## The socioeconomic value of the Plaka Bridge in mountainous Epirus

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### Abstract

Apart from legislation, the protection and preservation of cultural heritage is heavily dependent on available funding from both public and private sources. Consequently, the problem of cultural protection becomes more serious during the times of economic crises. It is known that Greece is still in the middle of crippling economic hardship. Thus, it is generally expected that only small amount (if any) of public expenditure will be directed to the protection of cultural heritage. In view of those issues, this paper presents the results of a Contingent Valuation (CV) survey that was conducted in Greece to estimate Greek society' WTP for the restoration of the historical stone Bridge of Plaka. The Bridge was built 150 years ago in a remote mountainous area, in the Epirus Region, and collapsed after heavy rainfall in February 1<sup>st</sup>, 2015. The findings of the study demonstrate the high social and cultural value of the Bridge, which is also reflected in the economic estimates, despite the economic situation. More explicitly, a significant part of the surveyed national sample had visited the Bridge in the past, in spite of its remote location, and said that felt deep grief when it collapsed. Further, the vast majority of the respondents were in favor of restoring the Bridge to its original condition. This was also expressed in the percentage (i.e. 53.3%) of those who were willing to make a donation for the reconstruction of the Bridge. The mean WTP value of the population is approximately 30.0 (median: 17.0), which results in an aggregated economic value of the order of €60 million. The restoration cost, according to preliminary estimates, is much lower and, thus, in cost-benefit terms, the project proves to be socially worthwhile.

**Keywords:** Built Heritage, Mountain regions, Cultural Economics, Contingent Valuation, Bridge of Plaka

#### **1** Introduction

The protection and preservation of cultural heritage, in general, and architectural heritage, in particular, is acknowledged and documented in national, European and international level (UNESCO 1993, 1972, 2000, 2005; ICOMOS 1999, 2000, 2007, 2010). However, legislation alone is not adequate since there is a plethora of cultural heritage goods, world widely, left to decay and destroy. The provision and allocation of financial resources is an equally important problem; the lack of adequate economic resources represents one of the most important (if not the most) reasons that impedes the realization of the protection of cultural heritage. The issue of cultural protection is, thus, even more crucial in a declining economic frame with diminishing public funding.

Resources for the funding of cultural heritage can be public or private. If public, it is necessary to document the public benefit deriving from the protection of cultural heritage, in order for the society to justify the allocation of economic resources for this purpose. If private, funds may derive from individuals or firms willing to donate money. In any case, the need for the deriving public benefit to be documented emerges, given that resources are restricted and several issues regarding their optimum allocation arise.

Protection of cultural goods is generally considered as beneficial for the society. This derives from certain elements and values attached to cultural heritage that are of positive contribution to social welfare (Montenegro et al. 2009; Rizzo and Throsby 2006;Riganti and Nijkamp 2004). Each society evaluates cultural goods according to its own inner value-system. Thus, the cultural value of these goods depends on a variety of social parameters such as beliefs, attitudes, views, etc., as well as on several socioeconomic characteristics such as gender, age, educational level, etc. (Choi et al. 2007; Tuan et al. 2011). Therefore, cultural value is not stable, but is changeable through time. Consequently, the knowledge of how a society values its cultural goods is an essential and necessary tool in policy- and decision making process regarding their management and preservation.

At the bottom line, the basic question that needs to be answered is whether the deriving public benefit from the preservation of cultural goods can socially and economically justify the utilization of economic resources for the goods' preservation. However, the two parts of this equation are being expressed in different quantitative and qualitative dimensions. The preservation cost is expressed in monetary terms, while the preservation benefit in qualitative terms (i.e. historic quality, aesthetic virtues, etc.). As a result, the non-estimation of the economic value of cultural goods may lead to a non-rational allocation of resources and to the decay or destroy of many cultural goods (Mourato and Mazzanti 2002; Tuan and Navrud 2008; Signorello and Cuccia 2002; Saccone and Bertacchini 2011; Giannakopoulou 2012).The bridging of this gap is being accomplished through the application of the methods and the techniques that have been

systematically developed, used and examined in Cultural Economics (Pagiola 1999; Kling et al. 2004).

Among different kinds of built heritage, buildings, monuments, small-scaled constructions, etc. of local importance bear a special interest. In contrast to cultural goods of global importance (usually inscribed on the World Heritage List), local importance monuments cannot attract other than national resources. In addition, such heritage goods located in or near villages, in rural areas, are usually of low priority when it comes to financial support, at national level. Therefore, their preservation depends, mainly, on the resources of local communities.

In view of examining the social and the economic value of local built heritage in a period of severe economic crisis, a CV survey has been conducted in Greece. More explicitly, the survey aims to estimate Greek society' WTP for the restoration of the Bridge of Plaka - an old, historical, stone-bridge built in the 18th century at a rather remote location - which collapsed in February 1<sup>st</sup>, 2015.

The rest of the paper is organized as follows: Section 2 provides background information about the Bridge of Plaka. Section 3 discusses the theoretical and methodological framework of the survey. Section 4 presents and analyzes the results of the survey. Finally, Section 5 summarizes the main conclusions drawn by the research.

### 2The historic Bridge of Plaka in Epirus

The Bridge of Plaka was built in 1866, on Arachthos River (N  $39^{\circ}$  E  $020^{\circ}$ ), at the settlement of Plaka of the Community of Raftaneoi (West Tzoumerka range), in the Perfecture of Ioannina, in Epirus (Fig. 1). The Bridge is situated at a distance of 86.5km from the outfalls of the Arachthos River, at an altitude of 250m. The Bridge formed the connection between the villages of Tzoumerka range and the cities of Arta and Ioannina. It is a one-arched Bridge with an arch-length of 40m. The total length of the Bridge is 70m and its width is 4m at its pedestals and 3.5m at its upper part (Fig. 2).

Between 1881 and 1913, Arachthos River formed the boundary between Greece and Turkey. Thus, in one bank of the river there was a Customhouse, a caravansary and a guardhouse of the Greek army. Since the liberation of Epirus (1912-1913), the Bridge was given to the residents of the area. For the initial construction of the Bridge, a local resident of the Pramanta village, A. Arvanitogiannis, offered, in 1863, the amount of 30,000kuruş<sup>1</sup>. However, the Bridge collapsed and it was rebuilt in 1866. The builder of the Bridge was Kostas Bekas, from Pramanta village. The cost for the construction of the Bridge was 187,000kuruş and it was covered by donations of local residents.

<sup>&</sup>lt;sup>1</sup>Kuruş: is the Turkish name for the coin of that time.

During the World War II, the residents from the mountainous villages of the Tzoumerka range used the Bridge in order to reach the flat areas and the wealthier villages resting in the valley, where they searched for work and food in order to survive. The German army tried to blow up the Bridge but it didn't succeed. The crack was repaired some years later. The area around the Bridge was a war center many times. In a building near the Bridge "The Treaty of Plaka" was signed, in 1944. This building still exists today and it is protected by law as landmark monument.

In 1960, in a place near the Bridge a new, modern bridge was built in order to enable cars' transit. The old Bridge remained as a monument and typical building of local vernacular architecture. On 02/01/2015, the biggest part of the Bridge collapsed after strong rainfall in the area (Fig.3, 4).



Figure 1. The Bridge of Plaka over the Arachthos River (source: google.earth, 2015)



Figure 2. Drawing of the Bridge of Plaka

(source: Report of the NTUA team of experts - http://gefyri-plakas.ntua.gr/prodromi-ekthesi)



**Figure 3.** The Bridge of Plaka (before its collapse) (source: http://www.newsbomb.gr/ellada/news/story/551122/kakokairia-gkremistike-toistoriko-gefyri-tis-plakas-sta-tzoymerka)



**Figure 4.** The Bridge of Plaka (after its collapse) (source: http://www.tanea.gr/news/greece/article/5206885/klimakia-toy-ypoyrgeioy-politismoykai-toy-emp-sto-gefyri-ths-plakas/)

### 3 Theoretical and methodological considerations

### **3.1 Theoretical context**

In Cultural Economics several methods are proposed and used to estimate the economic value of cultural goods. The methods differ in terms of data requirements, complexity, and the types of values considered (e.g. use and non-use). The characteristics of the good under investigation determine the suitability of each method (Adamowicz et al. 1998; Ahmed and Gotoh2006; Alberini and Longo 2006; Apostolakis and Jaffry 2005). One of the most widely used approaches in Cultural Economic is the Contingent Valuation (CV) method (e.g. Kim et al. 2007; Dutta et al. 2007; Tuan and Navrud 2008; Provins et al. 2008; Pagiola 1999; Garrod et al. 1996; Montenegro et al. 2009; Carson et al. 1998; Giannakopoulou et al. 2011; Giannakopoulou and Kaliampakos 2016), because it is able to estimate the total economic value (TEV) of a cultural good, i.e. its use and non-use value.

The CV method is a direct questionnaire approach, which aims at estimating the net change in the income of an individual (or household) that is equivalent to or compensates for the changes in the quantity or quality of public goods (Haab and McConnell 2003). In this survey, the maximum WTP of the respondents represents the amount that makes the respondent indifferent between the status quo (i.e. leaving the collapsed Bridge of Plaka as-is)  $q^0$  with an income y, and the increment (i.e. reconstructing the collapsed monument)  $q^1$  with an income y-WTP, according to the following indirect utility function:

$$V(p, q^{\theta}, y) = V(p, q^{\theta}, y-WTP)$$
 (Eq. 1)

The WTP of respondents for the improved situation is defined by the following expenditure function:

$$WTP = e(p, q^0, U^0) - e(p, q^1, U^0)$$
 (Eq. 2)

where p is a vector of prices for marketed goods,  $q^{1}$  and  $q^{0}$  represent the final (i.e. improved) and the initial (i.e. status quo) level of the cultural good,  $U^{0}$  is the reference utility level given by the indirect utility function  $V(p, q^{0}, y)$  and y is the income. Substituting the indirect utility function in the expenditure function yields the compensating surplus function in which WTP is a function of observable variables:

$$WTP = y - e(p, q^{1}, V(p, q^{0}, y))$$
 (Eq. 3)

Since the expenditures necessary to reach the utility level with the increment are less than income, WTP is positive (Alberini and Kahn, 2006).

### 3.2 Survey design

The survey was carefully designed and pre-tested following related application guidelines (e.g. Arrow et al. 1993; Bateman et al. 2002; Alberini and Kahn 2006; Kanninen 2006). The questionnaire was comprised of three sections. The first section contained eight, open- and close-ended, questions examining the attitudes and the beliefs of the respondents about the Bridge of Plaka. Respondents were asked whether they were aware of the Bridge, if they had visited it in the past and if they generally visit places of cultural interest in their leisure time. They were also asked about the Bridge's collapse, as well as on their opinion about the reasons that led to the collapse of the Bridge.

The second section consisted the core part of the survey. First, the respondents were asked whether they would like the Bridge reconstructed. Then, the questionnaire explored respondents' WTP for the reconstruction of the Bridge, using the following valuation scenario:

"Suppose that a plan for the reconstruction of the Bridge of Plaka is proposed from an independent institution which will be established for this specific aim. The plan will entail all the necessary construction works and other activities in order for the Bridge to be reconstructed in its exact original form. The approval of such a reconstruction plan for the Bridge of Plaka entails a certain economic cost. If the Greek State or any other form of funding resource is unable to cover the total economic cost of the plan, would you be willing to contribute to this independent institution with a lump sum donation of any amount of money?"

The respondents were asked to state whether they were willing to contribute or not and in case of positive answer they were then asked to state the amount of money they would be willing to pay using an open-ended form. Finally, two succeeding questions examined the reasons, either for positive or zero expressed WTP.

The third section asked respondents to provide typical demographic data, i.e. gender, age, family pattern, household size, region of permanent residence, educational level, employment pattern and family income.

The survey was conducted during March and April, 2015, by a research team of the Metsovion Interdisciplinary Research Center of the National Technical University of Athens. The population of reference was the total number of Greek households, i.e. 3,808,950 according to EL.STAT (2011) census data. A preliminary pilot survey took place in order to test the initial questionnaire, during which 30 telephone interviews were conducted, prior to finalizing the questionnaire. The survey was conducted through telephone interviews to Greek residents aged over 18 years old, who were randomly chosen from a database of over 6.5 million records. The response rate was approximately 40% and the resulting sample, which was representative of the population, included 410 observations.

#### **3.3 Econometric analysis**

The estimation of WTP was carried out by means of parametric and non-parametric models. Non-parametric estimation of the amounts was achieved through the Kaplan-Meier product limit estimator (Bateman et al., 2002).

The parametric estimation of WTP values followed the extended spike model proposed by Reiser and Shechter (1999). In this model, the population is considered to be composed of two sub-populations: one sub-population is not willing to pay at all for the good in question, while the other sub-population is willing to pay and has a continuous WTP distribution.

If p denotes the probability that a respondent chosen at random has WTP = 0 and F(x), x>0 indicates the continuous cumulative distribution function (cdf) for the subpopulation that is willing to pay, the cdf for an open-ended response w is:

$$P(WTP < w) = \begin{cases} 0 & w < 0\\ p & w = 0\\ p + (1-p)F(w) & w > 0 \end{cases}$$
(Eq. 4)

For an observed random sample of n respondents,  $\delta_i = 1$ , if the observed WTP of the*i*-th respondent is zero, and greater than 0 otherwise. Hence, the likelihood function can be written as:

$$\prod_{i=1}^{n} p^{\delta_i} [(1-p)f(w_i)]^{1-\delta_i} = \prod_{i=1}^{n} p^{\delta_i} (1-p)^{1-\delta_i} \prod_{w_i > 0} f(w_i) \quad (\text{Eq. 5})$$

where *f* is obtained as the derivative of F and  $\Pi_{wi>0}$  represents the product taken over all individuals with observed WTP>0.

The likelihood function can be separated into two parts, which can then be maximized independently to provide maximum likelihood estimates of the unknown parameters, i.e.  $\Pi_{i=1}^{n} p^{\delta_{i}} (1-p)^{1-\delta_{i}} \quad \text{(Eq. 6)}$ and  $\Pi_{w_{i}>0} f(w_{i}) \quad \text{(Eq. 7)}$ 

Maximizing Eq. 6 results in  $\hat{p} = \frac{\sum \delta_i}{n}$ , which is the percentage of the observed zero answers provided by the respondents. In order to maximize Eq. 7, an appropriate distribution for F should be selected. To model WTP answers and WTP amounts with explanatory variables, a subscript i on p, F (and f) is introduced. In this case, the Eq. 6 can be estimated using a logistic regression model, and the Eq. 7 can be calibrated using a general empirical linear regression model.

#### 4. Survey results

# 4.1 Demographic profile of the sample

About 47% of the respondents were female and 53% were male. As regards age classes, 3.9% of the respondents were between 18-24 years old, 14.7% were between 25-34 years old, 15.7% were between 35-44 years old, 23% were between 45-54 years old, 21.6% were between 55-64 years old, 11.3% were between 65-74 years old and 9.8% were older than 65 years. The majority of the respondents (42%) hold a bachelor or master's degree. Moreover, 28% and 15% have secondary and elementary education, respectively. Also, 8.4% had graduated from a College (2 years studies-program) and 4.2% had graduated from a Technical school. Finally, 2.5% of the respondents stated that they hadn't attended school at all. In reference to their employees and the 19.3% were self-employed. Around 15% of the respondents were unemployed. The remainder were pensioners (29%), housekeepers (10%) and students (2.5%).

#### 4.2 Attitudes and views of the respondents

The vast majority of the respondents (91%) had heard about the collapse of the Bridge. Most of them (55.4%) stated that they were aware of the existence of the Bridge before they heard about its collapse and an important percentage (21.2%), considering that the sample covers the total Greek population, had visited the Bridge in the past. In view of examining the relationship of the respondents with cultural heritage, in general, they were asked whether they visit places of cultural importance (i.e. monuments, sites, traditional villages, etc.) during their leisure time. The majority of them (69.5%) responded positively.

Respondents were, then, asked to describe their feelings when they heard about the collapse of the Bridge. The vast majority (90%) described strong, negative feelings about the collapse. In specific, most of the respondents (59%) felt deep grief and sorrow, 10.3% felt disappointment, 6.1% felt anger and rage, 5.9% felt that something important had been lost, while 5% felt surprised about the collapse of such an important, historical and old monument. Also, 11.1% of the respondents stated that they felt nothing (Fig.5).



Figure 5. Respondents' feelings about the collapse of the Bridge



Figure 6. Differences in feelings about collapse related to previous visit to the Bridge

Respondents who had visited the Bridge in the past expressed, in higher percentages, stronger negative feelings, while those who had never seen the Bridge before, stated in higher percentages that they felt nothing (chi-square=12.811, df=6, p-value=0.046) (Fig.6).

Further, the findings reveal a pattern that coincides with the findings from previous surveys. The knowledge, awareness and familiarity of the respondents with cultural heritage (i.e. monuments, sites, settlements, etc.) influences their attitudes and views thus, they become more sensitive in favor of the protection and preservation of cultural goods. Hence, respondents who were aware of the Bridge, regardless of whether they had visited it or not, stated at higher percentages strong feelings of grief, loss and anger (chi-square=35.615, df=6, p-value=0.000) (Fig.7). Moreover, respondents who stated that they usually visit sites of cultural interest in their leisure time, also stated that they felt grief and sorrow about the collapse of the Bridge (chi-square=68.100, df=14, p-value=0.000). To wit, 71% of the respondents who stated that they usually visit sites of cultural sites the corresponding percentages were 53% and 28%.



Figure 7. Differences in feelings about collapse related to awareness of the Bridge

By the time of the survey, there were only indications about the prevailing conditions that led to the collapse of the Bridge. The survey explored the public's opinion – formed at least in part by the media. To this direction, respondents were asked to state the most important reason responsible for the collapse of the Bridge (Fig.8).



Figure 8. Most important reasons that led to the collapse of the Bridge according to respondents

As it comes out, almost half of the respondents (47.3%) believed that the most important reason is the lack of concern of the Greek State and the competing authorities. Moreover, almost one-third of the respondents (29.5%) blamed extreme weather events (heavy rainfall that flooded the Arachthos River), 13% declared physical reasons ("it was old and deteriorated"), and 4% stated that the Bridge collapsed due to the lack of interest of the Greek society towards the protection and preservation of the specific cultural monument. Finally, 5.5% of the respondents stated unaware or unwilling to answer. The respondents' view about the main reason of the collapse is associated with their education level. Respondents with higher education attribute the Bridge's collapse to the indifference of the Greek State and the lack of preservation works. On the other hand, respondents of lower educational status appear to attribute the collapse to the weather conditions and the physical deterioration of the Bridge (chi-square=16.884, df=9, p-value=0.05) (Fig.9).

The respondents were then asked to state whether they agreed with one of the three following statements:

- a. I am of the opinion that the Bridge of Plaka has to be reconstructed at its exact initial form, even by placing each stone to its original placement, for historical and other reasons.
- b. I am of the opinion that the Bridge of Plaka should not be reconstructed, to remind the indifference of the Greek State and the Greek society.
- c. I am of the opinion that the Bridge of Plaka should not be reconstructed because there other priorities.

In addition, a fourth choice was offered to the respondents, namely "None of the above statements represents my opinion", if they disagreed with the three abovementioned statements.

As it comes out, the vast majority of the respondents (86%) was of the opinion that the Bridge should be reconstructed. A low percentage of respondents (6.6%) stated that there are other priorities and thus the Bridge should not be reconstructed, while an even lower percentage disagreed with the reconstruction of the Bridge in view of exemplification. The answers provided have an additional importance, bearing in mind that the research took place in a period of deep economic crisis in Greece, since it would be justified if an important percentage of the respondents had a different hierarchy regarding social priorities. Thus, the positive attitude in favor of the reconstruction provides strong evidence for the importance of the Bridge of Plaka to the Greek society. Another important outcome is that respondent's opinion on whether the Bridge should be reconstructed or not is statistically independent to her/his relation to the region of Epirus. In spite of the fact that topicality is a typical characteristic of cultural goods, this finding reveals that the reconstruction of the Bridge is an issue of national importance.



Figure 9. Reasons of collapse related to educational status

### 4.3 The economic value of the reconstruction of the Bridge of Plaka

### 4.3.1 WTP for the reconstruction of the Bridge

According to the survey's results, 53.3% of the respondents were willing to contribute to the reconstruction of the Bridge of Plaka, while 46.7% declined to do so. Almost twothirds of the respondents (i.e. 64.1%) who stated positive WTP wished to contribute to the protection and preservation of the national cultural heritage. This, also, underlines the importance of the Bridge as a monument of national importance. Further, 18.9% of the respondents were willing to contribute financially just to know that the Bridge will be inherited to the next generations (bequest value), 4.5% would pay in order for the Bridge to be preserved as part of the local landscape, and 5% would pay because they are somehow related to the area. In very low percentage (i.e. 2.3%) respondents would pay because the Bridge could form a pole of tourism attraction for the region, and, finally, 3.5% stated positive WTP for other reasons, mainly because they considered that Greek State is incapable of providing financial support for the reconstruction of the Bridge. Overall, respondents' WTP derives mainly (90%) from "non-use" motives. Respective results come out from relevant surveys in Greece, in regard to the preservation of cultural heritage (i.e. Giannakopoulou et al. 2011; Giannakopoulou and Kaliampakos 2012, 2016).

The prevailing reason for rejecting the contribution (57.1%) was the inability to financially support the proposed plan due to low income. Furthermore, 12% rejected the plan stating that there are more important priorities to fund and a very low percentage (1.1%) because they considered the plan unrealistic. Overall, "true zeros" sum up to 70%, with the inability to pay due to low income being the most important one. Another 30% of the respondents expressed zero WTP for protest reasons. More specifically, 14.3% said that it is obligation of the State to financially support the reconstruction of the Bridge, 7% were concerned about the proper use of funds, and 3.5% stated a variety of other protest reasons (i.e. "*I already pay much for taxes*", "*Only those with high income should pay*", etc.).

The analysis of zero WTP answers leads to several conclusions regarding the design of the study and the implementation of the CV technique. A first remark is related to the role of economic crisis and its contribution to the estimated economic value of the good. The percentage of denials regarding financial inability in this research is higher compared to previous studies conducted in Greece before or at the beginning of the economic crisis. More explicitly, in surveys conducted from 2008 to 2010, the percentage of "economic zeros" varied between 10% and 25%, while, in 2011, the percentage was over 30% (Greece entered the economic crisis in 2009) (Giannakopoulou 2012). As a result, and despite the fact that almost 85% of the

respondents were in favor of the reconstruction of the Bridge, WTP fell to almost 53%. This finding, combined with several other qualitative (i.e. corresponding results between inability to pay and low income) and quantitative factors (i.e. mean WTP value as a proportion of income), supports the credibility of the survey's results. Furthermore, it is also worth to mention that the percentage of those stating zero WTP because they consider that local residents should pay for the reconstruction of the Bridge is quite low. Related surveys (e.g. Navrud and Ready 2002; Giannakopoulou 2012) have found a stable (and respectively higher) percentage of people who believe that only actual users of cultural goods (e.g. local residents) are responsible to pay for their protection. This opinion is justified on the basis that the locals are the actual users of a good and are those who receive economic benefits from direct or indirect uses (e.g. benefits deriving from tourism development). On the contrary, the results of this survey show that the Bridge of Plaka is considered a monument of non-local importance, and part of the national cultural heritage.

# 4.3.2 Estimation of WTP amounts

According to the Kaplan-Meier estimator the non-parametric mean and median WTP values per household for the positive bids are 31.60 (C.I. 95%: 25.5-37.9) and  $\Huge{1}5.0$ , respectively. Taking into account the percentage of positive WTP bids, the mean and median values for the population are  $\Huge{1}6.7$  and  $\Huge{1}8.0$ , respectively.

Regarding the parametric WTP, in the case studied the positive WTP values followed the lognormal distribution, with:

$$F(z) = \Phi\left(\left(\frac{\log z - \mu}{\sigma}\right) \text{and} \Phi(t) = \int_{-\infty}^{t} \frac{1}{\sqrt{2\pi}} e^{-u^2/2} du \quad \text{(Eq. 8)}$$

Thus, the mean and median WTP values were estimated, according to the following equations, where  $\mu$  and  $\sigma$  were calculated by maximum likelihood estimation (MLE) (Bateman et al. 2002):

$$mean = (1-p)e^{\mu+\sigma^2/2} \text{ (Eq. 9) and } median = \begin{cases} (1-p)e^{\mu}, p < \frac{1}{2} \\ 0, p \ge \frac{1}{2} \end{cases} \text{ (Eq. 10)}$$

Considering the percentage of zero WTP answers (46.7%) and the MLE estimates of  $\mu$  (2.8473) and  $\sigma$  (1.1086), the mean WTP for the population is €17.0 and the median is €0.2, accordingly.

As noted, the Reiser and Shechter (1999) spike model was also used for exploring the determinants of WTP (yes/no) and WTP amounts. In specific, a logit model was used in order to examine the beliefs and demographic characteristics of the respondents that affect the WTP binary question. The results of the analysis are presented in Table 1.

Variables	b	Sig.
Constant	-2.041	0.000
Previous awareness of the Bridge	0.547	0.020
Visiting cultural monuments	0.740	0.040
View on the reconstruction	1.496	0.000
Age	-0.181	0.013
Income	0.390	0.001
-2Log likelihood	439.739	
Nagelkerke R Square	21.9%	

 Table 1. Logit model results

As it comes out from Table 1, the results are consistent with the anticipated signs of coefficients. The most important influencing parameter with regard to the acceptance of donation is the opinion of the respondent about the reconstruction of the Bridge. In specific, a respondent who is in favor of the Bridge's reconstruction is 4.5 times more possible to state positive WTP, in comparison to a respondent who is against the reconstruction, given that all other parameters remain stable. Likewise, the possibility of a positive WTP is mainly affected by whether the respondent visits cultural monuments in general, whether he/she knew about the Bridge before its collapse and by the total family income of the respondent. WTP for the reconstruction is negatively affected by the respondent's age, in other words older people appear less willing to contribute compared to younger ones.

In order to model WTP amounts with explanatory variables, a bid function was used based on a lognormal empirical regression model:

$$ln(WTP) = f(x_i, \beta, \sigma, \varepsilon_i)$$

where  $x_i$  is a vector of the selected explanatory variables of respondent *i*,  $\beta$  is the estimated coefficient of corresponding explanatory variables,  $\sigma$  is a variance parameter, and  $\varepsilon_i$  is a random error component with mean zero.

The results of the analysis are presented in Table 2.

Variables	b	Sig.
Constant	1.932	0.000
Previous visit	0.601	0.005
Cultural Heritage	-0.476	0.014
Family members aged under 18 years	0.164	0.014
Income	0.233	0.002
N	122	
$Adj.R^2$	20.3%	

**Table 2**.Bid function analysis

According to the results of the model, the variables that increase respondents' WTP value are, as follows:

- The previous visits to the Bridge of Plaka prior to its collapse. Those who had previously visited the Bridge are willing to offer higher donations.
- The number of the underage children. Families with underage children are willing to pay more money, for the Bridge to be preserved. This outcome appears to reflect mainly bequest values.
- The household income. Consistent with the economic theory, respondents with higher income are willing to pay more for supporting the reconstruction of the Bridge.

Using the results of the logit and the semi-log models the mean and median WTP values are determined at 14.2 and 8.9, respectively.

The value of aggregated WTP value for the reconstruction of the Bridge is estimated by multiplying the population mean WTP and the total number of Greek households (i.e. 3,808,950). The aggregated estimates deriving from the three different approaches are presented in Table 3.

Statistical Analysis	Mean WTP value per	Total value (€)	
	household (€)		
Non-parametric estimation	16.7 €	63,609,000 €	
Parametric estimation	15.9 €	60,704,000 €	
(without explanatory variables)			
Parametric estimation	14.2 €	54,107,000 €	
(with explanatory variables)			

**Table 3.** Total Economic Value in each statistical approach

The social value of the proposed reconstruction plan, estimated in monetary units, is approximately 60,000,000. This value is much higher than the pre-estimated reconstruction cost of the Bridge of Plaka and, thus, the proposed plan is justified in economic terms.

#### 5. Conclusion

The collapse of the Bridge of Plaka was an event that shocked the vast majority of the Greek society. The Bridge was a well-known monument, of over-local importance, before its collapse, a fact witnessed by its relatively high visitation rate and its recognition among the respondents. This, in comparison to the general relation between society and cultural heritage, explains the significant percentage of those voting for the reconstruction of the Bridge (over 85%) in spite of the fact that Greece is in the middle of a severe economic crisis. The percentage of those who are willing to contribute to the reconstruction of the Bridge (i.e. 53.3%) appears to be also higher than those found in similar surveys carried out in Greece during the past years. The difference between the willingness to restore the Bridge to its approximate original condition and the willingness to donate for that purpose reveals the drastic effect of the economic crisis, i.e. almost a quarter of the respondents stated that they would like to contribute but they are unable to do so, because they lack of money. This verifies the fact that CV surveys are depended and affected by the economic, social and political environment at the time of the study.

The population mean WTP value is approximately 30.0 (median: 17.0). This estimation is deemed conservative considering the valuation context and the payment vehicle used (i.e. WTP instead of WTA question, lump sum voluntary contribution, etc.), the qualitative and quantitative outcomes of the survey (i.e. well-informed respondents, compatibility between expressed WTP and income, etc.), and the treatment of the data (i.e. "protest zeros" regarded as "true" zero bids, exception of outliers, etc.). The total economic value of the plan is of the order of 60 million. It would be a safe assumption to expect a higher value under different socioeconomic conditions. But this is, after all, the main aim of these surveys, i.e. the estimation of the economic value of a non-market good under the specific socioeconomic conditions, in which decisions take place. Overall, the required cost for the reconstruction of the Bridge, according to preliminary estimates, is much lower than the estimated benefit. Hence, in cost-benefit terms, the reconstruction of the Bridge of Plaka proves to be socially justified.

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