia	1.17	4.71	Malaysia	0.95	2.98	United States (46)	1.06	0.83
Costa Rica	1.03	3.68	Mexico (1)	1.08	2.80	Venezuela	1.1	3.18
Denmark (4)	0.9	1.02	Morocco	1.17	9.76	Zambia	1.02	33.85
Ecuador	1.08	5.55	Namibia	1.05	6.61	Zimbabwe	1.07	19.65
Egypt	1.01	7.33	Netherlands (3)	0.97	0.94	*Societal cluster scores*		
El Salvador	1.15	6.12	New Zealand	1.01	1.47	Anglo (65)	1	
Finland (2)	0.96	1.08	Nigeria	1.1	20.93	Confucian Asia (2)	1.03	
France (2)	1.11	1.16	Philippines	1.03	11.15	Eastern Europe (5)	1.11	
Georgia	1.11	8.28	Poland	1.14	2.42	Germanic Europe (5)	1	
Germany (2)	1.07	1.07	Portugal (1)	1.05	1.66	Latin America (3)	1.08	
Greece (3)	1.16	1.42	Qatar	1	1.14	Latin Europe (5)	1.08	
Guatemala	1.15	8.67	Russia	1.15	2.37	Middle East (1)	1.04	
Hong Kong	1.11	0.89	Singapore	1	0.76	Nordic Europe (9)	0.91	
Hungary	1.23	2.18	Slovenia	1.09	1.46	Southern Asia	1.01	
India	1.02	13.71	South Africa	1.06	4.05	Sub-Saharan Africa	1.04	

The number of studies for each country used in the BT exercise is in parenthesis beside the country name. The GNI PPP index is the ratio of Gross National Income (GNI) per capita based on purchasing power parity (PPP) figures in Ireland to the GNI per capita based on PPP in each country. The most appropriate societal culture cluster score was used for studies from countries for which no individual score was available. These were Lithuania and Estonia (Eastern Europe societal culture), Norway (Nordic Europe societal culture) and Uruguay and Chile (Latin America societal culture)

difference in corporate affairs across countries (Shi and Wang 2011) and to examine the relationship between national culture and trade union membership (Posthuma 2009). This latter study highlighted the fact that GLOBE cultural constructs were better predictors of this relationship than a number of other measures of cultural identity. Whilst we recognise that using these indicators of cultural variability prioritises a given understanding or view on what is most important in capturing value-relevant aspects of culture, it did allow us to use a consistent indicator set across countries for which primary valuation studies for coastal ecosystem services are available.

We use the scores from these six GLOBE dimensions across different countries to create a cultural index, which we then employ to reweight our study site coastal ecosystem values. To make them more representative of the Irish population study site, coastal ecosystem values are multiplied by the ratio of the aggregate score on the 6 dimensions for Ireland to the aggregate score for the country where the study site valuation was carried out. The ratio used for each country is provided in Table 2. The exact BT formula used is presented in the methodology section.

4 Case Study: Galway Bay

The coastal zone of Galway Bay is the policy site used in this analysis. The geographical definition of the policy site was based on coastal waters as defined by the Western River Basin District (WRBD) under the Water Framework Directive (CEC 2000). As shown in Fig. 1, the study area comprised 143,430 ha of water based habitats and 2,840 ha of terrestrial habitats. The area of focus covers the Irish coastline from Slyne Head in the north-west to Blackhead in the south of the study area, a distance of 688 km along the western coastline of Ireland. With offshore islands included this aggregates up to a shoreline of 1,161 km. The site encompasses a variety of temperate coastal ecosystems (biomes), including salt marshes, rocky coasts, beaches, intertidal flats, estuaries and coastal lagoons (NPWS 2010). A significant area of the site (49,460 km^2 or 34 %) is also protected under EU "Natura 2000" site designation.

The two counties (Galway and Clare) surrounding the bay have a combined population of 258,749 (over the age of 18) and contain 83,871 households. According to Failte Ireland statistics, the combined tourist numbers visiting the two counties in 2009 was 1,311,000 (Failte Ireland 2011). Galway city is the main population centre in the coastal zone with approximately 80,000 residents. In order to define the land and marine ecosystems within the Galway Bay coastal zone, a database of coastal land and marine cover typologies was set up using the software package ArcMap 9.3. The typologies were determined by the available digital cartography and other available geo-referenced data. For terrestrial ecosystems used in the study, CORINE (Devillers et al. 1991) land cover data was used. CORINE aggregates land into parcels of no less than 25 ha for the purposes of defining land cover types. Beaches,

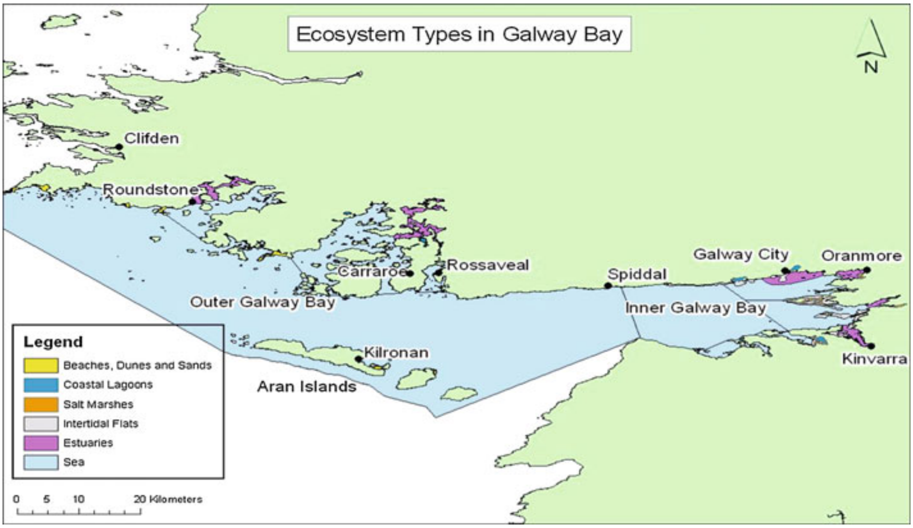

Fig. 1 The Galway Bay coastal zone with associated ecosystems

dunes and sands and coastal lagoons less than 25 ha were excluded from the CORINE data. These smaller parcels in the policy site were accounted for using geo-referenced data available from the Ordinance Survey of Ireland and in the case of the lagoons from the transitional water geo-data available from the WRBD.

For the near-shore marine ecosystems in the Galway Bay coastal zone, there was much less available GIS data. Research carried out by the Irish Marine Institute under the Infomar program provided information on most of the water covered area in the bay (84,560 ha) including seabed type (mud, sand, gravel, etc.) and bathymetry. Three aquatic ecosystems were considered in this study: sea; estuary; and marine seagrass meadows (*Zostera marina*) and kelp forests (*Laminaria* spp.). Sea area was based on the coastal areas defined by the WRBD, estuary area was based on the transitional areas defined by the WRBD (less transitional areas known to be coastal lagoons) and the seagrass area was based on a NPWS study (NPWS 2005) of the Kilkiernan Bay and Islands SAC and Galway Bay Complex, whilst kelp data was from the Irish Seaweed Centre.

Within the bay, new developments in aquaculture such as cod and abalone farming are being piloted, while there has also been a substantial increase in shipping activity in the last decade. Developments in these sectors, coupled with the considerable housing and infrastructural developments that occurred in the Galway Bay coastal zone during the "Celtic Tiger" years of economic growth in Ireland, means that the ecosystems within the Galway Bay coastal zone are under more pressure now than they ever have been in the past. The lack of consideration of the benefits of protecting coastal non-market goods and services in the planning process has been a contributing factor in the observed degradation of coastal resources within the bay.

5 Benefit Transfer Methodology

The coastal ecosystem services to be valued were broken down into four groupings following the Millennium Ecosystem Assessment (MEA 2005), namely supporting services, regulating services, provisioning services and cultural services.[6] The supporting services directly feed into the regulating services (e.g. the supporting services of biochemical cycling, primary production and food web dynamics all combine to contribute to the regulating service of eutrophication mitigation[7]) so to avoid double counting, only regulating and cultural

[6] The supporting services are those that are necessary for the production of all other ecosystem services but in themselves do not yield direct benefits to humans. They include biochemical cycling, primary production, food web dynamics, biodiversity, habitat and resilience. The regulating services are the benefits obtained from the regulating of ecosystem processes (Beaumont et al. 2007; Garpe 2008). The category of provisioning ecosystem services (such as transport and commercial fishing) which are traded in established markets were not analysed in this paper, as the focus of this study is on non-market services provided in the Galway Bay coastal zone. Also, non-market provisioning services such as shellfish picking for private consumption and the harvesting of seaweed for use as fertiliser in home gardens do occur in the Galway Bay coastal zone but could not be accounted for here due to a lack of information on the numbers participating in such activities as well as an absence of primary valuation estimates related to seaweed harvesting for private use. Finally, it should be noted that this breakdown of ecosystem goods and services does not account for interactions between different services and groupings.

[7] Eutrophication mitigation is the removal or transformation of high concentrations of nutrients, mainly organics, nitrogen (N) and phosphorous (P). Replacement cost studies for wastewater treatment and WTP studies for improvement of water quality associated with removing excessive nutrients were used to value the study site estimates used in the transfer for this ecosystem service. The other regulating service of atmospheric regulation only assessed the carbon sequestering value of the various ecosystem types. The regulation of other greenhouse gases such as methane and nitrous oxide were not included (other atmospheric regulation aspects

services are valued in the BT process. The total number of individuals living in the coastal counties bordering Galway Bay and the tourists visiting these counties were used to define the extent of the market.[8] Tourists were converted to local resident equivalents based on the length of time they spent in the area multiplied by the ratio of their spending to the average expenditure of an Irish person.

More formally:

$$R_{eq} = \sum \left(Tourists_{mkt_i} \times \frac{Tourist\ Days_{mkt_i}}{365} \times \frac{DTE_{mkt_i}}{DIS} \right)$$

where R_{eq} is the local resident equivalent, mkt_i is the tourist market segment (in Ireland it is divided into five market segments, Northern Ireland, Britain, Mainland Europe, North America and Other Areas), *Tourist Days* is the number of days spent in the country, *DTE* is the daily expenditure of a tourist and *DIS* is the daily expenditure of the average Irish person. The total local resident equivalent was then added to the local resident population. This resulted in an additional 15,826 persons being added to the residential population of the relevant region (Counties Galway and Clare). The ratio of *DTE* to *DIS* ranged from 1.67 for visitors from Northern Ireland to 2.94 for visitors from the USA.

Having defined the geographical area of the site using GIS[9] (as described in the previous section), the next step in the BT process involved a search and analysis of the valuation literature. The number of peer reviewed valuation studies with regard to coastal and marine ecosystems and their goods and services in Ireland is very limited. Therefore, in order to obtain a meaningful sample, the literature search was broadened to European, US and other international studies. The ecosystem valuation literature is most mature in the USA and has a longer history there than anywhere else. European valuation studies, including coastal and marine BT studies have also increased since the late 1980's (Troy and Wilson 2006; Liu 2007; Brondizio et al. 2010; McVittie and Moran 2010). While the bulk of the papers included are peer-reviewed papers, some valuations have also been taken from the grey literature (i.e. government reports, working papers of valuation research institutes). All original study estimates, the associated study characteristics and the reference to each study used in the analysis are available to download from the specifically constructed coastal ecosystem service valuation database at http://www.nuigalway.ie/semru/marine_ecosystem_service_value_estimates.html.

The ecosystem values taken from the international literature had to be standardised and the services valued in the study site matched to the correct ecosystem service in the policy site. This was achieved by first converting the estimates from the literature to Euro (€) values per hectare using the appropriate nominal exchange rate and then by adjusting for inflation based on the Irish consumer price index (CSO 2010) to convert to 2007 prices. Once this was done, three different types of unit value adjustment of increasing sophistication were carried out in the transfer of study site benefit estimates to the coastal zone policy site in Galway Bay. The first type of transfer conducted below is unit transfer with income adjustments where the transfer estimate for policy site p is given by:

Footnote 7 continued
such as transport of gases were also not considered. The complex interaction of ecosystems within the coastal and marine zone emphasises the difficulty in valuing each ecosystem separately).

8 Galway Bay is a very popular destination for both domestic and foreign tourists and these individuals also make use of the ecosystem services provided by the bay.

9 Using GIS is a relatively recent extension to the BT method and is used to apportion ecosystem values on a geographic basis to the study site (Bateman et al. 1999, 2006; Wilson and Liu 2008; Ghermandi et al. 2010).

$$V(ES_{ki})_p = V(ES_{ki})_s \times Ex_q \times CPI \times \left(\frac{y_p}{y_s}\right)^e$$

$V(ES_{ki})_s$ is the average of the original WTP estimates for service k generated by ecosystem i at study sites s, Ex_q is the euro-country q exchange rate in the relevant year and CPI is the consumer price index used to adjust to 2007 prices. The values y_s and y_p are the income levels at the study and policy site, respectively. Since data on the actual income levels of the affected populations at the policy and study sites were not available, Gross National Income (GNI) per capita based on purchasing power parity (PPP) figures for the year in which the study was undertaken[10] were used instead as proxies for y_s and y_p. The term e is an estimate of elasticity of the WTP for ecosystem service k with respect to changes in income. In this paper, we assume e is equal to one. Pearce (2003) found no conclusive evidence for a value greater than one but it could be alternatively hypothesised that there may be differing income elasticity of demands for different ecosystem goods and services in Ireland and further study is needed in this regard—although Jacobsen and Hanley (2009) find an income elasticity of WTP of less than unity using a global data base of biodiversity values. The unity assumption implies that the ratio of WTP at sites s and p is equivalent to the ratio of per capita incomes in Ireland and the home country of the study site $\left(\text{i.e. } \frac{WTP_p}{WTP_s} = \frac{y_p}{y_s}\right)$.

We then account for the cultural similarities of the policy site location and the study sites using the "Cultural Dimensions" scores discussed in Sect. 3:

$$V(ES_{ki})_p = V(ES_{ki})_s \times Ex_q \times CPI \times C_q$$

In calculating this Cultural Unit Transfer formula the cultural index C_q needed to be created, based on the 6 cultural dimensions from House et al. (2004) described above. Each dimension for each of the 62 societies in the study was given a rating on a Likert scale from 1 to 7.[11] The final cultural index for a study site in country q (C_q) is calculated using the following ratio:

$$C_q = \sum_{d=1}^{6} \theta_{dpq} \Bigg/ \sum_{d=1}^{6} \theta_{dsq}$$

where θ_{dsq} is the score for cultural dimension d for country q where study site s is situated and θ_{dpq} is the score for cultural dimension d for country q where policy site p is located (in this case the q in $\theta_{dpq} =$ Ireland). The value of C_q used for each country and for the different societal clusters is provided in Table 2. Table 2 also displays the number of studies from each country that were used in the BT process.

Finally, the third unit transfer methodology adjusts for both income *and* cultural differences across study and policy sites. In this case it is assumed that the ratios of income and cultural factors are not equivalent to each other, and are not perfectly correlated. It also assumes that there are other dimensions not captured by income differences that may be measured through cultural differences such that:

[10] PPP data was taken from World Bank (2010). GNI per capita, PPP (current international $), [Online] http://data.worldbank.org/indicator/NY.GNP.PCAP.PP.CD. The adjustment ratio used was *PPP per Capita for Ireland/PPP per Capita for Country of study*, for the year of the study.

[11] In creating our C_q index we converted the Performance Orientation, Assertiveness, and Power Distance indicators so that a higher rather than a lower score meant the country was likely to place higher values on ecosystem services. This meant that all dimensions scores had a low score for less of that dimensional element in their culture and a high score for more of that dimensional element in their culture. This was done simply by subtracting the original dimension score away from the highest possible value on the likert scale (7).

$$V(ES_{ki})_p = V(ES_{ki})_s \times Ex_q \times CPI \times \left(\frac{y_p}{y_s}\right)^e \times C_q$$

The final step in the BT process involved calculating the total non-market value of ecosystem services in the Galway Bay coastal zone using each of the 3 transfer approaches outlined above. To accomplish this, the average estimates of $(V(ES_{ki})p)$ for each of the identified ecosystem services (where an estimate had been found) in Table 3 were multiplied by the area of the associated ecosystems in the coastal zone and then aggregated.[12] Recreation participation rates were calculated for the reference population in the coastal zone using figures from a marine activities report produced by the Economic and Social Research Institute (ESRI 2004)[13] while the carbon price of €15/tC set by the Irish government in the 2010 budget was used in this study to calculate the value of atmospheric regulation in the bay (converted to 2007 prices it is €15.09/tC). The results of each of the unit transfer approaches used are presented in the next section.

6 Results

The literature review component of the BT process identified 209 point estimates from 123 separate studies related to the valuation of marine ecosystem services of which 169 value estimates could be used in the BT process. Those deemed unusable were mostly due to the lack of data at the policy site (e.g. hedonic pricing estimates for the value added to houses due to proximity to the coast had to be dropped due to lack of GIS data on the housing stock in the policy site) or due to not being relevant to ecosystem services produced at the policy site. The 169 valuation points were therefore taken from 95 studies of which 61 were peer-reviewed papers and the other 34 comprised of PhD theses, university working papers and technical reports. In terms of the types of valuation across the 95 studies, 68 were contingent valuation, 17 were travel cost, 1 was restoration cost, 5 were choice experiments, 5 were contingent ranking and 4 used the production function method.[14]

Several of the relevant ecosystem services across the different coastal biomes could not be assigned a value as there was insufficient information. There were no available values for the ecosystem services of science and education, cultural heritage and inspiration or the regulating service of local climate control across any of the coastal ecosystems. Due to these data gaps and also the use of lower WTP estimate values where lower and higher estimates were reported rather than means, there is a high probability that the BT exercise is likely to

[12] As ecosystems themselves are distributed spatially, it also makes sense to value their goods and services in a spatial manner such as Euro per hectare (Costanza et al. 1997; Troy and Wilson 2006). However, many non-market valuation studies present findings in terms of values per person or per household per year. Similar to Spash and Vatn (2006) we converted to values per hectare by aggregating the per person or per household estimates by the relevant population and then distributing the aggregate value across the ecosystem areas.

[13] The ERSI study calculated participation rates and average number of trips taken by participants across various marine and coastal recreational activities. The participation rates multiplied by the average number of trips per activity per year was used in our study in order to estimate the total use of the bay by the reference population in the year 2007.

[14] Note that the number of methodology types adds up to more than one per study as some papers used (compared) two or more types of valuation methodologies, e.g. travel cost and contingent valuation. The values used for atmospheric regulation does not change across the different unit transfer approaches as it is not based on any transfer value but instead was based on our own primary calculations using data on carbon sequestration for different ecosystem types and the Irish governments carbon price set in Budget 2010 at €15 per tonne.

Table 3 Non-market value of ecosystem services provided by each land and marine cover type in Galway (€000/ha/year in 2007)

	Beach, dunes, sand	Salt marshes	Intertidal flats	Coastal lagoons	Estuaries	Sea
Atmospheric regulation		0.03 (0.03) *0.03*			−0.09 (−0.09) *−0.09*	0.002 (0.002) *0.002*
Sediment retention	21.5 (35.1) *22.7*, **9**	1.4 (3.0) *1.4*, **3**				
Biological regulation						0.03 (0.03) *0.03*, **1**
Pollution control	12.5 (9.6) *13.0*, **7**				0.7 (0.8) *0.8*, **2**	0.01 (0.01) *0.01*, **3**
Eutrophication mitigation		8.8 (13.2) *9.3*, **6**		55.2 (123) *58.7*, **2**	4.9 (5.3) *5.2*, **16**	0.7 (1.4) *0.7*, **15**
Recreation	21.8 (27.7) *22.2*, **13**	9.7 (16.8) *10.2*, **10**		2.5 (4.9) *2.7*, **2**	0.6 (0.8) *0.6*, **6**	0.1 (0.16) *0.1*, **41**
Aesthetic value	3.9 (3.1) *4.3*, **2**					0.1 (0.1) *0.1*, **3**
The legacy of nature	3.1 (6.7) *3.4*, **3**	3.9 (7.1) *4.0*, **4**	1.4 (1.5) *1.4*, **1**	28.6 (36.2) *31.7*, **3**	1.4 (1.7) *1.5*, **1**	0.06 (0.08) *0.06*, **11**

Standard font figures indicate estimate values calculated using the income adjusted BT formulae. Figure in parentheses indicates estimate value calculated using the cultural adjustment BT formulae while figure in italics indicates estimate value calculated using the combined income and cultural adjusted BT formulae. Empty cells indicate lack of value data. Figure in bold indicate number of estimates used in the BT process for each service in each biome be an underestimate of the current value of total ecosystem service flows in the Galway Bay coastal zone.[15]

Before presenting the results of the 3 BT approaches outlined above it is important to first examine whether the cultural index, C_q, and the income index are correlated. Smith (2002) points out that income and wealth could be an integral part of a country's culture. Assuming this is true then adjusted $V(ES)$ for both income differences and the cultural index may lead to an element of double counting. In order to capture the true impact of culture on the benefit estimates beyond those captured by the income adjustment we need to examine the correlation between income and the cultural index. As a first step we calculated the correlation between all cultural dimensions and GNI per Capita for the 62 societies in the GLOBE study. The results are shown in Table 1. Five out of the 9 dimensions were found to be significantly correlated with GNI per capita. Overall the correlation between C_q and GNI per Capita, for all 62 societies, was also found to be statistically significant at the 95 % confidence level (correlation coefficient of 0.35). However, the correlation between C_q, GNI per capita and the income index, for countries in the BT analysis was found to be statistically insignificant.

We then ran a pooled meta-analysis, where the log of the benefit estimate was the dependent variable and GNI per capita, the aggregate culture score for each site/country and their interaction were included as independent variables. Dummies for ecosystem service, biome type and valuation methodology were also included as additional independent variables. This parametric approach to examining the relative importance of income and culture demonstrated significant coefficient estimates for the GNI per capita and the aggregate culture score variables. It also resulted in a statistically significant (and negative) estimate for the coefficient associated with their interaction. This implies that while both income and culture are important determinants of willingness to pay in their own right, higher levels of both have a moderating effect on an individual's willingness to pay for ecosystem services.[16] Having said that, it would appear from the regression results that the cultural factor is capturing differences in WTP which are not captured through the income factor.

6.1 Total Non-market Values by Ecosystem Service and by Biome

A breakdown of the benefit value per ecosystem and by service using the 3 transfer methodologies is shown in Table 3. The number of estimates used in the BT for each service across each ecosystem is also recorded. Moving from the income adjusted unit transfer approach to the unit transfer with cultural adjustments results in significant increases in the predicted value of the coastal ecosystem services across many of the different biomes. On the other hand, the income-adjusted unit transfer value and the unit transfer with both income and

[15] The largest numbers of point estimates was for the sea (75) and beach, dunes and sands (34) ecosystems. This is probably due to the fact that these are the most visible, well known and used of the ecosystems within any costal zone. Beach and sea ecosystems have a high number of associated literature valuation studies for recreation services (13 for beach, 41 for sea) although beach also has a high number of associated sediment retention (9) valuation studies as well. The next highest number of valuation points is for the estuaries ecosystem in which the ecosystem values of recreation (6) and eutrophication mitigation (16) are the most common valued in the literature. Salt marshes have a similar number of values from the literature as estuaries and similar to estuaries most of them are for recreation (10) and eutrophication mitigation (6). The other types of ecosystem services present in Table 2 are perhaps less familiar to the general public and this has probably contributed to a lower number of associated valuation studies.

[16] The results of the meta-analysis are not presented here but are available from the authors upon request. While the meta-analysis regression was a useful exercise in examining whether income and culture are significant determinants of WTP it could not be used for transferring value estimates across the coastal ecosystems due to the limited sample and the low predictability power of the ecosystem service and biome dummies.

cultural adjustments are similar in magnitude—with the size of the cultural-income adjusted estimates being consistently marginally larger.[17] It would thus appear that the addition of the cultural adjustment to the income adjustment has the tendency to moderate the size of the transfer estimate compared to where no adjustment is made to the unit values, or the adjustment where the cultural adjustment is applied on its own.

The highest ecosystem values per hectare (shown in Table 3) was found to be for *coastal lagoons* (€93,137 using the cultural-income transfer methodology) which is mainly due to their value in regards to eutrophication mitigation (€58,724).[18] The next highest value on a per hectare basis was for *beach, dunes and sand* (total non-market ecosystems service value were estimated at €62,903, €82,300 and €65,600 for the income adjusted, culture adjusted and culture-income unit transfer methodologies respectively). Similar to many other coastal ecosystem service valuation studies (e.g. Troy and Wilson 2006; Liu 2007) we found that beaches are a highly valued coastal ecosystem type, mainly due to their recreational value (€22,208 using the cultural transfer methodology). *Beaches, dunes and sand* were also associated with high values for sediment retention, pollution control, aesthetic value and the legacy of nature.

The *sea* was found to have low service values when compared to the other ecosystems on a per hectare basis (Table 3) due to the large area it covers (95 % of the study area), but as can be seen from Table 4, the aggregated area of the sea provides the highest total (measurable) ecosystem value in 2007. This represents approximately half of the total value of the non-market ecosystem services flow of the Galway Bay coastal zone. The highest values associated with the *sea* ecosystem measured here are for eutrophication mitigation. *Estuaries* are unique in this study as they have a cost (or negative benefit) associated with the atmospheric regulation ecosystem service (−€91). The carbon production of estuaries was estimated to outweigh the aggregated value of carbon sequestered in the sea, salt marshes and seagrasses so that the study site would seem to be a net producer of carbon dioxide. The contribution of *intertidal flats* and *sea grasses and kelp beds* to the total ecosystems services flow was found to be less than 1 % in each case reflecting the low number of services in these ecosystems for which values were available.

Table 5 shows the total contribution of each ecosystem service (for which estimates were available) to total (measurable) non-market ecosystem services value. Regulating services contribute the highest non-market values, representing over half (67 % using the cultural-income adjusted transfer estimate) of the total ecosystems service flow value. This is mainly due to the contribution being made by the service of eutrophication mitigation (54 % in total). The second highest valued ecosystem service was the cultural service of recreation (valued at €35.9 million using the cultural unit transfer approach and accounting for 13 % of the total non-market value of ecosystem services in the coastal zone). As with the per hectare ecosystem service value estimates the addition of the cultural adjustment to the income adjustment has the tendency to moderate the size of the total service flow value compared to where no adjustment is made or where the cultural adjustment on its own is applied (Table 6).

[17] Although not presented here, the naïve unadjusted BT approach (where no account is taken of even income differences) results in BT estimates which consistently lie between the cultural adjusted estimates and the cultural and income combined adjusted estimates.

[18] A cautious view needs to be taken with regard to this eutrophication mitigation value estimate as it is based on only two contingent valuation studies. Nevertheless, the Galway Bay area has a high proportion of the coastal lagoons in Ireland and many of them are vulnerable to eutrophication due to the karstic nature of the Galway Bay geology.

Table 4 Total ecosystem value flow for Galway Bay (2007)

Ecosystem type	Area (ha)	GNI adjusted (€000)	Cultural adjusted (€000)	GNI and cultural adjusted (€000)
Beaches, dunes, sand	691	43,466 (17.2)	56,857 (13.5)	45,330 (17.1)
Salt marshes	279	6,636 (2.6)	11,191 (2.6)	6,966 (2.6)
Intertidal flats	1,584	2,194 (0.9)	2,411 (0.6)	2,252 (0.9)
Coastal lagoons	400	34,547 (13.6)	65,928 (15.6)	37,255 (14.1)
Estuaries	3,976	30,158 (11.9)	34,496 (8.2)	31,958 (12.1)
Sea	139,386	132,962 (52.5)	248,385(58.8)	137,615 (52)
Seagrass and kelp	1,622	3,206 (1.3)	3,203 (0.8)	3,217 (1.2)

Figures in parentheses indicate what percentage each ecosystem type contributes to total ecosystem value

Table 5 Total service value flow for Galway Bay

Ecosystem service	GNI adjusted		Cultural adjusted		GNI and cultural adjusted	
	Value (€000)	%	Value (€000)	%	Value (€000)	%
Atmospheric regulation	−120	−0.05	−120	−0.03	−120	−0.02
Sediment retention	15,265	6	25,111	6	16,060	6
Biological regulation	3,845	2	4,064	1	3,735	1
Pollution control	12,713	5	11,645	2.8	13,536	5
Eutrophication mitigation	136,817	54	270,129	64	143,522	54
Recreation	34,533	13	51,685	12	35,939	13
Aesthetic value	15,266	6	15,294	4	15,530	6
The legacy of nature	34,849	14	44,663	11	36,389	14

Table 6 Performance of value transfer methods

Galway Bay study	Euro/ha/year for Galway Bay studies	Average transfer error (%)			
		Naïve unit transfer	GNI adjusted	Cultural adjusted	GNI and cultural adjusted
Recreation—beach (Barry et al. 2011)	63,899 (15,206; 90,689)	−57.50	−65.61	−57.69	−64.97
The legacy of nature—sea (Hynes et al. 2011)	70.68 (66.26; 75.24)	11.83	−8.63	15.85	−9.32
Pollution control—beach (Hynes et al. 2011)	18,310 (18,023; 18,569)	−49.82	−31.86	−62.58	−28.60
Eutrophication mitigation—sea (Hynes et al. 2011)	82.51 (55.29; 109.44)	73.60	60.39	94.34	52.99

6.2 Valuing Changes in Ecosystem Service Flows

The total ecosystem service values outlined above are useful to highlight the relative contribution of the coastal ecosystem services and biomes to human well-being. However, marginal changes in ecosystem service values provide more usable information for typical planning decisions. For example there is currently a planning proposal in place to expand the port in Galway city to facilitate vessels with capacity above 6,000 tonnes. It is envisaged that the development of the new port will also allow the Port Company to bring a significant number of cruise vessels to the heart of Galway city. The proposed development will consist of 23 ha of land reclamation. The development will extend 917 m out to sea providing 660 m of quay berth to −12 m Chart Datum (CD) depth serviced by a −8 m CD channel depth. The dredging of a 400 m diameter turning circle to −8 m CD is also planned to accommodate the larger cruise liners. The development will involve the permanent covering over of approximately 4.7 ha of intertidal flats and the reduction in estuary area by approximately 18 ha. Using the per hectare values presented in Table 3 (for values per hectare for intertidal flats and estuary[19]) and assuming a discount rate of 10 % we estimate that the net present value of the foregone non-market ecosystem services as a result of the harbour development would be €1.36 million, €1.49 million or €1.40 million per hectare using the income adjusted, cultural factor adjusted and cultural-income adjusted transfer values respectively.[20]

6.3 Testing Validity

A successful indication of the overall worth of the transfer approaches adopted in this study is whether the transferred values are similar to equivalent primary estimates for the policy site on the basis of some statistical criteria. Transfer errors are of great concern in the BT literature, as this indicator is of primary importance in providing confidence in the final valuation of the policy site (Colombo and Hanley 2008). While one of the main reasons for using BT to measure the ecosystem service values in the Galway Bay coastal zone is the lack of primary estimates for the policy site, we can still test our alternative unit transfer approaches against two recent beach recreational demand studies conducted in the Galway Bay coastal zone. Using a travel cost model, Barry et al. (2011) estimated the recreational use value per trip to a beach site in the Galway Bay coastal zone while Hynes et al. (2011) estimated the value of eutrophication mitigation, pollution control and benthic sea life to recreationalists at beach sites in the Galway Bay area.[21] The values per hectares for these benefits are shown in Table 5 along with the average transfer error associated with each BT approach. Following Bateman et al. (2000), the transfer error for ecosystem service, k is calculated as:

$$TransferError_k = \frac{(TransferredEstimate_k - PolicySiteEstimate_k}{PolicySiteEstimate_k} \times 100$$

[19] The value per hectare used for estuary does not include the recreation figures in Table 3 as the new port will not adversely affect any existing water based recreation activity in the area.

[20] We obviously do not include here any calculation of the provisioning ecosystem services that will be created as a result of the harbour development. With the construction of berthing facilities for general cargo vessels, oil tankers, passenger vessels, fishing vessels and container vessels, Roll on/Roll off facilities, berths for naval/research vessels and a marina providing 216 amenity berths, the NPV of such provisioning services are likely to very significant.

[21] The study estimates from Barry et al. (2011) and Hynes et al. (2011) were not included in the BT exercise itself.

As can be seen in Table 5 the transfer errors range from 9.3 to 94 %, depending on which transfer methodologies is used. The cultural-income-adjusted transfer approach gives the lowest transfer errors for both eutrophication mitigation and beach pollution control while the income adjusted BT approach gives the lowest transfer error for the value of benthic sea life. The naïve unit transfer, where no adjustment is made in terms of income or culture actually provides the lowest transfer estimate across all approaches for beach based recreation (57.5 %) [although the transfer error associated with the cultural adjustment is almost identical (−57.7 %)]. The cultural adjusted BT gives the highest transfer error across all BT approached for eutrophication mitigation (94 %).

These transfer errors compare favourably with many transfer errors found in the international BT literature (Alberini et al. 1997; Shrestha and Loomis 2001; Barton and Mourato 2003; Ready et al. 2004; Lindhjem and Navrud 2009; Rozan 2004). In a test of benefit transferability Zhai and Suzuki (2009) carried out the same coastal zone choice experiment at the same time in a coastal city in China, Japan and South Korea to determine which benefits can be most readily transferred internationally. They found mean transfer errors in the range of 97–243 %. More generally, Rosenberger and Stanley (2006) reviewed transfer errors in the environmental economics literature and found unit transfer BT error rates varying between 8 and 577 %. Lindhjem and Navrud (2009) note that international meta-analytic transfers, even with homogeneous valuation methods, similar cultural and institutional conditions across countries could still result in large transfer errors.[22]

7 Discussion and Conclusions

This paper examined the impact of using cultural dimensions in international BT. Unadjusted, income-adjusted, cultural adjusted and cultural-income adjusted unit value transfer approaches were compared in terms of their impact on the size of the resulting ecosystem service values per hectare at the Galway Bay coastal zone policy site. The adjusted unit transfer approach was seen as the most appropriate way of transferring benefit values both within Ireland, and between Ireland and other countries especially since we were dealing with multiple services across multiple ecosystems, which made the use of value function transfer approaches more difficult.[23, 24]

It is generally recommended that the BT researcher should identify and use only similar studies from the same country or other closely located countries which share a similar institutional and cultural context. This recommendation is based on validity tests showing that studies which are closer spatially tend to have lower transfer errors (Lindhjem and Navrud 2009). Adjusting international transfer estimates using a cultural index such as that developed in this paper should allow a wider range of studies to be employed in the BT exercise, since this index allows some statistical control over one reason behind the spatial patterning in

[22] The interested reader should see Johnston and Rosenberger (2010) for an in-depth review of the international value transfer literature.

[23] It has also been previously shown that when BT analysis is restricted to only include similar sites (in terms of the characteristics of those sites and their surrounding populations) transfer errors are minimised when simple mean value methods are applied (Bateman et al. 2009).

[24] It should also be noted that some researchers (e.g. Navrud 2007) have found that unit transfer methods can produce lower transfer errors than the more complex procedures of value function transfers due to the low explanatory power of WTP functions of stated preference studies, and the fact that methodological choice, rather than the characteristics of the site and the affected populations, has a large explanatory power in meta-analyses.

values. We find that the transfer error for the ecosystem service of beach based recreation is relatively high when we apply the unit transfer approach, but not so high as to be a transfer error outlier in the international BT literature. Controlling for income and cultural differences between the study and policy sites resulted in the transfer error being minimised for 2 out of the four services examined.

However, we found that once differences in income levels have been accounted for, the differences in cultural dimensions between study and policy sites actually have little impact on the magnitude of our valuation estimates. It should however be noted that the majority of our study site estimates (85 %) came from what House et al. (2004) refer to as the "Anglo societal cluster" of countries (Ireland, England, Canada, USA, New Zealand and South Africa) which all have ethnic and linguistic similarities and related migration patterns originating centuries ago from areas in Northern Europe. Due to these similarities, the countries within the Anglo cluster tend to have very similar scores in terms of the cultural dimensions used to calculate the cultural BT estimates (see Table 2) which means that for the majority of the estimates transferred, the cultural parameter, C_q, is close to unity and there is therefore no significant change in the cultural adjusted transferred values from those calculated using the income adjusted BT formulae.

However, additional studies from a more diverse range of countries may result in a more significant influence of the cultural dimensions on transfer estimates. If one wanted to conduct a BT exercise to policy sites within countries such as El Salvador, Colombia, or South Korea, where the vast majority of estimates in the BT exercise are derived from Anglo cluster countries, then the cultural adjustment would not be 'modest'. The international BT study conducted by Zhai and Suzuki (2009) revealed that between 3 Asian countries (Japan, China and South Korea), South Korea performed worst in terms of the transfer errors. If the cultural adjustment developed in this paper was used on the South Korean estimates prior to transferring the CE estimates to the other two countries (in both cases multiplying by a factor of 0.85), then the transfer errors reported for 13 coastal attribute values would have been reduced.

It should also be noted that our use of BT means that each of the ecosystem services were valued separately; no account was taken of the fact that there are linkages between services (e.g. habitat fishery and storm protection). Thus the 'integrated' benefits might exceed the valuation of each single ecosystem service on its own. As Hanley and Barbier (2009) point out, future research is needed to develop multi-service ecosystem modelling to understand more fully what values are lost and gained when integrated coastal ecosystems are disturbed. These caveats aside, the results demonstrate the range of ecosystem service values within Galway Bay and should increase awareness and commitment to sustainable coastal management within the study area. The process of identifying and quantifying the economic value of these coastal zone ecosystem services can provide valuable information to policy makers for the efficient management of natural resources within the coastal zone (Barbier et al. 2011). Further research that examines the best way of making adjustments for cultural differences in international BT could lead to an improvement in the reliability of the ecosystem service valuation approach and ultimately in its use as a tool for the sustainable use of natural coastal ecosystems and the vital services they provide.

Acknowledgments This research was funded through the Beaufort Marine Research Award, which is carried out under the *Sea Change* Strategy and the Strategy for Science Technology and Innovation (2006–2013), with the support of the Marine Institute, funded under the Marine Research Sub-Programme of the National Development Plan 2007–2013.

References

Alberini A, Cropper M, Tsu-Tan F, Krupnick A, Jin-Tan L, Shaw D, Harrington W (1997) Valuing health effects of air pollution in developing countries: the case of Taiwan. J Environ Econ Manag 34:107–126

Alvarez-Farizo B, Hanley N (2006) Improving the process of valuing non-market benefits: combining citizens' juries with choice modelling. Land Econ 82(3):465–478

Barbier EB, Hacker S, Kennedy C, Koch E, Stier A, Silliman B (2011) The value of estuarine and coastal ecosystem services. Ecol Monogr 81(2):169–193

Barry L, van Rensburg T, Hynes S (2011) Improving the recreational value of Ireland's coastal resources: a contingent behavioural application. Mar Policy 35:764–771

Barton D, Mourato S (2003) Transferring the benefits of avoided health Effects from Water pollution between Portugal and Costa Rica. Environ Dev Econ 8:351–371

Bateman I, Ennew C, Lovett A, Rayner A (1999) Modelling and mapping agricultural output values using farm specific details and environmental databases. J Agric Econ 50:488–511

Bateman I, Jones A, Nishikawa N, Brouwer R (2000) Benefits transfer in theory and practice: a review and some new studies. Centre for Social and Economic Research on the Global Environment (CSERGE) and School of Environmental Sciences, University of East Anglia, Norwich

Bateman I, Day B, Georgiou S, Lake I (2006) The aggregation of environmental benefit values: welfare measures, distance decay and total WTP. Ecol Econ 60:450–460

Bateman I, Brouwer R, Cranford M, Hime S, Ozdemiroglu E, Phang Z, Provins A (2009) Valuing environmental impacts: practical guidelines for the use of value transfer in policy and project appraisal. Value transfer guidelines. Eftec, London. Submitted to Department for Environment, Food and Rural Affairs (Defra), Dec 2009. http://www.defra.gov.uk/environment/policy/natural-environ/using/valuation/index.htm

Beaumont NJ, Austen MC, Atkins JP, Burdon D, Degraer S, Dentinho TP, Derous S, Holm P, Horton T, van Ierland E, Marboe AH, Starkey DJ, Townsend M, Zarzycki T (2007) Identification, definition and quantification of goods and services provided by marine biodiversity: implications for the ecosystem approach. Mar Pollut Bull 54:253–265

Blamey R, Common M, Quiggin J (1995) Respondnts to contingent valuation surveys: consumers or citizens?. Aust J Agric Econ 39:263–288

Brenner J, Jiménez J, Sardá R, Garola A (2010) An assessment of the nonmarket value of the ecosystem services provided by the Catalan coastal zone, Spain. Ocean Coast Manag 53:27–38

Brondizio E, Gatzweiler F, Zagrafos C et al (2010) Socio-cultural context of ecosystem and biodiversity valuation. In: McNeely J et al (ed) The economics of ecosystems and biodiversity (TEEB). United Nations Environmental Programme and the European Commission, Brussels

CEC (2000) Directive of the European parliament and of the council 2000/60/EC establishing a framework for community action in the field of water policy. Off J Eur Communities L327/1:72

Colombo S, Hanley N (2008) How can we reduce the errors from benefits transfer? An investigation using the choice experiment method. Land Econ 84:128–147

Costanza R, d'Arge R, de Groot R, Farber S, Grasso M, Hannon B, Limburg K, Naeem S, O'Neil R, Paruelo J, Raskin R, Sutton P, van den Belt M (1997) The value of the world's ecosystem services and natural capital. Nature 387:253–260

CSO (2010) Cenus 2006—interactive tables. http://www.cso.ie/census/. Accessed 28 June 2010

Devillers P, Devillers-Terschuren J, Ledant J (1991) CORINE biotopes manual: a method to identify and describe consistently sites of major importance for nature conservation. Data specifications—part 2 (EUR 12587/3 EN). Commission of the European Communities, Luxembourg

Dietz T, Fitzgerald A, Shwom R (2005) Environmental values. Ann Rev Environ Resour 30:335–372

Economic and Social Research Institute (ESRI) (2004) A national survey of water-based leisure activities in Ireland 2003. http://www.esri.ie/publications/search_for_a_publication/search_results/view/index.xml?id=1941. Accessed 17 July 2010 (online)

Failte Ireland (2011) Tourism regions data. http://www.failteireland.ie/Research-Statistics/Tourism-Facts/Tourism-Regions Accessed 12 Aug 2011 (online)

Furnham A, Kirkcaldy B, Lynn R (1994) National attitudes to competitiveness, money and work amongst young people: first, second and third world differences. Hum Relat 47:119–132

Garpe K (2008) Ecosystem services provided by the Baltic Sea and Skagerrak. Swedish EPA, Naturvårdsverket, Stockholm

Ghermandi A, van den Bergh J, Brander L, de Groot H, Nunes P (2010) The values of natural and human-made wetlands: a meta-analysis. Water Resour Res 46:W12516

Hanley N, Barbier E (2009) Pricing nature: cost-benefit analysis and environmental policy-making. Edward Elgar, London

Hanley N, Ready R, Colombo S, Watson F, Stewart M, Bergmann EA (2008) The impacts of knowledge of the past on preferences for future landscape change. J Environ Manag 90:1404–1412
Henrich J, Boyd R, Bowles S, Camerer C, Fehr E, Gintis H, McElreath R (2001) In search of homo economicus: behavioral experiments in 15 small-scale societies. Am Econ Rev 91:73–78
Hofstede G (2001) Culture's consequences: comparing values, behaviors, institutions, and organizations across nations. SAGE Publications, Thousand Oaks, CA
Hornborg A, McNeill J, Martinez-Alier J (2007) Rethinking environmental history: world-system history and global environmental change. Altamira Press, Lanham
House R, Hanges P, Javidan M, Dorfman P, Gupta V (2004) Culture, leadership, and organizations: The GLOBE study of 62 societies. Sage Publications, Beverly Hills, CA
Howley P, Hynes S, O'Donoghue C (2010) The citizen versus consumer distinction: An exploration of individuals' preferences in contingent valuation studies. Ecol Econ 69:1524–1531
Hoyos D, Mariel P, Fernandez-Macho J (2009) The influence of cultural identity on the WTP to protect natural resources: some empirical evidence. Ecol Econ 68:2372–2381
Hussain S, Winrow-Griffen A, Moran D, Robinson L, Fofana A, Paramor O, Frid C (2010) An ex ante ecological economic assessment of the benefits arising from marine protected areas in the UK. Ecol Econ 69:828–838
Hynes S, Hanley N, O'Donoghue C (2007) Using spatial microsimulation techniques in the aggregation of environmental benefit values: an application to corncrake conservation on Irish farmland. In: Envecon 2007: applied environmental economics conference, organised by the UK Network of Environmental Economists (UKNEE), London, Friday, 23 March 2007
Hynes S, Hanley N, O'Donoghue C (2010) A combinatorial optimization approach to non-market environmental benefit aggregation via simulated populations. Land Econ 86:345–362
Hynes S, Scully C, Browne A (2011) Valuing marine environmental characteristics associated with changes to the EU bathing water directive. Paper presented at the 3rd annual Beaufort marine socio-economic symposium, at the National University of Ireland, Galway, 11 Nov 2011
Inglehart R, Baker W (2000) Modernization, cultural change and the persistence of traditional values. Am Sociol Rev 65:19–51
Jacobsen JB, Hanley N (2009) Are there income effects on global willingness to pay for biodiversity conservation?. Environ Resour Econ 43:137–160
Johnston R, Rosenberger R (2010) Methods, trends and controversies in contemporary benefit transfer. J Econ Surv 24:479–510
Lindhjem H, Navrud S (2009) Asking for individual or household willingness to pay for environmental goods? Implications for aggregate welfare measures. Environ Resour Econ 43:11–29
Liu S (2007) Valuing ecosystem services: an ecological economic approach. PhD thesis, Faculty of the Graduate College, The University of Vermont
Loomis J (1992) The evolution of a more rigorous approach to benefit transfer: benefit function transfer. Water Resour Res 28:701–705
McVittie A, Moran D (2010) Valuing the non-use benefits of marine conservation zones: an application to the UK Marine Bill. Ecol Econ 70:413–424
MEA (2005) Ecosystems and human well-being: biodiversity synthesis. World Resources Institute, Washington, DC
NPWS (National Parks and Wildlife Services) (2005) Surveys of sensitive subtidal benthic communities in Kilkieran Bay and Islands SAC and Kingstown Bay SAC. Report prepared by MERC Consultants. http://www.npws.ie/en/media/NPWS/Publications/Marine/Media,6636,en.pdf. Accessed 10 July 2010 (online)
NPWS (National Parks and Wildlife Services) (2010) Galway—special areas of conservation. http://www.npws.ie/en/en/ProtectedSites/SpecialAreasofConservationSACs/. Accessed 23 July 2010
Navrud S (2007) Practical tools for benefit transfer in Denmark—guidelines and examples. Report to the Danish Environmental Protection Agency, Copenhagen
Navrud S, Ready R (2007) Environmental value transfer: issues and methods. Springer, Kluwer, Dordrect
Nunes PALD, Blaeij A, ven den Bergh J (2009) Decomposition of warm glow for multiple stakeholders: stated choice valuation of shellfish policy. Land Econ 85(3):485–499
Ojea E, Loureiro M (2007) Altruistic, egoistic and biospheric values in willingness to pay (WTP) for wildlife. Ecol Econ 63:807–814
Pearce D (2003) conceptual framework for analysing the distributive impacts of environmental policies. Report prepared for the OECD Environment Directorate workshop on the distribution of benefits and costs of environmental policies, Paris, March 2003. http://www.ucl.ac.uk/~uctpa36/oecd%20distribution.pdf. Accessed 23 Aug 2011

Posthuma R (2009) National culture and union membership: a cultural-cognitive perspective. Ind Relat 64:507–529
Pouta E (2004) Attitude and belief questions as a source of context effect in a contingent valuation survey. J Econ Psychol 25:229–242
Ready R, Navrud S, Day B, Dubourg R, Machado F, Mourato S, Spanninks F, Rodriquez M (2004) Benefit transfer in Europe: how reliable are transfers between countries?. Environ Resour Econ 29:67–82
Ronen S, Shenkar O (1985) Clustering countries on attitudinal dimensions: a review and synthesis. Acad Manag Rev 10:435–454
Rosenberger R, Stanley T (2006) Measurement, generalization, and publication: sources of error in benefit transfers and their management. Ecol Econ 60:372–378
Rozan A (2004) Benefit transfer: a comparison of WTP for air quality between France and Germany. Environ Resour Econ 29:295–306
Shi X, Wang J (2011) Cultural distance between China and US across GLOBE model and the Hofstede model. Int Bus Manag 2:1–7
Shrestha R, Loomis J (2001) Testing a meta-analysis model for benefit transfer in international outdoor recreation. Ecol Econ 39:67–83
Smith P (2002) Culture's consequences: something old and something new. Hum Relat 55:119–137
Spash C (2000) Ecosystems, contingent valuation and ethics: the case of wetland recreation. Ecol Econ 34:195–215
Spash CL, Vatn A (2006) Transferring environmental value estimates: issues and alternatives. Ecol Econ 60:379–388
Stern P, Dietz T, Guagnano G (1995) The new ecological paradigm in social-psychological context. J Environ Econ Manag 26:271–292
Troy A, Wilson MA (2006) Mapping ecosystem services: practical challenges and opportunities in linking GIS and value transfer. Ecol Econ 60:435–449
Turner R, Bateman I, Adger W (2000) Economics of coastal and water resources: valuing environmental function, studies in ecological economics series, vol 3. Kluwer, Dordrecht
Wilk R, Cliggett L (2006) Economies and cultures: foundations of economic anthropology. Westview Press, Boulder, CO
Wilson M, Liu S (2008) Evaluating the non-market value of ecosystem goods and services provided by coastal and nearshore marine systems. In: Patterson M, Glavovic B (eds) Ecological economics of the oceans and coasts. Edward Elgar, Northampton, MA
World Values Survey Association (2009) World values survey 1981–2008 official aggregate v.20090901. Aggregate file producer: ASEP/JDS, Madrid. www.worldvaluessurvey.org
Zhai G, Suzuki T (2009) International benefit transfer related to coastal zones: evidence from Northeast Asia. Mar Resour Econ 24:171–186