Country borders and the value of scuba diving in an estuary:

The case of the Oosterschelde

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Abstract

In order to gain insight into the impact of different nationalities, distances and travel costs in valuation studies, we analyze divers' preferences regarding the Oosterschelde, an estuary in the Netherlands close to the border with Belgium. As such this study is one of the first to use both a travel cost method and a stated choice experiment to estimate the benefits from recreational diving in a temperate maritime climate. The travel cost estimates based on day trips reveal a surplus of 108 and 197 euro per diving trip for Dutch and Belgian divers respectively. This leads to an estimated total access value of 21.7 million euro per year for recreational diving in the Oosterschelde. The choice experiment reveals that divers are willing to pay for improvements in biodiversity as well as for having an agreeable diving experience. The results show that nationality, or cultural identity, has an impact on preferences for diving and biodiversity protection. We also find evidence of a travel cost decay.

Keywords: Coastal recreation; Transnational valuation; Travel cost method; Discrete choice experiment; Scuba diving; Oosterschelde

1. Introduction

Natural areas often attract visitors from more than one country for a wide variety of recreational activities. This is easy to understand for unique natural areas with a broad international appeal such as the Great Barrier Reef or the Grand Canyon. Yet it is also relevant in other settings: when dealing with small countries or when the natural areas are located on or near country borders (Westing, 1993). Rivers and mountain ranges have frequently been used to define national territories in the past. The location of natural areas in one country, but close to another country, is clearly important when estimating users' preferences for conservation and when considering management decisions. Insight into the characteristics and the value of different types of coastal recreation is important to allow sustainable management of marine and coastal ecosystems. Balancing ecological, economic and social factors is a challenge that requires a large and varied amount of information. Among other things, a thorough assessment of the benefits of recreational activities is needed. However, since several of the welfare impacts of coastal recreation are not reflected in market transactions, economic valuation techniques are needed to gain insight into preferences for conservation policies.

Some past valuation studies have investigated cases where the environmental goods were provided in countries other than the country of residence of the participants (Horton et al., 2003; Hoyos et al., 2009; Ressurreição et al., 2012; Dallimer et al., 2014; Valasiuk et al., 2017). Ressurreição et al. (2012), for example, found that respondents in Portugal, Poland and UK each had different preferences for marine species and thus that conservation policies should take account of cultural diversity alongside biological diversity. Recently, Bakhtiari et al. (2018) have disentangled the effects of distance to a conservation site and of country of a conservation site for preferences regarding conservation policies of broadleaved forests in Denmark and Southern Sweden. The researchers found a clear and distinguishable effect of both location and country of provision in the results of a discrete choice experiment. Their results revealed that distance-related attributes reflect bridge tolls and per-kilometer transportation costs, and that Swedes and Danes prefer provision in their own country, over provision in the neighboring country.

In the current study we investigate the impact of national borders on divers' preferences, as this has not yet been studied. Previous studies focusing on recreational diving have used two valuation approaches: a revealed preference method, namely the travel cost method, and a stated preference method, namely discrete choice experiments. We use both approaches to capture divers' preferences from different points of view. Past studies based on the travel cost method (TCM) have focused mainly on diving in tropical coral reefs such as the Phi Phi Islands of Thailand (Seenprachawong, 2003), the Similan Islands of Thailand (Tapsuwan & Asafu-Adjaye, 2008), the Bonaire Marine Park in the Caribbean (Pendleton, 1995), the Florida Keys in the US (Park et al.,

2002) and the Great Barrier Reef in Australia (Deloitte Access Economics, 2017). To the best of our knowledge, there are no European studies[1] using TCM to estimate the value of scuba diving, as we are doing here for an estuary in the Netherlands. Looking at previous valuation studies using discrete choice experiments (DCE) a similar picture emerges. Most studies deal with tropical settings such as coral reefs in the Red Sea in Israel (Wielgus et al., 2003), diving trips by divers in Texas (US) (Sorice et al., 2007), the Bonaire Marine Park in the Caribbean (Parsons & Thur, 2008), coral reefs in South East Asia (Doshi et al., 2012) and coral reefs in Barbados (Schuhmann et al., 2013). Exceptionally, two valuation studies have investigated divers' preferences for a European case using DCEs. Kenter et al. (2013) and Jobstvogt et al. (2014) have used a discrete choice experiment in which one of the attributes represented the respondent's travel cost to study divers' and anglers' preferences for Marine Protected Areas in the UK. Rodrigues et al. (2016) conducted a first non-market valuation study of a typical Mediterranean habitat, the Coralligenous near the Medes Islands (Spain), which is characterized by high biodiversity, geomorphologic complexity and iconic species like gorgonians. In a DCE they elicited preferences regarding the number of divers on a diving trip, underwater landscape, presence of jellyfish species, expected state of gorgonians as well as the price of a dive. They explicitly asses the behavior of scuba divers under conditions of sea warming and ocean acidification.

Thus, in this study we use the travel cost method as well as a discrete choice experiment to investigate the benefits from recreational scuba diving in a typically European setting, the river estuary of the Oosterschelde, in a temperate maritime climate with mild winters and cool summers which is located at the border between two countries (The Netherlands and Belgium). The approach based on a revealed and a stated valuation method allows us to elicit preferences from both a user and a stewardship perspective (Jobstvogt et al., 2014). The current study contributes to existing literature in two ways.

Firstly, both TCM and DCE are used to examine preferences for diving trips as well as biodiversity conservation by recreational divers. The previously discussed valuation studies with respect to diving have all used only one of these methods. Thus, it is interesting to compare results from both approaches: the TCM results provide a picture of the current value of diving, while the DCE results allows us to comment on which changes to biodiversity, infrastructure and overall diving experience are most preferred by divers. Moreover, we are able to estimate travel cost decay based on actual travel costs.

[1] For example, the meta-analysis of the benefits of coastal recreation in Europe by Ghermandi (2015) found only ten of valuation studies looking at European cases and none of these dealt with recreational diving.

Secondly, we add to the literature looking at the impact of different nationalities and travel costs on the value of recreational diving in a European case. The Oosterschelde is the eastern estuary of the Schelde and is located in the province Zeeland of the Netherlands close to the border with Belgium (Figure 1). As a tidal area, mixing sea and freshwater, it is home to a very rich diversity of plants, birds and animals (Sheridan & Massin, 2005). In 2002 the estuary was designated as a national park with the status of a protected conservation area of exceptional value[2]. It is also a Natura 2000 protected area[3]. Home to seal and porpoise populations, different species leave the North Sea for a while to reproduce in this area. Therefore, biodiversity changes throughout the year, ranging from cuttlefish in spring and summer to sea horses in summer and autumn. It is a popular destination for recreational diving with more than 100,000 diving trips reported per year (Creative Marketing Results & Nederlandse Onderwatersport Bond, 2011).

In the next section the methods that we used to collect and analyze the dataset are explained. Section 3 describes the dataset and Section 4 presents the estimation results from the travel cost method and the discrete choice experiments. Section 5 discusses how nationality and distance affects the results and how preferences differ between Belgian and Dutch respondents. Section 6 concludes.

2. Method

We have divided the analysis into three stages. First, we estimate the access value for the Oosterschelde based on the travel cost method. Next, we use a discrete choice experiment to assess the relative value of different dive characteristics. Finally, we investigate the effect of nationality, distance and travel costs on the stated preferences through a set of interaction effects.

2.1 Stage 1: Travel cost method

The travel cost method (TCM) is frequently used to value recreational uses of nature and biodiversity (e.g., Clawson & Knetsch, 1966; Bockstael et al., 1989; Perman et al., 2003; Freeman et al., 2014). In this study we use a single site model to estimate the number of diving trips taken to the Oosterschelde as a function of the trip cost of reaching the site and some other respondent characteristics. Using a log-linear specification we estimate the following demand function:

$$lnV_i = c + \alpha\, TC + \beta X_i + \varepsilon$$

[2] https://www.vvvzeeland.nl/en/out-and-about/nature/oosterschelde/
[3] Natura 2000 is the largest coordinated network of protected areas in the world and stretches over 18 % of the EU's land area and almost 6 % of its marine territory. It offers a haven to Europe's most valuable and threatened species and habitats (http://ec.europa.eu/environment/nature/natura2000/index_en.htm).

With V_i the number of visits made by respondent i, c a constant, α the estimated coefficient associated with the travel cost TC, β the vector of estimated coefficients associated with respondent characteristics X_i and ε an error term. This specification allows us to estimate the individual's surplus created by a diving trip as $-1/\alpha$.

The individual travel costs are calculated as follows:

$$TC = (C_m + C_t + C_a)W + C_s$$

C_m represents the monetary costs of traveling, C_t the time costs, C_a the non-dive related additional trip costs and C_s the dive-specific additional costs. The monetary, time and non-dive additional costs are multiplied by a factor W which represents the weight that was attached to diving as a trip purpose compared to other trip purposes. This weight is expressed as a number between 0 and 1, with $W=1$ if diving was reported to be the sole purpose of the trip and $W<1$ if other trip purposes were reported to play a role in the travel decision. This weight was selected and reported by the respondents. The dive-specific additional costs (i.e. filling scuba cylinders) are not multiplied by this weighing factor since they relate uniquely to the diving activity.

The monetary costs of travelling are calculated as the product of the round-trip distance with the cost per kilometre driven. These km costs depend on the type of car defined by its fuel type and its purchase price (Table 1). The costs reported in VAB (2015) represented both fixed and variable costs of car ownership including purchase costs, insurance, taxes, maintenance and fuel costs. In Europe, the preferential tax treatment of company cars implies that many employees receive a company car as part of their compensation package. In Belgium the number of company cars was estimated to lay between 550 and 670 thousand in 2015, or put differently, 13.5% of employees used a company car which corresponded to 11% of the total number of cars in Belgium (May, 2017). The business lease market in the Netherlands amounted approximately 1.27 million cars in 2015, which corresponded to almost 16% of the total number of cars in the Netherlands[4]. Since it is unclear how car drivers assess the personal costs of driving a company car, we use two approaches. First, we treat company cars as privately owned cars and assign identical km costs. Second, we assume that trips with a company cars are considered to have no monetary costs by the car driver. This way we generate an upper and lower limit of travel costs for company car drivers. Next, the round trip distance was calculated in Google maps. If the route included a toll tunnel (either the Westerscheldetunnel or the Liefkenshoektunnel), a toll of five euro per passing was

[4] https://www.dealerleasing.nl/artikelen/cijfers-over-de-leasebranche

added to the monetary costs. These monetary costs were only attributed to the driver of the car and were assumed to be zero for its passengers.

The time costs are based on the average travel time and the value of time. Since we are looking at car drivers with a recreational trip purpose, we use a value of time of 7.50 euro per person per hour derived in the study of Warffemius (2013) for the Netherlands. For car passengers, this valuation is assumed to be 80% of that of the car driver (Eijgenraam et al, 2000).

Table 1: Per km costs for cars (VAB, 2015)

	Purchase price car (euro)						
	< 3000	3000 - 5000	5001 - 8000	8001 - 10000	10001 - 15000	15001 - 20000	20000 <
Per km cost for diesel cars	0.20	0.21	0.23	0.25	0.26	0.31	0.33
Per km cost for gasoline cars	0.26	0.28	0.30	0.31	0.37	0.42	0.47
Per km cost for hybrid cars	0.26						

The non-dive specific additional costs include parking costs, food, drink and accommodation. These were reported by the respondents. The dive-specific additional costs include the cost of filling scuba cylinders and renting diving equipment. The average costs of filling these cylinders for the trip - which could include more than one dive - was estimated at five euro. We did not include the purchase costs of diving material such as drysuits since, firstly, this equipment is typically used for a longer time period and not specifically for one particular trip and, secondly, the purchase costs vary strongly which makes it difficult to use an average value.

In order to test the robustness of our results, we use different measures of the travel costs:

TC1 = $W\,C_m$ for both company and non-company cars

TC2 = $W\,(C_m + C_t)$ for both company and non-company cars

TC3 = $(C_m + C_t + C_a)W + C_s$ for both company and non-company cars

TC1b = $W\,C_m$ for non-company cars; = 0 for company cars

TC2b = $W\,(C_m + C_t)$ for non-company cars; = $W\,C_t$ for company cars

TC3b = $(C_m + C_t + C_a)W + C_s$ for non-company cars; = $(C_t + C_a)W + C_s$ for company cars

2.2 Stage 2: Discrete choice experiment

Discrete choice experiments are often used to value specific characteristics of goods and services (Louviere & Hensher, 1982; Louviere & Woodworth, 1983; Hanley et al., 2002). This method relies on stated choices made by survey respondents and allows researchers to estimate both use and non-use values. We asked respondents to indicate which dive experience they would prefer after the future implementation of a payment scheme[5]. Payment would be enforced through mobile inspectors. Different payment options would be available (online versus on site; per day versus per year) and payments would be collected in a fund dedicated to support a sustainable management of the Oosterschelde as well as to improve diving infrastructure. Moreover, we reminded respondents of their budget constraint and stressed that they could also opt not to dive.

To describe three different dive opportunities and an opt-out (no dive), we included biodiversity, visibility, weather, water temperature, presence of a shipwreck, diving facilities, presence of a pub, the difficulty of the dive and the price per day as attributes. The selection of these attributes was based on past literature (Pendleton, 1995; Park et al., 2002; Seenprachawong, 2003; Tapsuwan & Asafu-Adjaye, 2008) and brainstorming sessions with experienced divers. Attribute levels include both gains and losses with respect to the current situation. Changes in biodiversity are expressed as the likelihood of seeing a lumpfish *(Cyclopterus Lumpus)*, a European eel *(Anguilla Anguilla)*, a cuttlefish *(Sepiida)* or a shorthorn sculpin *(Myoxocephalus Scorpius)* during a dive. An overview can be found in Table 2. We used Ngene to create a D-efficient design with fixed priors leading to a two-block design with each block consisting of nine choice cards with three profiles and an opt-out. Respondents were randomly assigned to one of the two blocks.

Table 2: Attributes and attribute levels

Attributes	Attribute level and variable name
Biodiversity	Worse – probability of seeing lumpfish: 3%, eel: 5%, cuttlefish: 5%, shorthorn sculpin: 12% *(Biodiv-1)* Current - 5%, 9%, 11%, 12% *(reference)* Improved - 7%, 14%, 16, 36% *(Biodiv+1)* Much improved - 11%, 18%, 21%, 50% *(Biodiv+2)*
Visibility	0.5 – 1 – 2 – 4 meters
Weather	Sunny Cloudy Rainy *(reference)*
Water temperature	6 - 12 - 18 °C
Presence of shipwreck	No shipwreck *(reference)* Shipwreck
Diving facilities	Parking facilities *(reference)* Parking facilities, stairs & pontoon *(infrastructure+1)* Parking facilities, stairs & pontoon, and changing rooms & lavatory *(infrastructure+2)*
Presence of a pub or a restaurant	Less than 5 minutes travel time *(pub nearby)* More than 5 minutes travel time *(reference)*
Difficulty of dive	Easy: not below 30 meter & weak currents *(easy dive)*

[5] Such payment scheme ('Zeelandvergunning', also called 'duikpas') has been used in the past for the Oosterschelde and required divers to pay an annual contribution in order to be allowed to dive. This system was abolished in 2002. In 2014 and 2015 the NOB (Dutch Underwater Sport Association) has investigated whether this system could be re-installed, but in 2016 it has decided not to do so due to lack of support (https://onderwatersport.org/duikpas-van-de-baan/).

	Challenging: below 30 meter & strong currents *(reference)*
Contribution per day	1 – 2 – 5 – 7 – 12 – 15 euro

In order to analyze the responses and allow for heterogeneity in respondents' preferences, we estimate a mixed logit model (MXL) (Hensher & Greene, 2003). A respondent *n*'s utility *U* from choosing alternative *i* in the *j*-th choice task is then given by:

$$U_{ijn} = V_{ijn} + \varepsilon_{ijn} = \beta_n' X_{ijn} + \varepsilon_{ijn}$$

with V_{ijn} representing indirect utility, ε_{ijn} the error term which is assumed to be i.i.d. with a Gumbel distribution, β_n representing the individual set of parameters to be estimated and X_{ijn} a matrix of attribute levels. The β coefficients are random parameters and are assumed to come from some known distribution, such as the normal or lognormal distribution, which depends on some unknown parameters θ to be estimated (usually means and the covariance matrix). Since we are specifically interested in estimating the distribution of WTP, we estimate a WTP-space model (Train & Sonnier, 2005; Scarpa et al., 2008). Explicitly distinguishing the non-cost attributes ($X_{ijn}^{non-cost}$) from the cost attribute (X_{ijn}^{cost}), we can characterize this model as follows:

$$U_{ijn} = -\beta_n^{cost}\left[\alpha_n' X_{ijn}^{non-cost} - X_{ijn}^{cost}\right] + \varepsilon_{ijn}$$

in which α_n is a vector of WTPs for each non-monetary attribute and is defined as

$$\alpha_n \equiv \frac{-\beta_n^{non-cost}}{\beta_n^{cost}}$$

The likelihood of a respondent's choices is thus dependent on unobserved random parameters.

2.3 Stage 3: Comparison and interactions

In the final stage, we estimate a series of interaction effects to study the influence of nationality, distance and travel costs on the WTP-estimates for dive characteristics and biodiversity management.

3. Dataset

An online survey in Dutch was distributed through diving clubs in Flanders (Belgium) and the Netherlands between December 2016 and March 2017. Respondents were limited to divers that visited the Oosterschelde at least once in the past two years. In total 486 individuals completed the questionnaire of the 828 that started it. The dataset consisted of 74% Belgian and 26% Dutch divers (Figure 1). Note that all respondents speak the same language, i.e. Dutch, even though they have different nationalities.

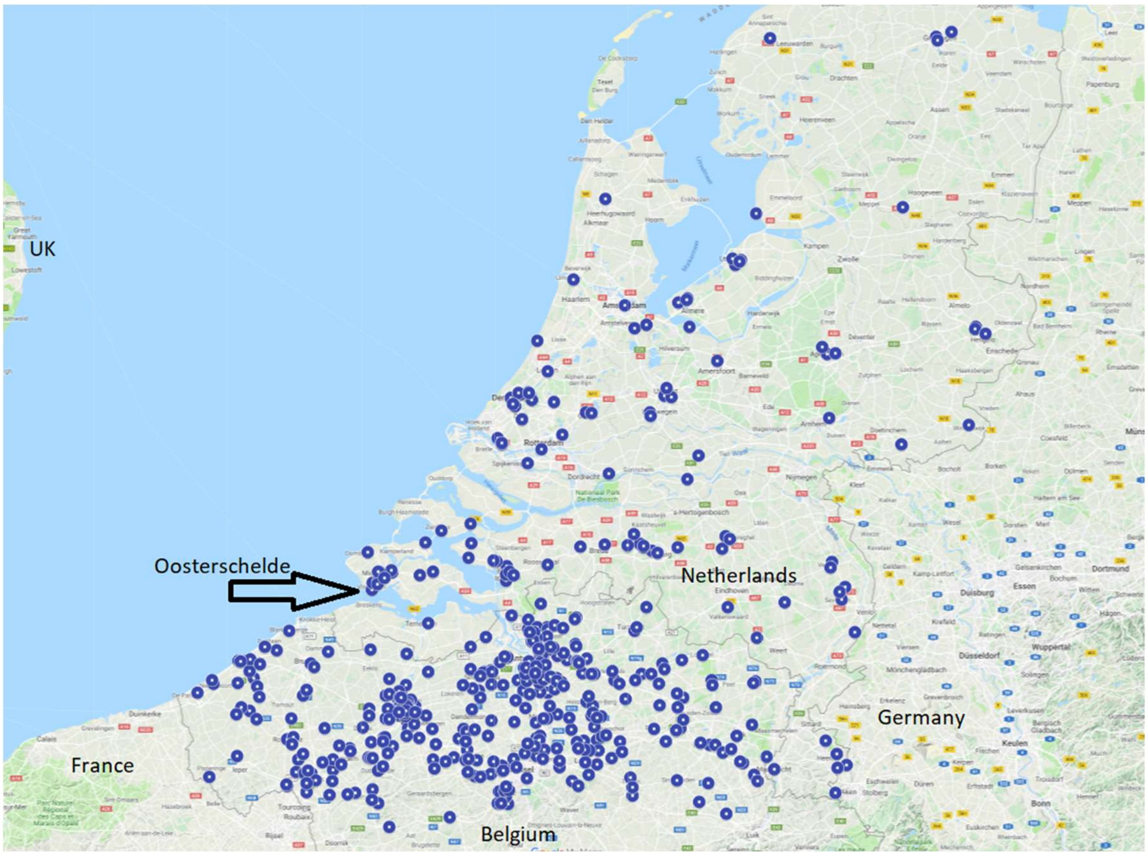

Figure 1: Map of respondents (made with Google My Maps)

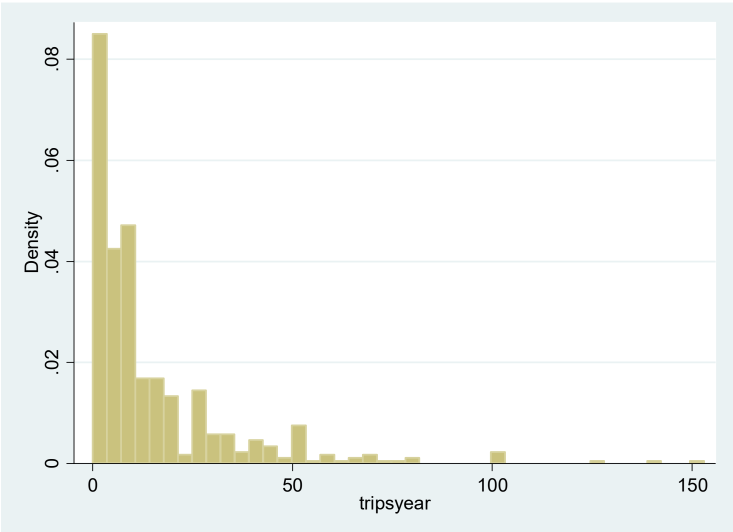

Figure 2: Density function of reported diving trips per year

The average age in the sample was 47 and about 18% of respondents was female. On average, respondents visited the Oosterschelde 15 times per year for diving, with 20% making more than 25 trips per year (Figure 2). Almost all respondents came to the Oosterschelde by car for their most recent visit: 77.5% as driver and 22% as passenger. Of the drivers, 30% used a company car for the trip. Respondents traveled on average 111 km from their home to the diving location at the Oosterschelde and 16% stayed more than one day in the region. The most popular diving spots in the estuary were Wemeldinge (selected by 239 respondents in their top three of best diving places), Zeelandbrug (199) and Goese sas/Putti's place (172). The main reasons why the respondents chose the Oosterschelde were the variety of plant and animal life (biodiversity), the accessibility of the diving location and because it was proposed by their diving association (Figure 3).

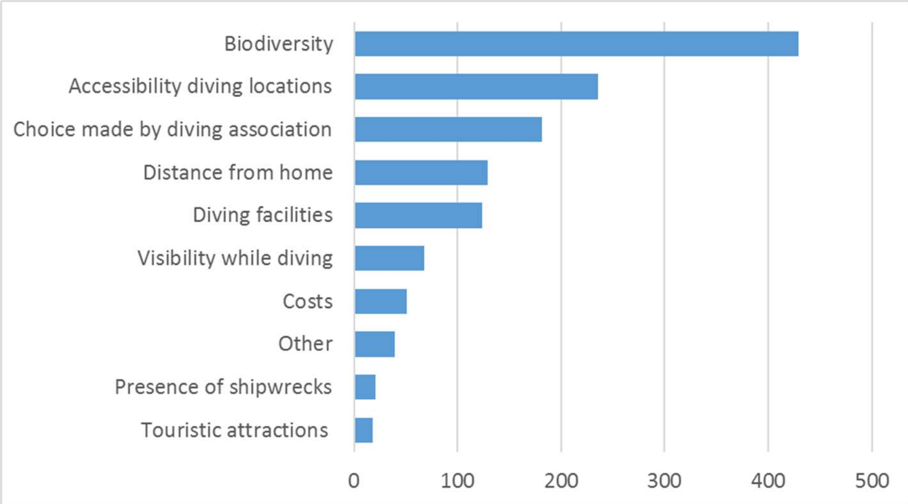

Figure 3: Motivations for diving in the Oosterschelde (max 3 motivations could be selected)

4. Results

After estimating the value of the Oosterschelde for recreational diving based on a travel cost model, we use a discrete choice model to assess the impact of several factors on the willingness to pay a diving fee. Next we investigate several interaction effects related to nationality, distance from the Oosterschelde and travel costs.

4.1 Travel cost estimates

Firstly, we look at the results from the travel cost method (Table 4). The variable definitions can be found in appendix A. The average travel cost lays between 32 and 83 euro per trip, depending on assumptions related to multi-purpose trips, the treatment of company cars and the cost elements included in the calculation (see section 2.1 for the definition of the travel cost proxies). Based on a log linear model, the divers' surplus created by visits to the Oosterschelde lays between 154 and 668 euro per trip depending on calculation of travel costs. The higher estimates are obtained when all travel and on-site costs are included (TC3 and TC3b).

Further, we find that higher educated respondents seem to be less likely to go diving in the Oosterschelde. In contrast, more experienced divers and Belgian divers seem more likely to visit the Oosterschelde. As diving and touristic websites warn, diving in the Oosterschelde is not for beginners due to the tidal currents[6]. Thus, our results confirm that the Oosterschelde is visited more frequently by more experienced divers. Divers that own a drysuit are better equipped to dive when it is colder[7] and this is also confirmed by our analysis. Belgian divers seem to be more likely to visit the Oosterschelde, as is corroborated by other data. Per year, approximately 133,000 diving trips to the Oosterschelde (with multiple dives) are made by Belgian (81,902 trips) and Dutch (51,443 trips) divers (Creative Marketing Results & Nederlandse Onderwatersport Bond, 2011). A possible explanation for this observation could be that there are fewer attractive substitutes for divers in Belgium than in the Netherlands. For instance, Lake Grevelingen is located in the Netherlands and is the largest saltwater lake in Europe (www.divers-guide.com). The Netherlands also has hundreds of freshwater dive sites. In Belgium, the number of dive spots is quite limited, and most of these are on private property, which implies that permission is needed first. Moreover, the lack of biodiversity in Belgian dive locations is explicitly mentioned as a downside (www.divers-guide.com).

Next, we investigate the impact of nationality on our results and check how much WTP estimates based on TCM differ between Belgian and Dutch divers. In addition to using data for all types of trips, i.e. day trips and overnight trips, we also calculate the surplus based only on data from day trips, excluding overnight trips, for Belgian and Dutch divers jointly as well as separately. In Table 3 we report the estimated coefficients that were statistically significant at the 5% level for the six travel cost proxies, the corresponding surplus and the adjusted R^2 value as a measure of model quality. Based on the adjusted R^2 value, the models based on TC2 (monetary and time travel costs) and TC3 (monetary, time and other on-site costs) perform best (see bold in Table 3). Given the complexity of overnight trips that can often be labeled as multipurpose trips, TCM estimates based on day trips are generally felt to be more reliable (Parsons, 2009).

Thus, we use the average surplus for Belgian respondents (197 euro per trip) and for Dutch respondents (108 euro per trip) based on TC3 and on day trips to calculate the total surplus created by recreational diving in the Oosterschelde. As mentioned above, 81,902 trips to the Oosterschelde were made by Belgian divers and 51,443 trips by Dutch divers in 2010 (Creative Marketing Results & Nederlandse Onderwatersport Bond, 2011). Based on these proportions, the annual total access value to the Oosterschelde for diving amounts to 21,7 million euro. Looking at both day and

[6] See for example, www.vvvzeeland.nl/en/out-and-about/nature/oosterschelde/ or www.divers-guide.com/en/dive-site-information/diving-regions/diving-in-the-netherlands.
[7] The waters are seasonal with temperatures ranging from -2°C in winter to 24°C in summer www.vvvzeeland.nl/en/out-and-about/nature/oosterschelde/).

overnights trips together, the total value lays between 21 and 97 million euro, based on TC2 and TC3 respectively.

Table 3: TCM results depending on nationality and trip type

		All trips			Only daytrips		
		All (N=479)	Belgian (N=356)	Dutch (N=123)	All (N=394)	Belgian (N=307)	Dutch (N=87)
TC1	coefficient	-0.00640	-0.00537	-0.00803	-0.00556	-0.00448	-0.00863
	surplus (euro/trip)	156	186	125	180	223	116
	adjusted R^2	0.2295	0.2279	0.1271	0.1913	0.2148	0.0503
TC2	coefficient	-0.00651	-0.00565	-0.00790	-0.00595	-0.00490	-0.00882
	surplus (euro/trip)	**154**	**177**	127	168	204	113
	adjusted R^2	0.2431	0.2375	0.1536	0.2038	0.2233	0.0805
TC3	coefficient	-0.00163	-0.00093	-0.00580	-0.00617	-0.00506	-0.00922
	surplus (euro/trip)	615	1073	**172**	**162**	**197**	**108**
	adjusted R^2	0.2184	0.2151	0.2291	0.2158	0.2309	0.1123
TC1b	coefficient	-0.00455	-0.00408	-0.00493	-0.00378	-0.00331	*not sign.*
	surplus (euro/trip)	220	245	203	265	303	
	adjusted R^2	0.2131	0.2189	0.0755	0.1792	0.2073	-0.0013
TC2b	coefficient	-0.00527	-0.00476	-0.00583	-0.00464	-0.00400	-0.00597
	surplus (euro/trip)	190	210	172	216	250	168
	adjusted R^2	0.2271	0.2287	0.102	0.1909	0.2152	0.0251
TC3b	coefficient	-0.00150	-0.00090	-0.00517	-0.00510	-0.00430	-0.00719
	surplus (euro/trip)	668	1106	193	196	233	139
	adjusted R^2	0.2153	0.2132	0.1875	0.2023	0.2224	0.0564

Table 4: TCM results (complete dataset)

	Model 1		Model 2		Model 3		Model 4		Model 5	
Ln (trips per year)	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Er
TC1	-0.00640**	0.0013								
TC2			-0.00651**	0.0011						
TC3					-0.00163**	0.0004				
TC1b							-0.00455**	0.0012		
TC2b									-0.00527**	0.001
TC3b										
University degree	-0.2498*	0.1181	-0.2510*	0.1170	-0.2599*	0.1190	-0.2678*	0.1189	-0.2739*	0.117
Prof. bachelor	-0.2485	0.1295	-0.2449	0.1283	-0.2569*	0.1304	-0.2607*	0.1307	-0.2595*	0.129
Student	-0.6661*	0.2577	-0.6737**	0.2545	-0.5002	0.2557	-0.6071*	0.2599	-0.6370*	0.257
Diver cat.2	0.5537**	0.2057	0.5487**	0.2039	0.5781**	0.2073	0.5443**	0.2079	0.5375**	0.206
Diver cat.3	0.7654**	0.2058	0.7648**	0.2040	0.7861**	0.2074	0.7560**	0.2079	0.7548**	0.206
Diver cat.4	0.9816**	0.2471	0.9666**	0.2449	1.0389**	0.2490	1.0029**	0.2496	0.9909**	0.247
Instructor	1.0751**	0.2111	1.0794**	0.2092	1.0652**	0.2127	1.0436**	0.2129	1.0507**	0.211
Drysuit	0.5465**	0.1178	0.5425**	0.1167	0.5745**	0.1185	0.5473**	0.1191	0.5402**	0.118
Company car	0.1945	0.1193	0.2010	0.1179	0.0915	0.1181				
Belgian	0.6546**	0.1155	0.6582**	0.1144	0.6515**	0.1163	0.6305**	0.1162	0.6326**	0.115
Other dives 2016	0.2462	0.1780	0.2572	0.1764	0.2512	0.1793	0.2375	0.1798	0.2474	0.178
Constant	0.6675*	0.2674	0.7771**	0.2678	0.4861	0.2640	0.5852*	0.2693	0.7030*	0.270
Adjusted R^2	0.2295		0.2431		0.2184		0.2131		0.2271	
N. of obs.	479		479		479		479		479	
Surplus (euro per trip)	**156**		**154**		**615**		**220**		**190**	

** / ** = statistically significant at 5% / 1% level*

4.2 Discrete choice estimates

Secondly, we have a look at the results from the discrete choice experiment (DCE) (see Table 5), which allows us to estimate willingness-to-pay (WTP) values for different characteristics of the dive based on a mixed logit model in WTP-space (Hole, 2016) with 500 Halton draws. All parameters were assumed to be normally distributed, except for the monetary variable which was assumed to have a lognormal distribution. The variable definitions can be found in Table 2. Preference heterogeneity is observed for biodiversity, visibility, sunny weather conditions, water temperature, technical level of the dive, changes in the available infrastructure and the level of the diving contribution, but not for cloudy weather conditions, the presence of a shipwreck and the presence of a pub or restaurant nearby.

Table 5: DCE results based in MXL estimation in WTP-space

	Mean WTP (euro per day)			Standard deviation		
	coeff.	std.err.	p-value	coeff.	std.err.	p-value
Biodiv-1	-8.060**	1.075	0.000	11.276**	1.299	0.000
Biodiv+1	3.758**	0.691	0.000	0.120	1.085	0.912
Biodiv+2	9.282**	1.020	0.000	7.013**	0.949	0.000
Visibility (in m)	3.219**	0.309	0.000	3.295**	0.358	0.000
Sunny	6.319**	0.774	0.000	3.947**	0.885	0.000
Cloudy	4.094**	0.627	0.000	1.190	1.135	0.294
Water temperature (in °C)	0.134	0.075	0.074	1.185**	0.118	0.000
Presence of shipwreck	1.829**	0.497	0.000	0.953	1.036	0.357
Infrastructure+1	1.436*	0.577	0.013	0.401	1.481	0.786
Infrastructure+2	1.665**	0.576	0.004	3.534**	1.074	0.001
Pub nearby	1.485**	0.503	0.003	1.363	0.837	0.103
Easy dive	6.121**	0.866	0.000	10.021**	1.130	0.000
Opt out (no dive)	-8.767**	2.720	0.001	33.048**	3.249	0.000
Contribution (euro per day)	-2.152**	0.077	0.000	0.308**	0.071	0.000

** / ** = statistically significant at 5% / 1% level*

Biodiversity levels in the Oosterschelde are found to have the highest impact on diving preferences. Divers in our sample are clearly against a deterioration of biodiversity. They are also willing to pay for improvements: namely 3.8 euro per day for a moderate increase in biodiversity and up to 9.2 euro for a substantial increase in biodiversity. Respondents are also willing to pay 3.2 euro per meter for improved visibility and 1.8 euro for the opportunity of visiting a shipwreck during the dive. They prefer diving when its sunny or cloudy rather than rainy. Moreover, they are willing to pay for improved infrastructure (stairs, shower and toilet facilities) or for having a pub or restaurant nearby.

4.3 Transnational valuation and interactions

The results of the TCM already revealed that the estimate of the value of a diving trips differs significantly between Belgian and Dutch divers in our dataset. Belgian divers value a diving trip to the Oosterschelde approximately twice as high as Dutch divers. The lack of high quality substitute diving sites for Belgian divers is a likely explanation of this result.

Next we check whether the DCE results also show different preferences for both nationalities and whether preferences are influenced by the size of the travel cost. Based on a conditional logit estimation with all attributes levels interacted with being Belgian and with the travel cost TC2 (Appendix B), we only find significant interactions for the technical level of dive, the highest increase in biodiversity and the opt-out. Belgian divers seem to have a higher WTP for more challenging dives compared to Dutch divers. In addition, Belgian divers are less likely of choosing the opt-out of not diving at all in the Oosterschelde. These results are in line with the lack of interesting substitute dive sites in Belgium compared to The Netherlands, as mentioned previously. Lastly we find that the higher the respondent's travel costs (including monetary and time costs), the lower the WTP for the highest level of biodiversity improvement. This result is in line with previously found distance decay effects for non-use values (Loomis, 2000; Jørgensen et al., 2013).

Next we include these significant interaction effects in the mixed logit model with 500 Halton draws. In order to reduce the complexity of the estimation, we assume homogeneous preferences for the presence of the shipwreck and the presence of a pub or restaurant nearby as the estimated standard deviation for these attributes was not statistically significant (Table 5).

The results show that nationality, or cultural identity, has some impact on preferences for diving trips. We find evidence of a travel cost decay when it comes to biodiversity conservation. The more costly traveling to the Oosterschelde is, the lower the WTP for the highest level of improvement in biodiversity in the estuary. The dislike for a biodiversity decline and preferences for a moderate increase in biodiversity are, however, unaffected by travel costs. Belgian divers are less willing to pay more for having a technically easy dive than Dutch divers. Finally, looking at the interactions with the opt-out, some interesting results emerge. Belgian divers are more willing to pay for diving in the Oosterschelde (they have a negative WTP for the opt-out of not diving in the Oosterschelde) than Dutch divers. While the WPT of Belgian divers is not influenced by their travel costs, Dutch divers seem to be willing to pay more for diving in the Oosterschelde as their travel costs increases.

Table 6: Mixed logit in WTP-space with interactions

	Mean WTP (euro per day)			Standard deviation		
	coeff.	std.err.	p-value	coeff.	std.err.	p-value
Biodiv-1	-6.936**	1.807	0.000	11.611**	1.208	0.000
+ travel cost TC2	-0.021	0.021	0.319	0.033*	0.013	0.014
Biodiv+1	4.321**	1.197	0.000	0.385	0.973	0.693
+ travel cost TC2	-0.006	0.013	0.628	0.003	0.011	0.811
Biodiv+2	11.832**	1.542	0.000	6.778**	0.913	0.000
+ travel cost TC2	-0.035*	0.015	0.018	0.023	0.012	0.053
Visibility (in m)	3.162**	0.312	0.000	3.639**	0.371	0.000
Sunny	6.538**	0.781	0.000	3.783**	0.909	0.000
Cloudy	4.217**	0.636	0.000	1.094	1.140	0.338
Water temperature (in °C)	0.164*	0.071	0.021	1.202**	0.112	0.000
Presence of shipwreck	1.800**	0.497	0.000			
Infrastructure+1	1.500*	0.587	0.011	0.493	1.890	0.794
Infrastructure+2	1.695**	0.580	0.003	3.594**	0.857	0.000
Pub nearby	1.492**	0.506	0.003			
Easy dive	11.185**	1.618	0.000	10.159**	1.119	0.000
+ Belgian	-6.367**	1.604	0.000	1.567	1.122	0.163
Opt out (no dive)	9.696**	3.642	0.008	18.886**	2.332	0.000
+ Belgian	-17.342**	5.690	0.002	29.691**	3.498	0.000
+ Travel cost TC2	-0.076*	0.032	0.019	0.125**	0.023	0.000
+ Belgian and TC2	-0.012	0.061	0.850	0.074*	0.029	0.010
Contribution (euro per dive)	-2.179**	0.074	0.000	0.156*	0.077	0.042

** / ** = statistically significant at 5% / 1% level*

5. Discussion

Based on the travel cost results for day trips and with all types of costs included in the travel cost estimate (TC3), we find that a diving trip in the Oosterschelde is valued at 197 euro by Belgian divers and at 108 euro by Dutch divers. Based on a travel cost estimate that includes monetary and time costs of travelling but not costs on site, this leads to estimates of 204 (day trips) and 177 (all trips) euro per trip for Belgian divers and 113 (day trips) and 127 (all trips) euro per trip for Dutch divers. These values are generally lower than values obtained in previous studies for scuba diving in the Phi Phi Islands of Thailand (789.5 USD per trip; Seenprachawong, 2003), the Similan Islands of Thailand (3323 USD per trip; Tapsuwan & Asafu-Adjaye, 2008), the Bonaire Marine Park in the Caribbean (929 USD per trip; Pendleton, 1995), the Florida Keys in the US (481 USD per trip; Park et al., 2002) and the Great Barrier Reef in Australia (662 AUD per trip; Deloitte Access Economics, 2017). As we are not considering coral reefs in tropical waters, but rather a river estuary in a moderate climate zone, the lower value estimates per diving trip in the Oosterschelde are not exactly surprising. Yet, the total value of recreational diving in the Oosterschelde is still substantial at approximately 21 million euro per year. As a top location for diving in Belgium as well as the Netherlands, the Oosterschelde attracts over 100,000 visitors per year. As noted on the website diveadvisor.com *'Both the Grevelingen and Oosterschelde were estuaries, now separated from the sea by dams. By far the most interesting places to dive in the Netherlands, they need a couple of days to be properly explored'*. The Oosterschelde is especially popular among Belgian divers since it is located near the border and no substitutes of similar attractiveness are available in Belgium.

As the Oosterschelde is a very attractive and popular destination for Belgian divers, one can question whether it is fair that the costs and efforts of protecting and managing this national park are born by the Dutch authorities. The structure of the financial resources used to manage the Oosterschelde is complex as shown by the following quote from the clerk of the National Park[8]:

> The financial flows in and around the Oosterschelde area are complex. Although the Oosterschelde is a National Park, it is an area with many use functions: fishing, Natura2000, recreation, shipping, but also water safety and climate play a role. Various governments (national, provincial, municipal) have a say or influence in the area. Funding is therefore provided via many roads, and the funding of the Oosterschelde National Park is only a very limited flow. Considering the latter on its own is therefore not enough. However, gaining insight into a large part or all of the funding flows is an enormous and complex (perhaps even impossible?) task.

One way of sharing the financial burden of managing the Oosterschelde is to require divers (and maybe other visitors) to pay a small contribution when visiting the Oosterschelde. The diving pass is one of the options that has been implemented in the past, but was abolished in 2002. End 2014, the NOB (Dutch Underwater Sports Association) investigated whether this system could be re-installed, but in 2016 decided not to do so due to lack of support[9]. Based on a direct question whether respondents would be willing to pay a contribution to help manage the Oosterschelde, we

[8] Personal communication by mail on 11 March 2019.
[9] https://onderwatersport.org/duikpas-van-de-baan/

find that 69% of our sample is open to pay such a contribution (see Table 7). The main drivers are a willingness to help protect nature and biodiversity as well as a desire to help maintain and improve diving infrastructure. Looking at the main reasons against such a contribution, we find that diving is already considered to be an expensive hobby. Moreover, it is felt to be unfair to pay for access to natural resources that should be publicly available, especially by focusing on one type of recreation and not including other recreational activities in a payment scheme. There is also skepticism related to the efficient use of the collected funds by the authorities. Further, several respondents refer to the past contribution (‘zeelandvergunning’) and how it was abolished because it was too costly to monitor and enforce. Finally, we also observe a larger willingness to contribute among Belgian divers than among Dutch divers (74% versus 59%). Thus confirms are findings that the coefficient of the opt-out option is significantly lower for Belgian than for Dutch respondents. Dutch respondents mention that they already pay local and national taxes and many of them also pay an annual contribution of 42.5 euro to the Dutch Underwater Sports Association NOB which explicitly includes *‘support to the preservation and improvement of diving locations’* (onderwatersport.org). Thus, they feel that they should not need to contribute more to be allowed to enjoy their hobby. As one respondent stated *‘Diving for the Dutch should be free, foreigners should pay for protecting the Oosterschelde’.*

Table 7: Willingness to pay a contribution to be allowed to dive in the Oosterschelde

	All		Dutch divers		Belgian divers	
	N	%	N	%	N	%
Yes, certainly	100	0.21	22	0.18	78	0.22
Yes, maybe	236	0.49	51	0.41	185	0.52
No, probably not	92	0.19	31	0.25	61	0.17
No, certainly not	54	0.11	21	0.17	33	0.09
Total	482		125		357	

Finally, looking at the DCE estimation we see that biodiversity and available infrastructure have the largest impact on diving preferences, even if several other elements play a role. Moreover, preferences for the technical level of the diving and for diving in the Oosterschelde in general are influenced by the nationality of the divers. Overall, Belgian respondents were willing to pay more for the opportunity to dive in the Oosterschelde than Dutch respondents. However, Dutch respondents seem willing to pay more as their travel costs increase. If we interpret a high travel cost as a strong desire to go diving, this result makes sense. Since we do not observe the same for Belgian divers, this confirms the importance of taking cultural identity and nationality into account when valuing natural areas and biodiversity, in line with previous studies (Ressurreição et al., 2012; Hoyos et al., 2009; Valasiuk et al., 2017; Bakhtiari et al., 2018).

6. Conclusion and policy implications

The results of this case study show that diving is a valuable recreational activity even in a setting that does not include sunny beaches, coral reefs and tropical waters. Moreover, we see that different valuation methods indeed capture different aspects of value. While the travel cost method reveals a rather high willingness to pay to go diving in the Oosterschelde, the stated choice experiments show which dive characteristics are valued most by the respondents. Thus, if a regional policy maker wants to stimulate or conserve diving activities, improving biodiversity seems to be a first priority, and to a lesser extent, improving infrastructure. This illustrates that combining revealed with stated valuation methods can also be valuable for single site studies because it provides information about preferences for changes in diving characteristics and into the relative importance of these characteristics.

The study also reveals that visitors in biodiversity rich diving locations are certainly not limited to one nationality. This international dimension provides some additional challenges in managing and valuing natural resources. The local visitors already pay taxes and contributions that could, and maybe should, go towards the management of the estuary and thus some of them are not willing to pay more. While the foreign visitors do not pay such taxes, they typically have higher travel costs and therefore some of these may feel that their trip already costs enough without additional charges. This cross-border dimension of coastal resources as the Oosterschelde is important to take into account. Clear communication to all involved will be crucial to gain a sufficient amount of support for sustainable management schemes.

This information is interesting for policy makers in Europe since this is one of a limited number of valuation studies for scuba diving in Europe and the first to focus on an estuary. These results are thus a more relevant starting point for benefit transfer in Europe than previous studies for tropical waters. The interaction between recreation and sustainable management of coastal habitats is a complex one. As noted by the Millennium Ecosystem Assessment (2005), tourism and investments in recreation-related infrastructure poses the second largest threat to the sustain provision of ecosystem services in coastal habitats. Yet, coastal visitors typically value healthy natural environments and a rich biodiversity. In order to develop policies for a sustainable governance of coastal ecosystems, a thorough assessment of the benefits of recreational activities is needed and more valuation studies are called for.

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Appendix A: Variable definitions

Variable name	Definition
TC1	=Weighted monetary costs of traveling for company and non-company cars
TC2	=Weighted monetary and time costs of traveling for company and non-company cars
TC3	=Weighted monetary, time and other on-site costs for company and non-company cars
TC1b	=Weighted monetary costs of traveling for non-company cars; =zero for company cars
TC2b	=Weighted monetary and time costs of traveling for non-company cars; =weighted time costs of traveling for company cars
TC3b	=Weighted monetary, time and other on-site costs for non-company cars; =weighted time and other on-site costs for company cars
University degree	= 1 if the respondent obtained an academic bachelor or master degree; = 0 else
Prof. bachelor	= 1 if the respondent obtained a professional bachelor degree; = 0 else
Student	= 1 if the respondent was a student; = 0 else
Employed	= 1 if the respondent has a job; = 0 else
Diver cat. 1	= 1 if the respondent is a 1* diver or open water diver; = 0 else
Diver cat. 2	= 1 if the respondent is a 2* diver or advanced open water diver; = 0 else
Diver cat. 3	= 1 if the respondent is a 3* diver, dive master or rescue diver; = 0 else
Diver cat. 4	= 1 if the respondent is a 4* diver, master scuba diver or diver master; = 0 else
Instructor	= 1 if the respondent is a diving instructor; = 0 else
Drysuit	= 1 if the respondent owns a drysuit; = 0 else
Company car	= 1 if the trip was done with a company car; = 0 else
Belgian	= 1 if the respondent was living in Belgium; = 0 else
Other dives 2016	= 1 if the respondent went to other places besides the Oosterschelde to dive in 2016; = 0 else
Ngo	= 1 if the respondent is a (past) member of a nature protection organization; = 0 else
Female	=1 if the respondent is female; = 0 else

Appendix B: Conditional logit results with interaction effects

	coefficient	**robust standard error**	**p-value**
Biodiv-1	-0.512	0.160	0.001
* Belgian	0.099	0.151	0.513
* travel cost TC2	-0.002	0.002	0.289
Biodiv+1	0.328	0.116	0.005
* Belgian	-0.020	0.105	0.849
* travel cost TC2	-0.001	0.001	0.416
Biodiv+2	0.852	0.145	0.000
* Belgian	-0.010	0.128	0.939
*** travel cost TC2**	-0.002	0.001	0.048
Visibility (in m)	0.230	0.038	0.000
* Belgian	0.004	0.037	0.918
* travel cost TC2	0.000	0.000	0.550
Sunny	0.529	0.120	0.000
* Belgian	-0.007	0.113	0.952
* travel cost TC2	0.000	0.001	0.757
Cloudy	0.474	0.119	0.000
* Belgian	-0.090	0.108	0.405
* travel cost TC2	-0.001	0.001	0.157
Water temperature (in °C)	0.026	0.014	0.060
* Belgian	0.006	0.012	0.605
* travel cost TC2	0.000	0.000	0.997
Presence of shipwreck	0.164	0.100	0.102
* Belgian	0.032	0.087	0.712
* travel cost TC2	-0.001	0.001	0.397
Infrastructure+1	0.133	0.111	0.230
* Belgian	-0.006	0.104	0.957
* travel cost TC2	0.000	0.001	0.723
Infrastructure+2	0.181	0.108	0.095
* Belgian	0.042	0.097	0.668
* travel cost TC2	-0.001	0.001	0.283
Pub nearby	0.022	0.087	0.798
* Belgian	0.105	0.079	0.179
* travel cost TC2	0.000	0.001	0.861
Easy dive	0.907	0.144	0.000
*** Belgian**	-0.510	0.126	0.000
* travel cost TC2	-0.001	0.001	0.277
Contribution (euro per dive)	-0.078	0.018	0.000
* Belgian	-0.002	0.016	0.893
* travel cost TC2	0.000	0.000	0.227
Opt out (no dive)	1.221	0.347	0.000
*** Belgian**	-0.732	0.305	0.016
* travel cost TC2	-0.003	0.003	0.310