European Transport \ Trasporti Europei n. 39 (2008): 59-81

Using conjoint analysis to investigate preferences of inhabitants for the future of a greyfield area: an application to the Old Port in Trieste

Jérôme Massiani [1*], Paolo Rosato [1, 2]

[1] *Università degli studi di Trieste, Dipartimento di Ingegneria Civile e Ambientale - Italy*
[2] *Fondazione Eni Enrico Mattei, Venezia - Italy*

Abstract

In developed countries, abandoned industrial (derelict or underused) areas often occupy important parts of the cities. This raises issues about the reuse of these areas as well as on the conservation of industrial heritage they often entail. In order to help decision maker in understanding the preferences of inhabitants for different reuse possibilities, different techniques have been used in the literature. Most of them were based on Contingent Valuation techniques, while the competing approach, Conjoint Analysis, has barely been used in this area of research. In this article, we present the results of a Conjoint Analysis experiment on the reuse of a large, partly abandoned, port area in Trieste (Italy) featuring buildings with intermediate historical and industrial heritage value. Three hundred computer-assisted interviews have been made on a representative sample of Trieste inhabitants, eliciting their preferences for different reuse hypotheses and building conservation scenarios. The collected data have been processed using Latent Class and Mixed Logit models to explore heterogeneity among interviewees' preferences. Our findings indicate a very clear preference in favour of tourism and leisure oriented uses. On the other hand, preferences in terms of conservation and the impact of cost are much more difficult to measure. This difficulty persists even when specified or non specified heterogeneity is taken into account, although Mixed Logit estimates provide more convincing results.

Keywords: Port, Reuse urban sites, Conjoint analysis.

1. Introduction

"Alt Wien war auch neue"

"Once, Old Vienna was also new"

In many developed countries, derelict areas occupy relevant parts of the cities. The existence of these areas raises issues regarding their future use. Moreover a number of these areas host buildings with some historical value, at least as testimonies of industrial history. In this context, policy makers and planners may need some instruments in order

* Corresponding author: jmassiani@units.it

to know the preferences of inhabitants regarding the future of these areas. A common instrument to investigate preferences for new situations, which has been developed in the area in psychometrics and is commonly used in economics, is Conjoint Analysis. This approach has generated a number of applications in areas ranging from transport economics to the valuation of environmental externalities or the demand for cultural goods. An ongoing stream of research is making use of these techniques, together with other techniques known as Contingent Valuation, to "assign a value" to the conservation of heritage (Pierce and al. 2002) and has resulted in applications to objects such as: Lincoln cathedral (Pollicino e Maddison, 2001), Changdeok Palace in Seoul (Kim e al, 2007), Northern Hotel in Fort Colins-Colorado (Kling et al, 2004) or the conservation of built heritage in Newcastle neighbourhood of Grainger town (Garrod e al, 1996). Strictly speaking, we are not aware of the applications of Conjoint Analysis technique to the future use of an urban area with consideration to the conservation of existing buildings[1].

The present article aims at filling this gap. The case study is the Old Port of Trieste (North-East Italy) a 700.000 square meters (173 acres) area that is partly unused but for a small number of port activities. This area hosts warehouses and industrial buildings constructed at the end of XIXth century that have some heritage value and are currently protected under Italian preservation regulation.

In this context, this paper aims at investigating the preferences of Trieste's inhabitants for the future of the Old Port regarding uses and conservation. The method used is based on Choice Based Conjoint Analysis.

Our research differs from previous researches reported in the literature (for an overview, see Pierce et al, 2002):

1. We explicitly concentrate on functions and functions mixes, while most of the available results consider merely conservation. This also allows use to investigate the possible complementarities and/or incompatibilities between different functions.
2. We deal with a heritage that has an "intermediate" value, while most of the previous researches (Pearce et al., 2002, pp. 262-264) concentrate on constructions with outstanding value.
3. We explicitly deal with different levels of preservation, giving the possibility to the interviewees to express preferences for the conservation of 0, 25 and 50% of the buildings. This makes it possible to detect non lineraties in the value assigned to the heritage.
4. We make use of single scale valuation questions regarding future uses and conservation, together with Conjoint Analysis questions, in order to be able to compare the outcomes of both types of surveys.
5. We investigate with special care the impact of the time scale for the payment (single year tax or decennial tax). Attention on the "periodicity of the elicited WTP" was listed by Pearce et al (2002, p. 265) as one of the major topics of future research for the valuation of heritage.

The article is structured in five sections. Following this introduction (section 1), section 2 presents the context of Trieste Old Port, section 3 presents the data collection

[1] Among previously cited papers only very few use Conjoint Analysis while a large majority uses Contingent Valuation. Among the researches using Conjoint Analysis, the study by Morey and Rossmann (2003) is probably the closest to our topic. Those authors use Conjoint Analysis to investigate the preferences for the conservation of a set of white marble monuments in Washington. However, their study cannot be strictly compared to ours as they investigate a heritage that is spread in the city.

and descriptive results about the sample, section 4 provides the results of the Conjoint Choice experiment, section 5 draws the conclusion of the research and indicates the possibilities for future developments.

2. Trieste Old Port

In this section, we provide a brief overview on the history of Trieste Old Port and subsequently investigate the possible future of the area.

2.1. From New Port to Old Port

The Old Port of Trieste was built during years 1867-1883, when the city of Trieste was under the Austrian authority, based on the project of the French engineers Paulin Talabot and Hilarion Pascal. However, it is only after 1887 that the warehouses and technical/servicing buildings were built to substitute shelters and give the port a more definite form. In the 1920's, when the port had found its final configuration, it held about 37 warehouses and 20 service buildings, some of them of relevant architectural interest as the hydrodynamic station (a facility which uses water pressure to move goods), warehouse number 26 and the custom belt buildings surrounding the port. Due to the fast growing traffic of the beginning of the 20th century, and due to the intrinsic limitation of the Old Port (in particular the limited water depth) a decision was taken to expand the port facilities of Trieste through the construction of a New Port in the easternmost part of the city (distant 4 km from Old Port). The work started in 1901. Twenty years after its completion, what was until then the "new port" becomes the "Old Port", as it is still now.

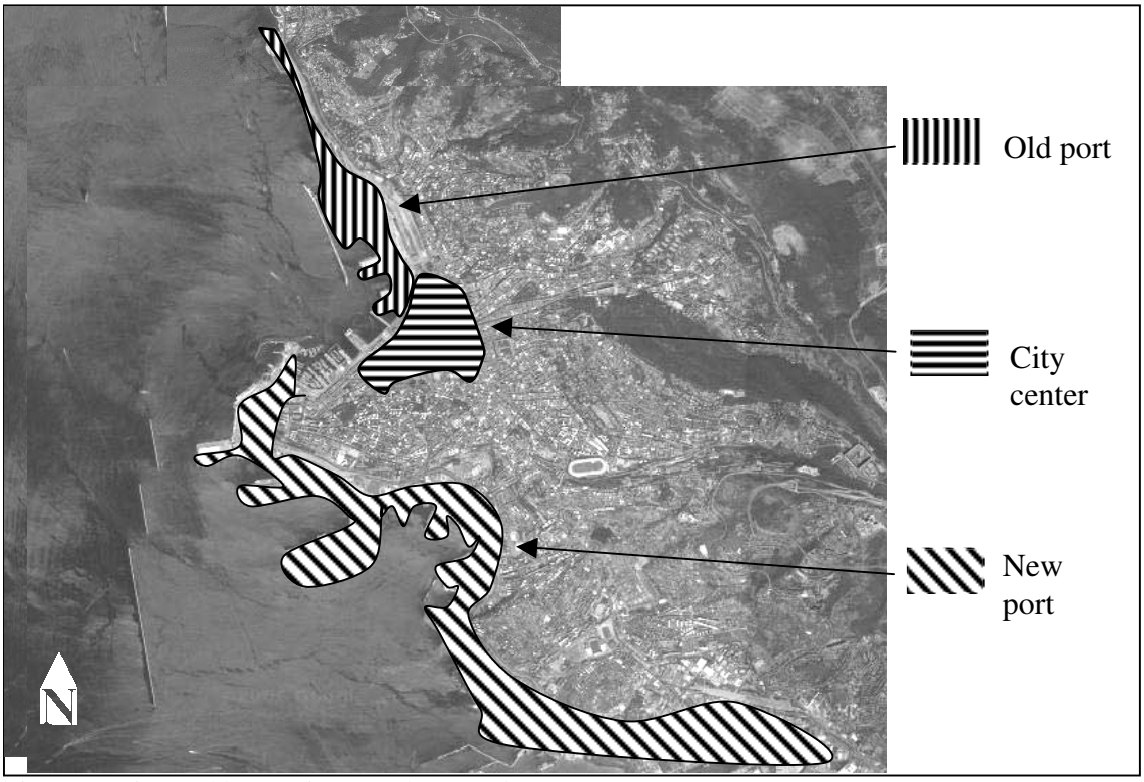

Figure 1: Trieste Old Port, city central area and New Port.

In the subsequent years, the Old Port had a declining activity and was the object of numerous urban projects. Table 1 provides an overview of the main projects developed for the area, including an unsuccessful candidature of Trieste for the International Exhibition of 2008. None of these will be, even partially, undertaken. The port area is nowadays partly unused, hosting a few specialized freight activities (like a terminal for the export of living cattle, some stocking in the warehouses, and some administrative functions related to the maritime activity like the Port Authority).

Figure 2: Snapshot of buildings of Trieste Old Port.

Table 1: 35 years of unrealized projects in the Old Port, an overview.

35 years of unrealized projects in the Old Port, an overview	
1974	Guido Canella's project based on Park, Exhibition centre, parking
1988 - 91	Project Polis: urban neighbourhood with offices Project Bonifica: Two marinas and offices with a tunnel connecting with the New Port
1990	Synthesis between Polis and Bonifica projects Special planning scheme focused on traffic issues
1995	Project Tergeste Pier III : Marinas, shops and parks
1997	Association Trieste Futura: Masterplan for the restoration of Old Port (arch. Sola Morales)
2000	Port Authority project for the update of Old Port masterplan (arch S. Boeri), the project is blocked by the veto of the ministry of cultural goods
2006	A new masterplan (Systematica e Norman Foster and partners) is proposed. It is compatible with the listing of different buildings and mixes a large variety of functions

2.2. Prospects for the future of Old port

The current situation of the area appears to many observers as unsatisfactory because the port area has major assets. First, it is very close to the heart of the city (less than one km from the virtual centre of the city and adjacent to Trieste central railway station). Second, it is a very large area (700.000 m²). This is a valuable resource because,

although Trieste economy is relatively stagnating, the city is one whose building space is scarce due to its geographical situation (the city is built on a tiny land strand, between a plateau and the seashore).

The legal situation of the port is also peculiar: it is a free custom area in virtue of a post war agreement, known as the London memorandum, a situation latter recognised by European Union Treatise. This may explain the difficulties that emerged in the realisation of past projects. Recently, the regulatory framework of the Old Port has undergone important changes through deliberations of the Port Authority and the local administrations, who issued new building and land use regulation for the area. This change will authorize a number of non-strictly maritime activities in the area (in a first stage: education, shops and offices).

In this new context a number of questions arise. These questions relate to the function mix that the area will host. Functions that such an area can host are numerous, to name a few: industry, shops, education, public services (hospital, schools, etc), offices, marinas, hotels and restaurant etc; not to mention the expansion of port activity that is advocated by part of the business community. Given the size of the area, it would be unreasonable to concentrate on one single use for the Old Port and it is more sensible to think in terms of function mix, referring at least to one main use and one complementary use.

Eventually, the future of the area raises issues about the conservation of existing buildings. These buildings may be of intermediate, rather than outstanding, heritage value, especially in a city that can count on a very rich built heritage, it is however a legacy of the past port history of the city. This heritage is submitted to legal protection: a majority of the buildings is listed and thus protected by restrictive regulations (Marin, 2003).

In this context, we propose to use a Conjoint Analysis questionnaire, in order to understand what are the preferences of Trieste inhabitants for the future reuse of the port. The next section presents more in details the questionnaire and data collection.

3. Questionnaire and data collection

In this section we present the questionnaire. We also provide information on the data collection process. Eventually we present descriptive data of the interviewed population.

3.1. The questionnaire

A full list of the interview questions is provided in appendix. The questionnaire consists of three parts. The first part is introductory: it contains questions that allow to check whether the interviewee meets the target population (people living in the Trieste province), how much they know about the Old Port (did they already go there? are they capable of precisely indicating its location in the city, etc…), closed question (would they prefer the Old Port to become a pedestrian area?) as well as ratings of possible future uses of the port.

A second section consists in the Conjoint Analysis experiment itself. Each interviewee had to answer to eight conjoint choice questions. These questions are as illustrated on Figure 3. Two "project" alternatives are presented, together with one "status quo" alternative defined as "*make no intervention and leave the Old Port as it is*". The project alternatives are defined by four attributes: two attributes describing the

reuse of the port (main use and complementary use), one describing conservation versus reconstruction, and one reflecting the cost of the program. More in details, the attributes were:

- Conservation and restoration of existing buildings: 0% (full reconstruction), 25% (only buildings with high heritage value), 50% (same as previous + buildings of intermediate heritage value). Note that this attribute implies conservation and restoration together. None of the projects presented in the interview, except the status quo alternative, intends to conserve buildings in their condition at the time of the interview.
- Cost for taxpayers (0, 25, 50, 100, 150 €). This attribute expresses the cost of a future scenario for the reuse of Old Port. It is based on the assumption that the cost would incur through a special scope local tax. This extra cost is expressed in two different ways: single payment or the annual amount of a decennial tax. Half of the sample answered the questionnaire with the 10 years payment and half of the sample answered the questionnaire with the single payment.
- Main use, as well of complementary use could be one of the followings: Port, Production, Shops, Offices, Housing, Hotels and restaurants, Marinas, Parking, Public services (school, civic centre).

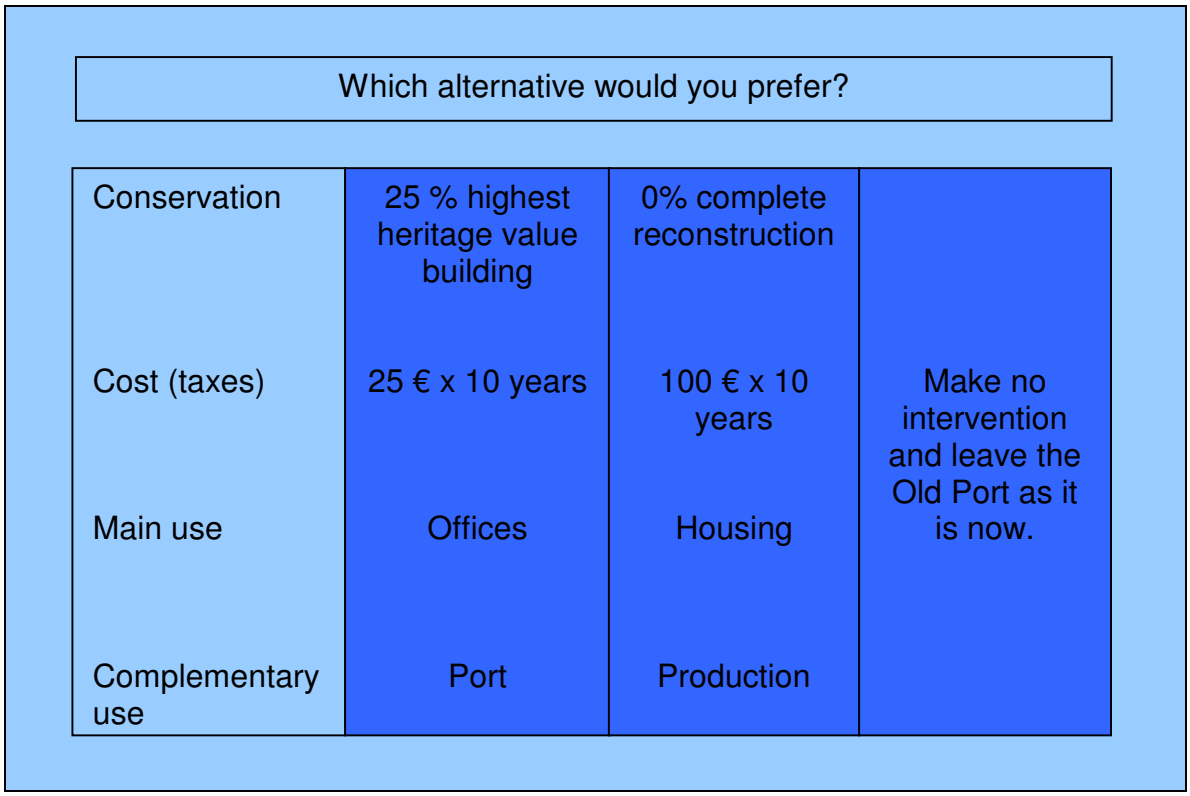

Figure 3: Conjoint choice interview screenshot (translation to English, questionnaire with 10 years payment).

Figure 3 illustrates the screen that was presented to the interviewees during the conjoint choice section of the questionnaire.

A third section contains a set of supplementary descriptive questions regarding the socio economic characteristics of the interviewee (personal net income, age, education, etc).

3.2. Data collection

The data collection took place from 20 may to 28 July 2007. The target population was defined as the inhabitants of Trieste Province[2]. The survey method was based on quota sampling. Four characteristics have been selected to define the quota: age, sex, area of habitation and level of education. The targets of the quotas are presented in Table 2. These targets were respected in the data collection with a deviation smaller than 1%.

Table 2: Questionnaire target quotas (%, reproduced ± 1% in the collected data).

Population categories and corresponding shares	
Age:	
18-24	6,1
24-34	15,9
35-44	16,6
45-54	15,6
55-64	16,8
65-74	14,2
>74	14,8
Gender:	
Male	46,2
Female	53,8
Location:	
Neighbourhoods close to the port	29,9
Other neighbourhoods of Trieste municipality	57,3
Other municipalities in the Province	12,8
Educational level:	
University degree	6,7
Secondary school	30,8
Primary school (final)	30,3
Primary school (intermediate)	27,4
No diploma	4,6

3.3. Results

The descriptive data collected in the survey indicate, first, a good level of familiarity of interviewees with the port. It turned out that 94% of the interviewees knew the location of the Old Port, although 25% knew its location but could not give a clear

[2] Unlike other Provinces in Italy, Trieste Province is chiefly consisting (87% of the population) in the capital town Trieste, while the 13 % of the Province's inhabitants live in the 5 other municipalities of the Province. Trieste is the smallest Province of Italy. It extends on a tiny seashore strand 25 km long and 3-5 kilometres wide. For the purpose of our study it was found more reasonable to investigate preferences of all the province inhabitants, rather than artificially restricting to the municipality of Trieste.

description of its extension[3]. 58% of the interviewees already entered the area of the port, mainly for professional or entertainment purposes[4], 42% (out of 58%) entered the area at several occasions. Interestingly, we asked people what they thought was the current use of the Old Port, and it turned out that 82% of the interviewees declared it was not used, 7% said it was used for port activities, and 10% for parking. While the latest answer derives from confusion (there is a large parking building at the hedge of the area, but not within the area), the two other answers should be considered as consistent with the current situation of the area.

The second information provided by the interview indicates a concern that, the future of the area should not only be dictated by functionality but also by urban quality. First, interviewees advocate a balance between the construction of new roads *to access* the area and the need to preserve the interior of the area from too much road and traffic: while 55% of the interviewees declare "very important" or "rather important" the "creation of roads to connect the area with the main road network", 88% of them declare that they would prefer an area mainly pedestrian rather than the "construction of roads within the old port area". Interviewees exhibit also a preference for the conservation of existing buildings: keeping "buildings with high or intermediate heritage value, half of the existing buildings" would be favoured by 46% of the sample; an alternative, more modest protection (preserving "only buildings with high heritage value, 25% of existing buildings") would be supported by 45% of the population. This means that 91% of the sample is in favour of the preservation of 25% or more of the buildings and, conversely, only 9% of the population is in favour of a complete reconstruction of the area.

Eventually we asked people to rate the different future possible uses of the area. As illustrated on Table 3, the main features emerging from these data is that there are clear preferences for uses linked with leisure and tourism (Marina is ranking first, Hotels and restaurant is ranking second) and services for the public (ranking third). On the contrary, there is a dislike of industrial and port activities (both ranking as the two least preferred activities).

Table 3: Rating of possible future uses of the Old Port area.

	Port	*Production*	*Shops*	*Parking*	*Housing*	*Offices*	*Services for the public*	*Hotels and restaurant*	*Marina*
Mean	3.8	3.7	4.1	4.4	5.2	5.4	5.8	6.2	7.5
Median	3.0	4.0	4.0	5.0	5.0	6.0	6.0	7.0	8.0
Variance	9.2	5.8	5.8	4.8	6.2	6.7	7.3	6.7	3.5

Note: question was phrased as "important for the future of Old Port", 1 means not important, 10 means very important.

These results give indication on the preferences of Trieste inhabitants for the future of the port area. However, one limitation of such results is that they give no indication on the trade-offs between competing objectives, and in particular they give no monetary measure to the benefits of the various possible operations in the area. To overcome these limitations we make use of the conjoint choice data whose results are presented hereafter.

[3] This situation typically occurs considering the fact that the Old Port is adjacent to the city central area, but that the remaining part of the Old Port is less visible, as it is inaccessible lying between the rail tracks and the sea shore. Thus, a number of Trieste inhabitants know where the Old Port is, but have no clear idea of the extension of the area.

[4] The area is occasionally hosting recreational and cultural events.

4. Conjoint choice experiment results

The conjoint choice data have been analysed using different models. We first present the results of a basic multinomial Logit. The logit model express P(i), the probability of choice of each alternative i, as a function of the stochastic utility V_i of each alternative.

If we suppose that the utility associated with each alternative *i* consists of a deterministic and a stochastic component such that:

$$U_i = V_i + \varepsilon_i . \quad (1)$$

If we also suppose that ε_i has a Weibull (or Extreme Value type I) distribution, independent and identical among alternatives and among interviewees, the probability of choosing alternative *i* can be expressed by the logit formula:

$$P(i) = \frac{e^{V_i}}{\sum_{j=1}^{3} e^{V_j}} \quad (2)$$

where P(i) is the probability of choosing alternative i, and V_i is the deterministic component of the indirect utility of alternative i. We suppose that the deterministic part of the utility can be expressed as :

$$V_i = \beta X_i \quad (3)$$

where β is a vector of coefficients, and X_i is a vector of attributes.

In our application, X_i consists of the following attributes:

- Annual tax: amount of annual taxation (= 0 for the interviews with 10 years taxation);
- Total 10 years tax = 10 × annual tax (= 0 for interviews with single year taxation);
- RestCons25: a spline variable that takes the value 0 if the alternative has no conservation, and the value 25 if the scenario implies restoration and conservation of the most valuable 25% among existing buildings;
- RestCons50: 0 if the alternative has no conservation, 50 if the alternative implies restoration and conservation of 50% of the buildings. Note that when using such a codification for RestCons25 and RestCons50, the corresponding coefficients can be directly compared as they express the utility of one percent of restoration;
- 8 variables that code the Main Use of the area. Namely: port, production, shops, offices, housing, hotels and restaurant, marinas, parking, public services (hospital, schools, etc). These variables are coded using effect coding[5] rather than the more usual dummy codification;

[5] Effect coding has the advantage of making the coefficients of theses attributes independent of the value chosen as the "base variable". Moreover, it offers the advantage of making it possible to compute the attribute's coefficient of this baseline, as minus the sum of the other coefficients. See Hensher et alii (2005) for more details.

- 8 variables that represent the complementary use (same list as main use, included with effect coding);
- Status quo: a dummy variable that is 1 for the alternative described as "make no intervention and leave the Old Port in its current situation" and 0 for other alternatives.

Table 4: Model estimates for MNL (both questionnaires and single questionnaire).

Model number			*Model 1*		*Model 2*		*Model 3*	
Model type			MNL		MNL		MNL	
Sample			Half sample				Full sample	
			One year tax		10 years tax		One year +10 years	
n obs (choices)			1200		1200		2400	
rho^2			0.232		0.172		0.196	
LogLikelihood			-1091		-1013		-2120	
			β	Signif.	β	Signif.	β	Signif.
Total cost (euro)		(1 year)	-0.00039		-	-	-0.00049	
		(10 years)	-	-	-0.00014		-0.00011	
Restoration-Conservation		R-Cons25%	-0.0011		-0.0041		-0.0021	
		R-Cons50%	-0.0019		0.0007		-0.0005	
uses	main	Port	-0.64	-	-0.98	-	-0.80	-
		Production	-0.77	***	-1.22	***	-0.97	***
		Shops	-0.28	**	-0.46	**	-0.35	***
		Offices	0.28	**	0.49	**	0.37	***
		Housing	-0.11		0.01		-0.04	
		Hotels and rest	0.43	***	1.14	***	0.76	***
		Marinas	1.71	***	1.93	***	1.79	***
		Parking	-1.26	***	-1.57	***	-1.41	***
		Services	0.64	***	0.66	***	0.65	***
	complemen	Port	-0.66	-	-0.97	-	-0.79	-
		Production	-0.55	***	-0.42	***	-0.49	***
		Shops	-0.06		-0.07		-0.06	
		Offices	0.23	*	0 .27	*	0.24	**
		Housing	-0.23	*	0.00	*	-0.10	
		Hotels and rest	-0.06		0.10		0.01	
		Marinas	0.90	***	0.81	***	0.84	***
		Parking	0.09		-0.13		-0.01	
		Services	0.33	***	0.41	***	0.36	***
		Status quo	-0.55	***	-0.56	***	-0.54	***

Note: Significance: *** at 1% probability, ** at 5%, * at 10%, "-" = Non available.

Table 4 presents the results of a simple MNL model. Model 1 is calibrated on the 150 questionnaires with one year payment; Model 2 is calibrated on the 150 questionnaires with 10 years payment. Model 3 is calibrated on all 300 interviews.

The general pattern exhibited by models 1 to 3 is striking. They indicate very clear preferences in favour of leisure- or tourism-oriented uses and a strong opposition to productive uses (industrial and port) as well as parking. This is conform to answers given through Likert scales in the first part of the questionnaire. Complementary uses exhibit the same kind of preferences except that "Hotels and restaurants" and "Parking" are not significant. Results also indicate that the present situation of the port is disliked by the interviewees. Recall that these estimates have been made using the Effect Coding of the uses' attribute, instead of the more usual dummy coding. For this reason, each coefficient of the variables that are included in this form can be interpreted independently of the choice made for the (omitted) base variable.

Another relevant result is that neither cost nor the share of conserved and restored buildings are significant in the estimates. As far as cost is concerned, this is hardly consistent with economic theory. As far as conservation is concerned, this is not consistent with answers given by interviewees to previous answers of the questionnaire. This motivated a more in-depth examination of the data based on the idea that the reasons behind these results had to be found in heterogeneity of preferences among the interviewees. This hypothesis relies on a set of evidences collected in the literature on heritage preservation and cultural goods. For instance, Garrod and Willis' valuation of maximum Willingness to Pay for visiting the Durham cathedral indicates that individual willingness to pay of the interviewees varies a lot (1999, p. 46). A number of researches also found that individuals could be grouped into clusters based on the structure of their preferences. A way to identify these clusters is to make use of Latent Class where the segmentation of the population in different clusters is made together with the model estimation. Applications of Latent Class to heritage goods include the visits to Dutch museums (Boter et alii, 2004), the preservation of marble monuments (Morey and Rossmann, 2003), choice of recreational parks (Boxall and Adamowicz, 2002), the visits made to urban parks (Kemperman and Timmermans, 2006; Kemperman et alii, 2005). These latest authors found that the decomposition of the demand into four groups noticeably improves the quality of the model. Other methods to deal with heterogeneity rely on Mixed Logit which relaxes the hypothesis of fixed coefficients among the population in favour of a continuous distribution.

In the next paragraphs we propose to implement various instruments to explore the heterogeneity among interviewees in order to check for the existence of preferences for conservations and aversion to costs.

4.1. A priori segmentation based on interviewees' characteristics

A preliminary approach is to make use of a priori segmentation. Different segmented models have been estimated based on characteristics of the interviewees (sex, age, education, location, professional status, …).

Table 5: Segments with cost or conservation coefficient significant (10%).

Attribute	*Value*	*Segment*	*β*	*P critic*	*Number of obs.*	*Number of interviewees*
Conservation	50%	No diploma	-0.0188	0.07	112	14
and		18-24 years	0.0117	0.07	144	18
restoration		Student	0.0146	0.04	112	14
Cost	10 years	Female	-0.0003	0.01	1280	160
		Leave close to the port	-0.0003	0.02	728	91
		Secondary school diploma	-0.0003	0.03	752	94
		Age = 55 - 64 years	-0.0004	0.06	416	52
	1 year	Retired	-0.0029	0.09	664	83

Note: estimations have been made based on specification of model 3, pooling observations of one year tax and ten years taxes interviews.

Table 5 indicates that only a few among the segments of the population have a significant coefficient (at the 10% confidence level) for the conservation or cost attributes. Conservation at 25% is never found to be significant, while conservation at the 50% level is found to be significantly praised mainly among young interviewees (18-24 years old and students) and is significantly disliked among interviewees with low educational level.

One year tax is found significant (with the correct negative sign) only for retired people, while 10 years tax has a significant and negative coefficient for female, people living in the area close to the port, people whose educational level is secondary school diploma and people whose age is between 55 and 64 years.

These results indicate that a priori segmentation may not suffice to represent heterogeneity among the interviewees. This motivated to investigate whether Latent Class model would not be superior in that it relaxes the hypothesis of deterministic clustering that is underlying in a priori segmentation.

4.2. Latent Class estimate

The Latent Class model expresses the probability of choosing alternative *i*, as the product of two probabilities: the probability of belonging to class *c* and the probability of choosing alternative *i* if individual belongs to class *c*. Formally:

$$P(i) = \sum_{c=1}^{C} P(i \mid c).P(c) = \sum_{c=1}^{C} \frac{\exp(\delta_c z)}{\sum_{c=1}^{C} \exp(\delta_c z)} \cdot \frac{\exp(\beta_c X_i)}{\sum_{j=1}^{J} \exp(\beta_c X_j)} \quad (4)$$

where δ_c are the class membership model coefficients, z are the characteristics of the individuals that are relevant for the classification among classes, β_c are the class specific coefficients and X_j are the attributes of alternative j. The Latent Class approach is based on a discrete distribution of the coefficients' vector.

Different Latent Class models have been estimated based on our data. The choice has been to estimate separated models for the each version of the questionnaire. This choice is based on the conjecture that the existence of two different versions of the

questionnaire in one single Latent Class model could bring to serious flaws in the clustering of the population because the version of the questionnaire would already structure the data set.

Table 6: Latent Class estimates (2 classes, one year tax).

Model number			*Model 4*			
Model type			Latent Class			
Sample			One year tax			
n obs (choices)			1200			
rho^2			0.23			
LogLikelihood			-1011.7			
			Class 1		Class 2	
			β	Signif.	β	Signif.
Total cost (euro)		(1 year)	-0.0068		-0.0009	-
		(10 years)	-	-	-	-
Restoration-Conservation		R-Cons25%	-0.0070		-0.0042	
		R-Cons50%	-0.0048		0.0040	
Uses	main	Port	1.13	-	-1.16	-
		Production	1.06	***	-1.43	***
		Shops	1.69	***	-0.76	***
		Offices	0.92	***	0.27	***
		Housing	-1.84	***	0.22	**
		Hotels and rest	-1.81	***	0.92	***
		Marinas	1.90	***	2.04	***
		Parking	-2.17	***	-1.17	***
		Services	-0.88	***	1.07	***
	complem	Port	0.83	-	-1.13	-
		Production	0.31		-0.85	***
		Shops	0.07		-0.15	
		Offices	0.40		0.30	***
		Housing	-1.20	***	0.01	
		Hotels and rest	-1.18	***	0.28	**
		Marinas	1.35	***	0.90	***
		Parking	-0.69	**	0.10	
		Services	0.10		0.53	***
		Status quo	-1.18	***	-0.37	***

Note: Significance: *** at 1% probability, ** at 5%, * at 10%, "-" = Non available.

The general conclusion that emerges from the estimation is that only a few among the estimates were feasible (due to convergence issues) and it was noticeably difficult to obtain estimates for more than two classes. Table 6 presents the results of a Latent Class model (2 classes) estimated on the questionnaire with one year tax. This models include a set of class membership coefficients (personal income; zone of habitation – whether

close to or far from the port, coded as an ordered variable; education; age). This model exhibit a significant coefficient for cost in the first class and for conservation (50%) in the second class. Interestingly, a larger number of coefficients for the use attributes are significant in both classes, compared with the specification without segmentation (model 3), like for instance the coefficient for housing. However, the validity of these results is limited considering that class membership model (not reported here) has no significant coefficient.

This observation may indicate that Latent Class is not the appropriate tool to represent heterogeneity in our observations. This may be due to the assumption about discontinuities of coefficient values that is inherent to the Latent Class approach. This motivated to estimate Mixed Logit models where the distribution of individual coefficients is assumed to be continuous.

4.3. Mixed Logit

Mixed Logit model relaxes the hypothesis of discrete distribution that is inherent to the Latent Class estimation in favour of a continuous distribution of each coefficient. The coefficients β_n, where n refers to the individual, are assumed to be distributed, independently of ε and *X*, with a distribution $f(\beta/\theta)$ where θ are the parameters of the distribution in the population, e.g. the mean and covariance. Such a specification is useful to capture variation in preferences among interviewees. Several distributions can be assumed, typically: normal, lognormal, triangular, uniform, etc. Instead, the error term ε_i is assumed to be independently and identically distributed (iid) Weibull (or Extreme Value type I).

If the researcher could observe β_n, then the choice probability would be a standard logit. That is the probability of choosing alternative *i* for individual *n*, conditional on β_n would be:

$$L_{ni}(\beta_n) = \frac{\exp(\beta_n' X_{ni})}{\sum_{j=1}^{J} \exp(\beta_n' X_{nj})} \tag{5}$$

However, the researcher does not know β_n. The unconditional choice probability is therefore the integral of $L_{ni}(\beta_n)$ over all possible variables of β_n

$$P_{ni} = \int L_{ni}(\beta_n) f(\beta \mid \theta) d\beta . \tag{6}$$

A Mixed Logit probability is the integral of standard logit probabilities over a density of parameters, or, in other terms, a weighted average of the logit formula evaluated at different values of β, with the weights given by the density function $f(\beta/\theta)$.

Tables 7 presents the estimates of a Mixed Logit model. This model assumes a triangular distribution for the cost coefficients. This is conform to the a priori expectation that cost coefficient is bound to be always negative. The conservation coefficients were assumed to be normally distributed, a solution that is usually invoked when there are no contrary evidence.

The results presented on Table 7.b indicate a slight increase in the fitting of the model[6]. One conservation coefficient (25%) is significant at the 10% confidence level. The sign of the coefficient associated with 25% conservation is negative, which indicates an aversion to conservation. The standard deviation of the normal distribution of both conservation coefficients, presented on table 7.a, is significant, which indicates the existence of a relevant dispersion in the "tastes" of the population regarding conservation. Based on the mean and the estimated standard deviation of the coefficient for conservation, one can estimate that 55% (cons 25) and 54% (cons50) of the distribution of the conservation coefficients is negative.

Tables 7: Mixed Logit estimation.

Tables 7.a: Standard deviation of β.

Attribute	*Distribution*	*Standard deviation of β distribution*	*Significance*
(1 year)	Triangular	0.00096	
(10 years)	Triangular	0.00026	
R-Cons25%	Normal	0.0540	***
R-Cons50%	Normal	0.0276	***

[6] The adjusted rho square is 0.195, to be compared with 0.192 for a comparable MNL Model both estimated without panel data structure.

Tables 7.b: Coefficient estimate.

Model number			*Model 5*	
Model type			Mixed Logit	
Sample			Full sample One year +10 years	
n obs (choices)			2400	
rho^2			0.1951	
LogLikelihood			-2111.96	
			β	Signif.
Total cost (euro)		(1 year)	-0.00048	
		(10 years)	-0.00012	
Restoration-Conservation		R-Cons25%	-0.0067	*
		R-Cons50%	-0.0026	
Uses	main	Port	-1.02	-
		Production	-1.19	***
		Shops	-0.48	***
		Offices	0.45	***
		Housing	-0.06	
		Hotels and rest	0.95	***
		Marinas	2.29	***
		Parking	-1.75	***
		Services	0.82	***
	complem	Port	-0.96	-
		Production	-0.64	***
		Shops	-0.10	
		Offices	0.28	**
		Housing	-0.13	
		Hotels and rest	0.06	
		Marinas	1.07	***
		Parking	0.02	
		Services	0.44	***
		Status quo	-0.59	***

Note 1: Significance: *** at 1% probability, ** at 5%, * at 10%, "-" = Non available.
Note 2: Due to algorithm conversion reasons, the model estimation does not take into account the repeated observations nature of the data (panel).

4.4. Model with use interactions

Eventually, we tested the existence of interactions among the different uses. The reason for these other estimates is both to investigate potential complementarities among uses and to check whether the existence of these complementarities may be an alternative potential reason for some limitations of the MNL models. In other words, other than heterogeneity, does the existence of interactions between the uses explain

why cost and conservation coefficients are not significant in the various models that were estimated? Table 9 provides the estimates of uses' interactions coefficients where each use interaction variable is defined as the product of two dummy variables (for instance the attribute representing the mix Port (main) + Shops (complementary) takes the value one when these two uses are proposed in the considered alternative and the value zero for other uses). Each column corresponds to a main use, each line to a secondary use. The mix Shops + Production is chosen as an (arbitrary) baseline for the estimation.

Table 8: Coefficient of the cost and conservation coefficients (model with uses' interaction).

	β	*Critical probability*
1 year tax	-0.00034	0.64
10 years tax	-0.00012	0.09
R-Cons25%	-0.00139	0.62
R-Cons50%	-0.00025	0.85

Table 9: Coefficient of the use mixes (model with uses' interaction).

Main use Compl.	*Port.*		*Prod.*		*Shops*		*Offices*		*Housing*	
Port.	-	-	0.00		-	-	0.81	*	0.29	
Prod.	0.72		-	-	0.96	**	0.71		0.83	*
Shops	0.85	*	0.55		-	-	1.46	***	0.73	
Offices	0.84	*	0.25		1.03	**	-	-	1.65	***
Housing	0.38		-0.03		0.61		1.94	***	-	-
Hotels and rest	-0.04		-0.19		1.36	***	1.73	***	1.26	***
Marinas	0.93	**	1.44	***	1.94	***	2.63	***	2.26	***
Parking	0.47		0.63		0.92	**	1.66	***	1.15	**
Services	0.92	*	0.01		0.91	*	2.31	***	1.45	***
Main use Compl.	*Hotels and rest*		*Marinas*		*Parking*		*Public Services*			
Port.	1.17	**	2.12	***	-1.09		0.92	**		
Prod.	1.24	***	2.40	***	-0.84		1.43	***		
Shops	1.73	***	3.16	***	-0.44		1.67	***		
Offices	1.96	***	3.60	***	0.07		2.22	***		
Housing	2.20	***	2.97	***	0.12		1.71	***		
Hotels and rest	-	-	2.89	***	0.27		1.87	***		
Marinas	2.81	***	-	-	0.93	**	2.49	***		
Parking	1.96	***	3.09	***	-	-	2.69	***		
Services	2.90	***	3.58	***	0.14		-	-		

Note 1: Significance: * at 10%, ** at 5%, *** at 1%.

Note 2: The models are estimated based on a dummy codification for the uses' mix. For instance, the configuration where main use is Productive and secondary use is Port is coded by an attribute that takes value 1 when the proposed alternative has theses uses, and 0 in the other situations. We recall that the mix (main use = shops and complementary use = port) is taken as the (arbitrary) baseline.

The conclusions emerging from Table 8 and Table 9 are twofold. First, they indicate that, when interactions between uses are taken into account, the only coefficient for cost and conservation that is significant is the coefficient for the 10 years taxes, this is slightly more satisfactory than in the base model (model 3), but does not solve all the problems linked with the lack of significance of these coefficients. Second, regarding the interactions between the uses, the main pattern emerging from Table 9 is that the main uses that are significant in the other model estimates are still significant when combined with another use. Marinas still exhibit the highest coefficients, whatever complimentary use is proposed. Hotels and restaurant also rank high. This happens even in circumstances where the complementary use is disliked like, for instance, when Port and Production are proposed as complement to Marinas or Hotels and restaurant. The most appreciated uses' mix is Marinas + Offices, the most disliked mix (with at least 10% significance) is Office + Port. One can also note that some uses are significant only in certain combinations; this is for example for the main use as parking that is significant (at the 10% probability) only with marinas as a complementary use.

5. Conclusions

In this article we have used choice-based Conjoint Analysis to explore the preferences of Trieste inhabitants for the future of the Old Port area. Thanks to a first set of questions, we found that Trieste inhabitants have a knowledge of the Old Port that seems sufficient to consider their preferences as meaningful. Second, when asked about the future of the port, interviewees declare to be in favour of the conservation of existing buildings. They are also in favour of a predominantly pedestrian area, indicating a preference for a "soft" development scheme. They also exhibit clear preferences in favour of the introduction of marinas, hotels and restaurants and public services, and are against port or productive activity. These results, obtained through the use of conventional poll techniques are completed with Conjoint Analysis questions that are more novel in the area of urban studies.

The Conjoint Analysis experiment confirmed preferences of the inhabitants regarding the uses. However, it failed to measure a significant influence of cost and conservation. This observation persisted even when considering segmentations, except for a very limited number of segments (mainly cost for women, conservation for youngest and most educated interviewed). Other modelling techniques, which are more capable of dealing with preferences' heterogeneity, have been implemented on our data set. Latent Class models proved to be relatively inefficient to identify relevant clusters. Mixed Logit provided a better result, where one cost coefficient (10 years taxes) and one conservation coefficient (25 % most valuable heritage) proved significant. This latest model indicated the existence of considerable heterogeneity among the data.

As far as policy implications are concerned, our conclusions are manifolds. First, the strong preference in favour of touristic and leisure oriented uses (marinas, hotel and restaurants) appears very clearly. The reluctance to port and industrial uses is also very strong and is conflicting with the evidence that such uses contribute to the prosperity of the city, and that locations, alternative to the Old Port, are barely available in the Trieste area, except for limited extensions in the easternmost part of the city (New Port). As far as conservation is concerned, the authors can only acknowledge a conflict between the strong support to conservation expressed by the interviewees in the initial section of the

questionnaire (91 % of the interviewees are in favour of conservation, whether 25 % or 50 % of the existing buildings) and the non-significance of the conservation attribute in different estimations based on the Conjoint Analysis data. Our analysis suggests however that the reason for such a result is probably to be searched for in the heterogeneity of inhabitants' preferences. Whether modelling techniques, other than the ones we have implemented, are likely to properly represent how heterogeneity affects preferences for conservation is still an open question. On this point, we hope that other applications of the technique will be available in order to complement our results.

Acknowledgements

The authors gratefully thank numerous colleagues for discussion of early versions of this paper and, in particular, Romeo Danielis, Lucia Rotaris, and the participants to various workshops of the PRUA research program. They also thank Davide Zatti for his patient contribution to the data collection. Research funded by the Italian Ministry of Research PRIN 2005.

References

Boter J., Rouwendal J., Wedel M., (2004), "Employing Travel Costs to Compare the Use Value of Competing Cultural Organizations," *Series Research Memoranda 0011*, Free University Amsterdam, Faculty of Economics Business Administration and Econometrics.

Boxall P., Adamowicz W., (2002), "Understanding heterogeneous preferences in random utility models: a latent class approach", *Environmental and Resource Economics*, 23, 4, pp. 421- 446.

Garrod, G., Willis, K.G., Bjarnadottir, H. and Cockbain, P. (1996) "The Nonpriced Benefits of Renovating Historic Buildings - A Case Study of Newcastle Grainger Town", *Cities*, 13, 6, pp. 423-430.

Garrod G., Willis K. G., (1999), "Northumbria - Castles, Cathedrals and Towns", in: *Valuing Cultural Heritage: Applying Environmental Valuation Techniques to Historical Buildings, Monuments and Artefacts*, edited by Navrud, S. and Ready, R. C., Edward Elgar Publishing Ltd., UK.

Hensher, D. A., Rose, J. M., Greene, W. H., (2005), *Applied Choice analysis : a primer*. Cambridge: Cambridge University Press. 742 + xxiv p.

Kemperman A.D.A.M., Timmermans H.J.P., (2006), "Preferences, benefits, and park visits: A latent class segmentation analysis." *Tourism Analysis*. Vol. 11, 4, , pp. 221-230.

Kemperman A.D.A.M., Ponjé M.M.W., Timmermans H.J.P., (2005), "Analyzing heterogeneity and substitution in trip-making propensity to urban parks: A Mixed Logit model." *Tourism Analysis*, 10, 3, pp. 223-232.

Kim S. S., Wong K. K. F, Cho M., (2007), "Assessing the economic value of a world heritage site and willingness-to-pay determinants: A case of Changdeok Palace", *Tourism management*, 28, pp. 317-322.

Kling, R.W., Revier, C., Sable, K. (2004) "Estimating the public good value of preserving a local historic landmark: the role of non-substitutability and citizen information", *Urban Studies*, 41, 10, pp. 2025-2041.

Marin A., (2003), *Il Porto Vecchio di Trieste da vuoto urbano a risorsa per la città,* mimeo.

Morey E., Rossmann, K. G., (2003), "Using Stated-Preference Questions to Investigate Variations in Willingness to Pay for Preserving Marble Monuments: Classic Heterogeneity, Random Parameters, and Mixture Models". *Journal of Cultural Economics*, 27, 3/4, pp. 215-229.

Pearce D., Mourato S., Navrud S., Ready R. C., (2002), "Review of existing studies, their policy use and future research needs", in: *Valuing cultural heritage, applying environmental valuation techniques to historic buildings, monuments and artefacts*, edited by Navrud, S. and Ready, R. C., Edward Elgar publishing Ltd, UK.

Pollicino, M., Maddison D (2001) 'Valuing the Benefits of Cleaning Lincoln Cathedral', *Journal of Cultural Economics*, 25, 2, pp. 131–148.

Appendix

Questionnaire

The University of Trieste is making a study on the future of Old Port,
(…)

1. First of all, we would like to ask you a few general questions

2. Are you resident in Trieste (city and Province)? Y/N

3. or do you leave (incl. temporarily) in Trieste anyway? Y/N

4. In which commune are you leaving?
(list ...)

5. In which neighbourhood (only for people leaving in Trieste city)?
(list ...)

6. Since how long do you leave in Trieste (years)?

7. Can you describe us, in a few words, where is located the Old Port?
(Based on the description provided, the interviewer classifies the interviewee in one of the three categories)
1 - answer is correct
2 - answer is partly correct
3 - answer is wrong

8. Did you already enter the Old Port?
1 - never
2 - yes, once
3 - yes, more than once

9. In which occasion(s)?.....

10. What would you say is the main use of Old Port today (one single answer)?
(list … 9 uses + unused)

11. We will now ask you a few questions about the future of Old Port. We will specifically ask you to think about various possible use of the Old Port.

12. How would you assess these potential reuses of the Old Port?
Please, give a rate from 1 (not important) to 10 (very important).
(list of 9 uses)

We will now ask you which future use of the Old Port seems the most prioritary to you. In other words, which uses should be implemented first?

13. Rank the following uses by order of priority.
(list of 9 uses)

14. In the prospect of a reuse of Old Port, could you indicate us which of these two possibilities would you prefer?
1 - Make the area prevalently pedestrian
2 - Create streets inside the area

15. In the prospect of reusing Old Port, how much do you think the creation of new roads for connecting Old Port with main road infrastructure is important?
1 - very important
2 - quite important
3 - not very important
4 - not important at all

16. As far as existing buildings of the area are concerned, how far should they be protected?
1 - only buildings with high heritage value (25% of the buildings)
2 - buildings with high and intermediate heritage value (50% of the buildings)
3 - none. The whole area should be reconstructed

CBC section:

In this section, we would like to ask you about your preferences for various scenarios for the future of the Old Port. Three different possibilities for the reuse of Old Port will be presented to you. The first two are defined by a set of attributes. The third one corresponds to the current state of Old Port. We would ask you, each time to indicate what is your preferred alternative.

17. eight choices set are presented to the interviewees.

18. In the choice sets that we have just presented you, do you remember how was proposed to finance the reuse of Old Port (up to 3 answers).
1 - one year tax
2 - 10 year tax
3 - permanent tax
4 - 2 years tax
5 - none among these 4

We now would like to make a few questions about you

19. Education
1 - University degree
2 - Secondary school diploma
3 - Primary school (final)
4 - Primary school (intermediate)
5 - No diploma

20. Are you?
1 - self employed
2 - employee (public sector)
3 - employee (private sector)
4 - Retired
5 - Student
6 - looking for a job

21. What is your profession? …….

22. Can you indicate your age?
1 - from 18 to 24
2 - from 25 to 34
3 - from 35 to 44
4 - from 45 to 54
5 - from 55 to 64
6 - from 65 to 74
7 - over 74

23. In which interval is your income (personal, after taxes, per year, euro)?
0 - non income
1 - < 7.500 euro
2 - from 7.500 to 10.000
3 - from 10.000 to 15.000
4 - from 15.000 to 25.000
5 - from 25.000 to 40.000
6 - from 40.000 to 75.000
7 - > 75.000

(If answer to question 23 is 0)
24. In which interval are the revenues of your household (after taxes, year)?
0 - no income,
1 - < 7.500 euro
2 - from 7.500 to 10.000
3 - from 10.000 to 15.000
4 - from 15.000 to 25.000
5 - from 25.000 to 40.000
6 - from 40.000 to 75.000
7 - > 75.000

(If answer to question 23 is >0)
25. What percentage of the total household revenue does your personal revenue represent?