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# Is inshore fishery an asset for recreational demand on the coastline?

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## Abstract

The concept of multifunctionality of fishing activities is emerging, as fishery activities do not only provide commodity goods but have others functions (environmental, social, territorial, etc.). We choose to focus on the provision of amenities, such as the presence of fishing boats or direct sales of seafood, for which there is a demand that partly conditions the individual choices of visit on the coastline. We used choice experiments to estimate willingness to pay for these amenities produced jointly by commercial fishing. The empirical study was conducted on a sample of 1000 people we surveyed along the coast of French Channel.

**Keywords:** Inshore fishing; Multifunctionality; Non market value; Choice experiment.

**JEL Classification:** C35 (Discrete Regression and Qualitative Choice Models); C9 (Design of Experiments); Q22 (Fishery); Q26 (Recreational Aspect of Natural Resources).

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# 1 Background and motivation

The concept of multifunctionality was initially developed for agriculture. ? defined multifunctionality as an attribute of agriculture, *i.e.* the ability to jointly<sup>1</sup> produce commodity outputs (mainly food) and other products. When these other products exhibit characteristics of public goods, markets are inefficient and their supply may be too low. Therefore, it is necessary to encourage the provision of public goods by coupled support (production related-aid) or aids targeting specific practices, depending on the degree of the jointness and transaction costs (?).

Unlike agriculture, where multifunctionality had been much questioned in the 2000s, academic works and policy discussions on the multifunctionality of fishing activities are largely non-existent. In a recent paper on the development of small-scale fisheries in the Mediterranean and Black Sea, ? tried to address the concept of multifunctionality to fishing activities, making a distinction with the issue of diversification of fishing activities. Among the functions that exhibit public good characteristics, these authors distinguish environmental, territorial and social functions.

As concerns with the environmental functions, fishing activities impact aquatic ecosystems, but rather negatively, particularly through overfishing and damaging caused by gear and fishing techniques. In addition, the absence of well-defined property rights, related to resources and the aquatic environment, does not contribute to make credible claims about the environmental function of fishing. France is one of the few countries who have awarded compensation in respect of this function through Blue Contracts introduced in 2008.

About the territorial and social functions identified by ?, the capacity of fishing activities to attract visitors in tourist areas is one of the most believable function with respect to the multifunctionality of fisheries : "visitors like to see boats in the ports and fishes in the markets". In other words, visitors are sensitive to aesthetic, social, cultural and heritage amenities related to fishing activities (presence of boats and fishermen, fish landing and selling). We have to deal here with an almost pure public goods, for which the degree of jointness in the production of marketed goods and services depends on the type of activity (probably stronger for small-scale fisheries and direct sales than for deep sea fishing and sales auction).

Our study focuses on the demand for these amenities produced jointly by commercial fishing, which could justify public support for this sector. We tried to see if these attributes of coastal sites are valued by visitors, analyzing the trade-off they make between different categories of attributes.

However, non-market benefits valuation from fishing is a difficult task since it does

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<sup>1</sup>This definition refers to the production technology (primal approach). We can also characterise multifunctionality from the costs of production (dual approach). The notion of joint production involves then economies of scope.

not exist any market to observe directly the prices of these amenities. In this case, we recommend to use stated preference methods. In addition, fisheries are very heterogeneous, such as it would have been really difficult to use revealed preferences methods based on observed behaviors, such as houses prices or travel costs. Revealed preferences methods could also have raised complex econometric problems (uncontrolled attributes, spatial autocorrelation, etc. ). As a consequence, we preferred to use stated preference methods despite its hypothetical nature. As we note, choice experiments (CE) is the most accurate method from a range of non-market valuation techniques to value benefits from multiple characteristics and functions of environmental goods. CE was initially developed by McFadden and Train and belongs to the family of

choice modelling. In CE, through a survey, individuals are invited to choose between alternative goods described by attributes. One advantage of using CE instead of the traditional contingent valuation method, historically the most stated preference method used, is the possibility to estimate marginal willingness to pay for each attribute (Train). In addition, CE minimizes strategic behaviors because it is quite difficult for respondents to adopt strategic response across multiple choice sets (Train).

In this study, we look at the individual trade-offs between attributes of interest (fishing boats and direct sales of seafood) and classic coastal sites attributes (beaches, coastal walks, marina, architectural heritage), through the choice between fictitious sites described by specific attributes. The empirical application was conducted on a sample of approximately 1,000 people surveyed in coastal departments of the French Channel. We show that the amenities produced by professional fishing are valued by visitors, as well as some traditional coastal attributes, as recreational and heritage ones.

The paper successively presents the theoretical model, the design of the choice experiment, the data and estimates, before concluding.

## 2 The theoretical model

In choice experiment, individuals have to choose between mutually exclusive alternatives. All alternatives are hypothetical and defined by some attributes. CE shares with other environmental valuation techniques the same theoretical framework: the random utility model. According to this framework, an individual  $i$  ( $i = 1, 2, \dots, n$ ) choosing the alternative  $j$  ( $j = 1, 2, \dots, J$ ) gets the following utility:

$$V_{ij} = U_{ij} + \varepsilon_{ij} \quad (1)$$

$V_{ij}$  is the indirect utility function composed by  $U_{ij}$ , the part of the utility function which is observable by the analyst and  $\varepsilon_{ij}$ , the random component (unobservable from the analyst). Individual  $i$  chooses an alternative  $j$  only if this alternative gives him more

utility than any other alternative  $h$  from the choice set.

## 2.1 Conditional Logit

In the most simple specification, known as the Conditional logit model, every explanatory variables depends only on alternatives  $j$ . The deterministic part of the indirect utility is specified as a linear index of the attributes, as expressed by:

$$V_{ij} = \beta X_j + \varepsilon_{ij} \quad (2)$$

Where  $X_j$  is the vector of explanatory variable (attributes of the alternative  $j$ ) and  $\beta$  is the vector of parameters of attributes  $X_j$ .

Then the individual's probability of choosing the alternative  $j$  in the choice set to any alternative  $h$  is expressed as the probability for the utility  $V_{ij}$  to be superior to any utility  $V_{ih}$ :

$$p_{ij} = p(V_{ij} \geq V_{ih}) \quad \forall h \neq j \quad (3)$$

$$p_{ij} = p(U_{ij} - U_{ih} \geq \varepsilon_{ih} - \varepsilon_{ij}) \quad \forall h \neq j \quad (4)$$

$$(5)$$

Assuming the random term ( $\varepsilon_{ij}$ ) is independent and identically distributed with an extreme value distribution type I, leads to the following explicit probability:

$$p_{ij} = \frac{\exp(U_{ij})}{\sum_{h=1}^J \exp(U_{ih})} \quad (6)$$

This assumption leads to a particular property of the Conditional logit model: the independence from irrelevant alternatives' property (IIA). It means that the relative probabilities of two alternatives is independent of the introduction or the removal of other alternatives. If alternatives are all every different or very similar, this assumption is relevant. Otherwise, if the IIA property is violated, it is necessary to use some other statistical models like the Random Parameter Logit model.

## 2.2 Random Parameter Logit model (RPL model)

The RPL model (also called Mixed Logit) is a flexible model which allows for random taste variation and exhibit the IIA property. Each individual is supposed to have its personal tastes reflected by the parameters of the utility function, which depend now on the individual:

$$V_{ij} = U_{ij} + \varepsilon_{ij} \quad (7)$$

$$V_{ij} = \beta_i X_j + \varepsilon_{ij} \quad (8)$$

The analyst observes the explanatory variables  $X_j$ , but neither the parameters  $\beta_i$ , nor the random term  $\varepsilon_{ij}$ . The random component is supposed to be iid extreme value, as in the Conditional logit. The coefficients  $\beta_i$  vary over individuals with density  $f(\beta)$ . This density depends on parameters  $\theta$ , for instance the mean and standard deviation of the  $\beta$ 's among individuals. The analyst chooses the more relevant distributions for the  $\beta$ 's and estimates the parameters  $\theta$  of these distributions. Individuals know their own  $\beta_i$  and their  $\varepsilon_{ij}$  for all alternatives  $j$ , and choose an alternative  $j$  only if  $V_{ij} > V_{ih} \forall j \neq h$ . However, the analyst only observes the  $X_j$  and the choices. Then, the choice probability (unconditional on the knowledge of  $\beta_i$ ) is:

$$p_{ij} = \int \left( \frac{\exp(\beta_i X_j)}{\sum_{h=1}^J \exp(\beta_i X_h)} \right) f(\beta) d\beta \quad \forall h \neq j \quad (9)$$

### 2.3 Willingness to pay (WTP) estimates

Estimates of consumer surplus associated with changes of attributes can be derived from the estimated models (Conditional logit or Random parameter logit model) following ?, using the parameter  $\beta_p$  which represents the marginal utility of income (which is usually the coefficient of the payment attributes). The willingness to pay (WTP) for a marginal change in the level of attribute  $X_a$  can be calculated as the negative ratio of the coefficient of the attribute  $X_a$  to the coefficient  $\beta_p$ .

$$WTP_a = - \frac{\beta_a}{\beta_p} \quad (10)$$

In the RPL model, the WTP is random (with mean and standard deviation) as it is expressed as the ratio of random coefficients. We suppose the coefficient of the payment attribute  $\beta_p$  to be constant.  $\beta_a$  and  $\sigma_a$  are the mean and standard deviation of  $\beta_{ai}$ . The distribution law for the WTP for the attribute  $a$  is the same as this for the coefficient attribute  $a$ .  $WTP_a$  is expressed as the mean of the implicit price of the attribute  $X_a$  with standard deviation being  $\frac{\sigma_a}{\beta_p}$ .

Table 1: Example of a choice set

	Site A	Site B	Neither
Choice	O	O	O
Presence of fishing boats	X		
Presence coastal walks			
Locally caught fresh fish to buy	X		
Distance between your residence and the site	40 km	60 km	
Presence of a beach		X	
Presence of a marina			
Architectural history (harbour, old houses and building, etc.)		X	

### 3 Design of the choice experiment

The aim of this study is to evaluate the non market value of fishing port. We want to know if the maintenance of the fishing activity increases the value of a fishing site. We choose to use stated preference method and more precisely choice experiment. People are asked to choose between different alternatives. Each alternative is a fictitious recreational site defined by a collection of attributes. From the conducted meetings and discussions, seven attributes seemed to us to be more relevant as determinants of people's choices. Attributes selected include possible recreational activities and amenities of the seaside: fishing boats, coastal trails, marina , beach, architectural heritage and direct selling of seafood caught by local fishermen. Each of the attributes has two levels (presence in the site or not). The last of these attributes is the distance to travel by car to the proposed site, as a proxy for cost as in (?), (?). We did not use a direct monetary attribute, because people look especially distance or time rather than cost when deciding to visit a site. After a survey on the maximum distance people usually do to go for a walk on a sunday, we chose four levels for this attribute (20km , 40km, 60km, 80km). This attribute has been presented amongst the other attributes in order to not highlight it. Attributes and their associated levels enabled to define alternative sets of choices which are fictitious locations to visit. Several choice sets are presented to respondents. For each, the respondent may choose between 3 alternatives : visit the site A, visit the site B, or no visit the proposed sites (called here the *statu quo* alternative). We indicated to respondents that these are day trip (round trip). Table ?? presents an example of a choice set faces by respondents.

These attributes and their associated levels gave us ( $2^6 \times 4^1$ ) possible combinations, *i.e.* 256 choice sets for a full factorial design, which is too many choice situations for a single respondent. We used a fractional factorial design in order to reduce the number of choice situations. We wanted to use efficient design but we have no prior information on the parameters estimates. We chose to run a pilot survey in spring 2013 (100

people, 10% of the sample objective) in order to get this information. It allowed also to check respondents' understanding of the choice context and task. This first experimental balanced design contained 32 choice sets. Since it still contains too many choice situations to give to a single respondent, we split it across four blocks of 8 choice sets. Then, we had four versions of the questionnaire. For each version, sets of choice were not always presented in the same order to avoid fatigue bias. With the information on parameter priors, we made the design more efficient by minimising the D-error, *i.e* the determinant of the asymptotic variance covariance matrix (?). The level of precision of the estimated parameters determined the level of efficiency. If different measures of efficiency exist (A-error, D-error), the D-error has the advantage to be insensitive to the magnitude of the scale of the parameters (?). Even if the inclusion of a *status quo* option may reduce efficiency, it has to be included in the questionnaire to improve its congruency with consumer theory and real choices (?).

Our final efficient design still consisted in 32 choice situations (split in four blocks), but ruled out dominant alternatives. The questionnaire contained other parts than choice experiments. We asked respondents to sort all the attributes according to their importance in the choices to be made, in order to ensure the consistency of their choice. We also interviewed individuals on their opinion on fishing, on their links with the fishing sector. We asked people if they were originally from the seaside, what are their main recreational practiced activities and their habits when going on the seaside. In addition, we have collected socio-economic data.

## 4 Sampling and data collection

The survey area is the neighboring departments of the Channel coast in France. The surveys were conducted in cities of different sizes both on the coast and inland. We interviewed indifferently either tourists or residents, assuming that behavior would not be different as the sites proposed to be visited are fictitious sites. However, we tested whether there were differences in responses in the econometric analysis of choices. We used a quota sampling to have a representative sample of the French population in terms of age and gender. The interviews were conducted face-to-face, in spring 2013 for the pilot survey, and during the summer 2013 for the final survey. We have 4 versions of the questionnaires, each with 8 sets of choices. We finally collected 1,005 usable questionnaires.

Table (??) presents a summary of some sociodemographic characteristics of the sample. It also summarizes the responses to questions about the main activities on the seaside, the frequency of visits to the seaside, or the potential links with the fishery sector of people surveyed. The majority of the respondents has visited the sea side at least one time during summer (around 90%) and in winter (83%). The main activities by



the sea practised by the investigated people are beach, walks and swimming. Rather most respondents have a good image of fishing. Nearly three-quarters think it is an important economic activity and part of the heritage. Few respondents think about the negative impacts on resources or biodiversity. More than the half has no links with fisheries (either at work, leisure, family).

Table 2: Descriptive statistics of the sample

Variable	Mean	Standard deviation
<b>Household size</b>	2.56	1.32
<b>Number of children under 18 years old</b>	0.54	0.87
Variable	Proportion	
<b>Gender (female %)</b>	51.94	
<b>Touriste (%)</b>	20.91	
<b>Originally from a coastal town (%)</b>	43.78	
<b>Own a second home on the coast (%)</b>	13.34	
<b>Age (%)</b>	20-29 years old	17.94
	30-39 years old	16.25
	40-49 years old	18.34
	50-59 years old	17.05
	60-69 years old	15.5
	More than 70 years old	14.96
<b>Occupation (%)</b>	Employee	53.48
	Unemployed	5.78
	Retired	27.19
	Student	9.56
	Other	3.98
<b>Net monthly income (%)</b>	Less 1500 euros	25.34
	1500-2500 euros	43.21
	2500-5000 euros	23.53
	More than 5000 euros	9.56
<b>Education level (%)</b>	None	11.12
	GCSE or equivalent	22.51
	A levels or equivalent	25.79
	Degree or postgraduate qualification	40.50
<b>Main activities on seaside(%)</b>	Beach	63.68
	Water sports	19.80
	Swimming	53.53
	Recreational fishing	20.90
	Walk	75.12
	Cultural tours	35.42
	Discovering nature	40.00
	Yachting	12.25

Continued on next page

Table 2 – continued from previous page

Variable	Proportion
<b>Visit on the seaside (%)</b>	
<b>In summer</b>	
Every day	18.89
Several times a week	25.00
Several times a month	29.75
Less than once a month	16.29
Never	9.95
<b>In Winter</b>	
Every day	10.18
Several times a week	14.03
Several times a month	27.15
Less than once a month	31.45
Never	17.08
<b>Views about fishing(%)</b>	
Important for regional economy	73.33
Polluting activity	11.84
Conflicts with tourists	3.68
Attractive for tourism	46.27
Negative impacts on resources and biodiversity	16.42
Part of the heritage	65.17
<b>Main relationship with fishing (%)</b>	
Professional fisherman	1.09
Recreational fisherman at sea	18.81
Recreational fisherman in rivers	8.56
Job associated with fishing industry	4.58
Friends or family in fishing sector	20.30
No link with fishing	57.91

## 5 Model estimation

### 5.1 Estimates results

The results of the estimated models from the data collected are shown in table ???. We first estimates a conditional logit model (column (1) in table ??) with an alternative specific constant (ASC) and including 7 site characteristics which of the distance attribute. We choose to introduce an ASC for the *statu quo* alternative in order to capture the effect of unobservable variables on *statu quo* choice. In a second model (column (2) in table ??), we introduce some site attributes crossed with some individual characteristics, as income, age, number of children under 18 years old, and a dummy indicating when the respondent has no link with fisheries. Others individual characteristics have been tested but have proved being not significant. In column (3) and (4) of table ??,

we present results from the random parameter logit model. We fit a model in which coefficients are normally distributed, except the distance coefficient. We assume the same distance preference for all people interviewed, in order to facilitate the derivation of the willingness to pay (?). The four models are all significant and exhibit good fitness. The log-likelihood ratio are highly significant and pseudo  $R^2$  are rather high, well-fitted models occurring with pseudo  $R^2$  greater than 0.2 (?). For every models, the coefficients estimates related to specific attributes of the sites are significant at the 1% level, which indicates that site attributes we consider are relevant determinants of visit choices on seaside. All specific site parameters estimates are positive, meaning that each of the characteristics used to describe a site contributes positively to the utility of the people surveyed, except the distance attribute, which parameter estimates is negative. Obviously, lower distances are preferred to higher distances when going on seaside. The constant is significant and negative, meaning that going to a proposed site rather than not going anywhere provides utility to respondents. Coefficients estimates indicate that respondents prefer much better the beach attribute to the others. The second most preferred attribute on seaside is architectural history, followed closely by the presence of fishing boats. Presence of marina or coastal walks has a lower contribution to utility of the respondents.

The importance attached to the presence of fishing boats on a site increases with the age of the respondent, but decreases with the number of children under eighteen years old in the household. When respondents have no link with fishing (in work, family, friends, etc.), the importance they attach to the presence of fishing boats decreases. These respondents are also less sensitive to the possibility to buy fresh fish from local fisheries on the site. They are more interested than others in architectural heritage. Younger respondents attach more importance to the attribute beach in choosing to visit a site on seaside. Finally, we tested whether being tourist alter responses in the choice experiment, but we found no significant difference.

For the Conditional logit model, we tested the IIA assumption using the Hausman and McFadden test (?). We sequentially drop alternative A, alternative B and the *statu quo* alternative. The results of the Hausman test are respectively  $\chi^2 = 61.34$  (0.00),  $\chi^2 = 46.41$  (0.00) and  $\chi^2 = 95.72$  (0.00) indicating that the IIA assumption is violated which leads to inconsistent estimations. The RPL model relaxes the IIA assumption, which justifies why we estimate this model thereafter. For the RPL model, we present in the upper part of columns (3) and (4) in table ?? the mean parameter estimates. These parameters are highly significant and positive (except for the distance attribute) as in the logit conditional model, but they are higher in absolute value in the RPL model. The relative importance of each specific site attribute in utility remains the same as in the conditional logit model, except for the coastal walks attributes where parameter estimates is higher and close to the fishing boat one. The second part of columns (3)

and (4) in table ?? shows standard deviation estimates of parameters for specific site attributes (except for distance). All standard deviations estimates are highly significant which demonstrates preferences heterogeneity between people interviewed for site attributes. Only standard deviation of parameter linked to marina is not significant. We crossed individual characteristics with some attributes as for the conditional logit model. We observe the same effect of the age of the respondent on the choice of the beach attribute. When people have no link with the fishing sector, the coefficient estimates on attributes such fishing boats and coastal walks decrease, whereas it increases for architectural heritage. Thereafter, we will use the results of the RPL model to estimate WTP in order to take into account individual heterogeneity. For the RLP model, the Log Likelihood Ratio presented at the bottom of columns (3) and (4) implies that we can reject the null assumption of all the standard deviation are equal to zero.

## 5.2 Welfare estimates

Parameter estimates for specific site attribute can be interpreted as the marginal utility of this attribute, except the parameter for distance which is the marginal disutility of distance. Distance is used as a proxy for cost, we had to convert it into money. In literature, several solutions are proposed. We agreed to retain only the cost of fuel without including the cost of wear and tear because most people rely on the fuel cost to make their travel choices. Then, we relied on the French tax scale for converting the distance coefficient into a cost one as in (?). We apply a fuel cost of 0.10325 euros by kilometer, multiplied by two because we have to take into account the round trip. This value is close to the one used in (?). The choice experiment survey allowed us to observe the choices of individuals due to changes in the level of attributes. Then we can derive the willingness to pay (WTP) for an attribute as the negative ratio of the attribute parameter to the distance parameter converted into price. Table ?? presents the WTP estimates for each attribute.

Intuitively we expect that the WTP for the beach and coastal walks attributes are higher, since these are activities on seaside mainly mentioned by the respondents of the sample (63 % and 75 %). As expected, the WTP is the highest for the beach attribute, but not for the coastal trails. Surprisingly, the WTP is as important to see fishing boats as to go on coastal walks. The WTP is almost halved for the fishing boats attribute. This is closely followed by the WTP for the the architectural history and coastal trails attributes, and then the direct sales of fresh caught fish attribute. The lowest WTP is for the marina attribute, which is a quarter of the WTP for the beach one. The RPL model estimates show that the coefficient of the fishing boat attribute is lower when the respondent has no link with the fishing sector (almost 58 % of our sample). Thus, the WTP to see fishing boats on coast decreases almost half (from 6.15 euros to 3.65

Table 3: Models parameter estimates

		Conditional Logit		Random Parameter Logit	
		(1)	(2)	(3)	(4)
<b>Mean</b>					
	ASC	-0.641*** (0.063)	-0.672*** (0.068)	-0.581*** (0.100)	-0.632*** (0.117)
	Fishing boats	0.525*** (0.032)	0.678*** (0.090)	0.671*** (0.065)	0.876*** (0.076)
	Coastal walks	0.393*** (0.039)	0.230** (0.091)	0.663*** (0.067)	0.727*** (0.073)
	Locally caught fish to buy	0.440*** (0.038)	0.595*** (0.058)	0.517*** (0.068)	0.651*** (0.086)
	Beach	1.061*** (0.038)	1.552*** (0.082)	1.131*** (0.091)	1.667*** (0.105)
	Marina	0.366*** (0.033)	0.452*** (0.053)	0.445*** (0.068)	0.420*** (0.063)
	Architectural history	0.663*** (0.035)	0.622*** (0.056)	0.796*** (0.072)	0.726*** (0.078)
	Distance	-0.026*** (0.001)	-0.026*** (0.001)	-0.028*** (0.002)	-0.029*** (0.002)
	Fishing boats x Nb. of children < 18		-0.078** (0.036)		
	Fishing boats x Age		0.032* (0.19)		
	Coastal walks x Revenu		0.229*** (0.038)		
	Fishing boats x No link with fishery		-0.370*** (0.066)		-0.355*** (0.060)
	Locally caught fresh fish to buy x No link with fishery		-0.225*** (0.068)		-0.192*** (0.064)
	Architectural history x No link with fishery		0.141** (0.069)		0.141** (0.064)
	Marina x No link with fishery		-0.111* (0.067)		
	Beach x Age		-0.149*** (0.021)		-0.162*** (0.019)
<b>Standard deviation of random parameters</b>					
	Fishing boats			0.164*** (0.043)	0.182*** (0.053)
	Coastal walks			0.185*** (0.059)	0.238*** (0.070)
	Locally caught fish to buy			0.434*** (0.068)	0.340*** (0.057)
	Beach			-0.219*** (0.074)	0.152** (0.068)
	Marina			0.057 (0.079)	0.104 (0.080)
	Architectural history			0.258*** (0.058)	0.236*** (0.070)
	N	24120 (1005 x 3 options x 8 choice sets)	21168 (882 x 3 options x 8 choice sets)	24120 (1005 x 3 options x 8 choice sets)	24072 (1003 x 3 options x 8 choice sets)
	Log Likelihood	-6907.92	-5927.20	-6848.2346	-6772.43
	Log Likelihood Ratio	3849.85 (0.00)	3649.21 (0.00)	119.37 (0.00)	117.74 (0.00)
	Pseudo R <sup>2</sup>	0.218	0.235		

\*\*\*, \*\*, \* denotes significance at the 1%, 5% and 10% level

Standard errors are given in parenthesis

Table 4: Willingness to pay estimates

Specific site attribute	Individual WTP (euros per round trip)
Fishing boats	6.15 [1.28]
Coastal walks	5.13 [1.68]
Locally fresh caught fish to buy	4.60 [2.40]
Beach	11.77 [1.07]
Marina	2.96 [0.74]
Architectural history	5.13 [1.67]

Standard deviation into brackets

euros). The WTP for beach is higher for the youngest people interviewed. It decreases by around one euro per age class. Thereby, individuals in the sixties have almost the same WTP for the fishing boats attribute (6.04 euros) than for the beach.

The use of distance as a proxy for cost allows us to express differently the WTP for an attribute as the maximum distance an individual would be willing to travel from home to benefit from this attribute on a site (?). On this basis, people are willing to travel about 57 km from home for going on a site with a beach, whereas only 30 km for seeing fishing boats or walking on coastal trails, and even less for marina (14 km).

## 6 Discussion and conclusion

The paper presents results from a choice experiment study of recreational demand on the coastline in France. It aims to show that fishery activities has a significant role in the production of non market services such as amenities for visitors. We assume that individual choices of recreational sites are a function of the attributes of the site. A large survey has been made in the neighboring departments of the Channel coast in France. Respondents were asked to choose between two fictitious sites on the coastline described in terms of seven attributes, including the presence of fishing boats and the possibility to buy fresh fish caught by local fishermen. They also had the option to choose none of the proposed sites. We used an efficient design to produce choice sets. Our first discrete choice model specification was a conditional logit model. But the IIA assumption being violated, thereby we estimated a random parameters logit model. From this model, the estimated WTP for a marginal change in the provision of each site attribute indicates that the second highest value after the beach attribute is the WTP for the presence of fishing boats, followed by the WTP for the locally fresh caught fish attribute, far ahead the one for the provision of a marina. Individuals like to see fishing boats on the coastline, likewise fish catches (regardless of the fact to buy it). Fresh fish caught by local fishermen landed and directly sold to consumers on the ports or in

local open markets is also an attraction for visitors. These are positive externalities produced by inshore fisheries.

Results of our work seem to indicate that public supports of the fishery activities are relevant if we consider the related amenities attracting visitors on the coastal areas. The general issue of multifunctionality is whether policy measures must be targeted or coupled. This question depends of the degree of jointness between commodity outputs (or production factors) and amenities. In fishing, as in agriculture, the jointness is more or less strong according to the type of activities. The strongest jointness are observed in the case of small-scale and coastal fishing, and in direct sales of seafood products. We should thus intend to address coupled aids, for example by boat or by fisherman, only to inshore fishing. The problem is that coupled measures are also known to encourage overfishing because of a decrease in the costs of fishing effort. We must then ensure that marine resources are managed in a sustainable way, with quotas or others forms of property rights. Therein, the French scallop fishery in the bay of Saint-Brieuc is a canonical example as it provides amenities and the resource is rather well managed.

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