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Valuing the Cultural Monuments of Armenia: Bayesian Updating of Prior Beliefs in Contingent Valuation

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**Valuing the Cultural Monuments of
Armenia: Bayesian Updating of
Prior Beliefs in Contingent
Valuation**

Anna Alberini and Alberto Longo

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SIEV – Sustainability Indicators and Environmental
Valuation

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Valuing the Cultural Monuments of Armenia: Bayesian Updating of Prior Beliefs in Contingent Valuation

Summary

We use contingent valuation to place a value on the conservation of built cultural heritage sites in Armenia. When we present the hypothetical scenario in the questionnaire we spell out what would happen to the monuments in the absence of the government conservation program. We posit that respondents combine such information with their own prior beliefs, which the questionnaire also elicits, and that the WTP for the good or program is likely to be affected by these updated beliefs. We propose a Bayesian updating model of prior beliefs, and empirically implement it using the data from our survey. We find that uncertainty about what would happen to the monument in the absence of the program results in lower WTP amounts.

Keywords: Valuation of Cultural Heritage Sites, Non-Market Valuation, Contingent Valuation, Bayesian Updating, Prior Beliefs

JEL Classification: Z10

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Valuing the Cultural Monuments of Armenia: Bayesian Updating of Prior Beliefs in Contingent Valuation

By

Anna Alberini and Alberto Longo

I. Introduction and Motivation

The Republic of Armenia is renowned for its distinctive historic buildings—including churches, monasteries, fortresses and caravanserai—many of which date back to the middle ages. These buildings are an essential part of the cultural heritage of the Armenian people and make a great impression on tourists and visitors.

Concerns over the limited resources available for restoring and conserving these cultural heritage sites—especially since the country’s independence from the former Soviet Union—and its tendency to experience severe earthquakes have recently prompted international organizations to take an interest in Armenia’s monuments. At this time, three Armenian monasteries, one church and one archeological site are on the World Heritage Sites list, and UNESCO considers 30% of Armenia’s cultural heritage sites at risk. Since resources are limited, it is important that the benefits of monument conservation programs be monetized and compared with their costs.

In Spring 2004, we conducted a contingent valuation survey to elicit the willingness to pay (WTP) of Armenian households for preserving cultural heritage monuments in their country.¹ Contingent valuation is a method of placing a value on an environmental or other public good. The approach relies on asking individuals how much they would pay for a hypothetical public program that maintains or improves cultural heritage site (or environmental) quality. Contingent Valuation (CV) has been extensively

¹ See Alberini and Longo (2006) for a travel cost method study of cultural monument visitation in Armenia.

used in valuing cultural heritage.² One reason for its appeal is that it is the only non-market valuation technique capable of measuring non-use values, i.e., the value placed on monument conservation by people who do not currently visit monuments and may or may not plan to visit monuments in the future (see Freeman, 2003). Another advantage of contingent valuation is that it accommodates for conservation levels or initiatives that do not currently exist.

The purpose of this paper is two-fold. First, we wish to elicit the WTP for monument conservation, which can be used to estimate the benefits of conservation programs, and assist government efforts to prioritize conservation interventions. We are aware of only one previous non-market valuation study that monetizes the benefits of conservation of cultural heritage sites in a transition country (Mourato et al., 2002).

Second, we investigate the role of respondents' prior beliefs on the fate of a public good or environmental quality in the absence of the hypothetical public program described in the contingent scenario. We examine explicitly how people revised their prior beliefs after the provision of information in the course of the interview. In addition, we assume that individuals are driven by a Bayesian updating mechanism and estimate WTP regression models that include variables capturing respondent prior beliefs about

² See Navrud and Ready, 2002, and the 2003 special issue of the *Journal of Cultural Economics* on valuing cultural monuments. For example, CV has been used to value heritage improvements at holiday destinations (Signorello and Cuccia, 2002; Whitehead and Finney, 2003), visits and preservation of archaeological sites (Beltrán and Rojas, 1996; EFTEC, 1999; Santagata and Signorello, 2000, 2002; Riganti and Willis, 2002), congestion and traffic scheme improvements at cultural monuments sites (Brown and Mourato, 2002; Maddison and Mourato, 2002; Scarpa et al, 1997; Willis, 1994), conservation of museums collections (Brown, 2004), preservation of historic buildings (Chambers et al, 1998; Garrod et al, 1996; Del Saz Salazaar and Marques, 2005; Grosclaude and Soguel, 1994; Kling et al, 2004; Pollicino and Maddison, 2004; Powe and Willis, 1996), preservation of religious buildings (Mourato et al, 2002; Pollicino and Maddison, 2002; Navrud and Strand, 2002), arts festivals (Snowball, 2005). Noonan (2003) and EFTEC (2005) summarize the empirical literature on contingent valuation of cultural monuments. Throsby (2003) argues against the use of contingent valuation, which, he feels, provides an incomplete view of the non-market value of cultural goods. Finally, Epstein (2003) considers that cultural amenities are the kinds of things that government hopes to create or preserve, often with tax dollars, for which valuation "has to be done by non-market means if it is to be done at all."

the state of conservation of the monument. The regression results are broadly consistent with a Bayesian updating mechanism.

As noted in Bateman et al., 2002, p. 121, in general, constructing the scenario is one of the most delicate aspects of the development of a CV survey questionnaire. CV practitioners are usually advised to strike a balance between information overload (which would happen when the scenario and its attributes are presented in great detail) and vagueness, “both of which are desirable.”³ Tkac (1998) emphasizes the importance of prior respondent beliefs on the effect of providing information about environmental quality and the hypothetical programs. He found that prior knowledge was positively associated with willingness to pay, but that prior knowledge also offset the effect of new information treatments (the information treatment had no effect on the valuations of respondents with greater prior information, but was positively associated with willingness to pay among respondents with less prior information).⁴

Bayesian updating mechanisms have been previously used to study people’s perceptions about own mortality and morbidity risks (e.g., Viscusi, 1985, 1989, 1992; Viscusi and O’Connor, 1984; Brower et al., 2001), the effect of such perceptions on WTP for reductions in these risks (e.g., Bhattacharya et al., 2007) and on behaviors that would reduce such risks (Bishai et al., 2004). Cameron (2005) and Lee (2002) examine how

³ An excessively detailed scenario would not hold the respondent’s attention, and/or could be rejected by the respondent on the grounds that the specifics do not apply to him. An excessively vague scenario may be dismissed by the respondent as lacking realism and credibility, and/or because the respondent feels that it does not apply to him.

⁴ Ajzen et al. (1996) argue that the effect of information depends on the degree of respondent involvement with the good being valued. They found that if the good was highly relevant to the respondents, the latter were not sensitive to irrelevant cues such as priming procedures. In conditions of high personal relevance, willingness to pay increased depending on the quality of the cognitive arguments. In cases of low personal relevance, affective priming cues had a greater effect on WTP than did cognitive arguments.

subjective perceptions of climate change risks influence the WTP for greenhouse gas mitigation.

In contrast with the area of climate change, ecological systems or mortality risks, where both laymen's and scientists' beliefs are complex and riddled with much uncertainty, we would expect the Armenians to have relatively well-educated expectations about the fate of monuments in Armenia unless conservation efforts are stepped up. This suggests that individuals are likely to combine their prior information with information provided in the survey, as is assumed by a Bayesian updating mechanism, and that extreme or alarmist responses are unlikely.

The results of our survey suggest that our respondents *are* willing to pay for a hypothetical conservation program, whether or not they currently visit cultural heritage sites and expect to visit any in the future. Willingness to pay is higher among the "users" of monuments (i.e., visitors), but even those who have not visited any monuments in the last year would pay for the conservation of cultural heritage sites.

Comparison of initial beliefs about the future of cultural heritage sites and the expectation of what would happen to them if the program described in the survey were not implemented, suggests that many people that were originally neutral, optimistic or simply agnostic revised their views towards expecting that the monuments would deteriorate. This is broadly consistent with a Bayesian updating model. We find that WTP is *lower* among those that were initially most uncertain about what would happen to the monuments of Armenia unless conservation was stepped up.

The remainder of this document is organized as follows. Section II describes our survey questionnaire, the sampling frame and the administration of the survey. Section III

shows the descriptive statistics of our sample, including the answers to the WTP questions and the respondent perception about the fate of the monuments *before* and *after* we provide the information on the hypothetical program. Section IV presents a formal model of WTP that incorporates Bayesian updating of prior beliefs about the fate of the monument and the associated likelihood function. WTP regressions are presented in Section V. Section VI concludes.

II. The Survey

Our survey questionnaire was administered in-person to a sample of the Armenian population. The sample was stratified geographically and with respect to urban v. rural areas and is comprised of N=1000 completed questionnaires.⁵ The interview begins by showing respondents a map (available from the authors) and a list of the principal built cultural heritage sites in Armenia, and asks them which they have visited over the last 12 months and whether they plan to visit any over the next year.

We then ask respondents to focus on *all* cultural heritage sites in Armenia and query them about their perceptions of their current and future state of conservation. Do they expect the state of conservation of the monuments of Armenia to stay the same, improve, or get worse over the next ten years? We focused on a horizon of 10 years

⁵ The survey took place on August 21-September 5, 2004. The questionnaire was administered in person at the respondent's home. Our target population was Armenian nationals living in Armenia. We wished to have a sample that mirrored the distribution of the population over urban and rural areas (66% and 34% of the population, respectively). Accordingly, we sampled 700 households in four major cities, the capital Yerevan (350), Gyumri (200), Kapan (100), Goris (50), and the remaining 300 households in 10 villages, one in each selected marz (region). (Most of cultural monuments of Armenia are located in rural areas, not in the major cities.) To select the households slated for participation in the survey, we began with obtaining a comprehensive list of households, complete with full addresses. We then did systematic sampling with a random starting point. The enumerators were instructed to choose a person at random among those of ages 18 and older at home at the time of the interview, and to ensure a roughly even number of men and women in the final sample. All interviews took place between 11:00am and 8:00pm.

because early development work suggested that respondents were relatively comfortable with this time frame.

We then present information about the *actual* condition of the monuments, which leads into the hypothetical contingent valuation scenario. Respondents are told that a recent study by the government of Armenia has determined that the state of conservation of many monuments is poor and getting worse over time: Out of 33,000 monuments on the government's registry of cultural heritage sites, about 30% are at risk of collapse, and others are deteriorating fast, due to a combination of climate and seismic factors, plus insufficient maintenance and upkeep.

In the absence of any conservation efforts, within the next decade one should expect 9000 monuments to suffer from serious damage to the point that they would be no longer recognizable, 12000 to become at high risk of collapsing, and the remaining 12000 to suffer from significant deterioration. If prioritized conservation interventions were undertaken, the respondent is told, many of the monuments currently classified as high risk would be saved from collapse. Continuous monitoring would reduce the damage to the other monuments.

At this point, we inquire about the respondent's degree of concern about these problems affecting cultural monuments, and then describe a hypothetical government program that would assess the condition of the monuments, implement conservation measures, and establish sustainable conservation programs. In addition to ensuring the physical survival of the building, the program would also enable visitors to enjoy their visits to the site more by improving infrastructure at selected sites, providing interpretive

materials on site, and establishing museums, where appropriate. Awareness programs would also be initiated.

We obtain information about the individual's WTP for the program by means of a referendum question. We explain the mechanics of the referendum by telling the respondent that if there were a majority of votes in favor of the proposed program, the program would be established, and everyone would have to pay the stated amount; if the majority of the votes were against, the proposal would be abandoned, and no tax would be imposed.⁶

In describing the funding mechanism, we explained that the program would be funded through the revenue from admission fees, which would be charged only to foreign tourists, and through donations from international organizations.⁷ Because these sources of funding would not be sufficient, Armenians would have to contribute to the financing of the program by paying a one-time additional tax. In the early survey development work, we worried that people might fear that the monies would be misspent, so we further explain that the money would be placed in an interest-bearing account, and would be specifically earmarked for this program. It would not be spent on anything else.

⁶ The one-on-one survey development work, our local collaborators and the political events of the time suggested that most people understood the concept of referendum (despite decades of Soviet rule) and were comfortable with it, but they were also nervous about the possible lack of transparency when spending public monies. This is the reason for including additional language explaining the mechanics of the referendum and reassuring respondents that the money would not be misspent. For comparison, Wang et al. (2004) ask Armenians to consider a government plan that would maintain water levels at Lake Sevan, and hence ecological systems, commercial fisheries and quality of recreational use at a specified cost to the respondent household. They then ask respondents "how likely" they would be to vote for such a plan if "there was a cost" to their household, and proceed to showing respondents several possible payment amounts on a card (Wang et al., 2004, p. 39). Bluffstone and DeShazo (2003) ask respondents in Lithuania—another former Soviet republic—how much more they would pay, above and beyond their monthly current waste disposal fee, for landfills that meet new and stricter construction standards and for proper closure of old landfills. An increase in the sewage fee is the vehicle used in Ready et al. (2003) to inquire about the WTP for improved wastewater treatment in Latvia, which would improve water quality in the Gauja River.

⁷ Until very recently, UNESCO has indeed contributed to monument conservation in Armenia. In 2001, UNESCO provided funding for projects for a total of about \$1.5 million.

As mentioned, the payment questions are framed as the respondent's vote in a referendum. To refine information about WTP, we use the dichotomous choice approach with one dichotomous choice follow-up question. After the payment questions, we probe respondents about the reasons why they answered the way they did. People who answered that they would vote against the program both at the initial and follow-up tax amount were asked at what tax they would turn their vote to "in favor."

The questionnaire ends with questions about cultural interests and attitudes towards cultural heritage, sociodemographic, and debriefing questions about the respondent's assumptions of what would happen to the Armenian monuments in the absence of conservation initiatives.

Version	Initial amount	if yes	if no
I	1000	2000	500
II	2000	3500	1000
III	3500	6000	2000
IV	6000	10,000	3500
V	10,000	15,000	6000

All respondents received the same questionnaire, except for the tax amounts in the referendum payment questions. People were randomly assigned to one of five possible sets of tax amounts, as shown in table 1.

III. The Data

A. Individual Characteristics of the Respondents

Descriptive statistics of our sample (n=1000) are displayed in tables 2 and 3.

⁸ At the time of the survey, the average exchange rate was 515 AMD to the US dollar.

	Percent of sample
Male	47.0
Was born in Armenia	90.1
Has a college degree or better	33.8
Is married	69.3
Is not gainfully employed (homemakers, students, retired persons, unemployed, invalid)	41.0

variable	Mean	std. deviation	minimum	maximum
age (years)	43.91	15.05	18	75
annual household income (thousand dollars)	2.36	2.23	0.6	24
household size	4.46	1.78	1	12
number of children under 18	1.15	1.18	0	7

The sample is balanced with respect to gender, since there is only a slight prevalence of women (53%, versus 47% of men), and highly educated, as almost 34% of the respondents have a university degree or have completed their doctoral studies. The majority of our study participants are married (69%), and 41% of them are not gainfully employed, a broad category that includes homemakers, students, retired persons, the unemployed, and the disabled. The average age in our sample is almost 44 years, but our enumerators were able to interview even individuals in their mid-seventies. The average household is comprised of 4.6 persons, 1.15 of whom are children under the age of 18.

The average household has an annual income of \$2,363. We were curious to see if household income varies across cities, and indeed it does, but not in a statistically significant manner. The average household income is \$2,670 in Goris, \$2,370 in Gyumri, \$2,100 in Kapan, \$3,100 in Yerevan and \$1,600 in the villages where we conducted the survey.

The descriptive statistics for our sample can be compared with official statistics (2001 Republic of Armenian Population Census), which indicate that (i) women account for 51.8% of Armenian population, (ii) 62.1% of the population is married, and (iii) the average age is 38. Of the population aged 15 and older, 17% of the population has higher and high (post-graduate and scientific degree) education.

The average household size in Armenia is 4.1 persons, and about 65 percent of the population is considered economically active, but 35.9% of the labor force is unemployed. ARMSTAT (2003) reports an average annual income of 1,045 US\$ per household for the population of Armenia in year 2001. We expect this figure to have risen considerably since: the Gross Domestic Product of Armenia grew 12% per annum in the 2001-2003 period.

B. Use of Monuments and Subjective Assessment of their Condition

In the previous 12 months, 51.1% of our respondents had visited one or more cultural heritage sites. Fifteen percent of the sample reported having visited cultural heritage sites once, and 35% more than once. When we asked our respondents to judge the overall state of conservation of *all* cultural heritage sites in Armenia, the majority of them (77.6%) selected response categories implying a very poor to fair state of conservation.

We also asked respondents to tell us what they thought would happen to the monuments of Armenia over the next decade (the time horizon used when describing the hypothetical restoration program) *before* we provided information about monument conditions and the program. Twenty-three percent of the sample thought that they would

stay as they are now, 26.2% thought that their state of conservation would improve, and 30.9% thought that it would get worse. The remainder of the sample (19.4%) simply did not know what to answer.

At the end of the questionnaire, we asked respondents what they thought would happen if the program were not implemented. The distribution of the responses to this question is reported in table 4.

1 Nothing, they would remain in the same condition as today	16.4%
2 There would be a moderate degree of decay	43.4%
3 There would be extensive decay /many monuments would be lost	34.3%
9 Don't know	5.9%

* elicited at the end of the interview.

Table 5 displays the cross-tabulation of the responses to question Q15—the respondent perception about the fate of monuments over the next 10 years *before* we provided information about monument conditions and the program—against the responses to question Q39, which asks them—at the end of the interview—what they would have expected to happen to the cultural heritage sites in the absence of the program. The table suggests that many people that early in the survey were neutral or optimistic about the future of monuments revised their views towards more pessimistic expectations.

For example, of the people that initially thought that in the next decade monuments would stay in the same condition as now, only 40% remained true to this belief. About 54% revised their expectations in favor of moderate or extensive decay, and the remainder said that they did not know what would happen. Likewise, only 15% of

the people who initially felt monuments would improve said at the end of the survey that they expected the monument condition to improve in the absence of the program. Virtually everyone else revised their views towards expecting that the monuments would deteriorate. Those who initially said that the monuments would fare worse in the future are faithful to this view.

Table 5. Crosstabulation of Q15 (perception of future condition of monuments before respondents were told about current state of conservation and about the program) and Q39 (what would happen in the absence of the program).						
		Q39: What did you think would happen to the cultural monuments of Armenia if the conservation program is not put into effect?				Total
		1=nothing. They would remain in the same condition as today.	2=there would be a moderate amount of decay	3=there would be extensive decay	9=don't know	
Q15: would you expect the state of conservation to...	1=stay the same	94	98	30	13	235
	2=improve	39	107	111	5	262
	3=get worse	10	134	155	10	309
	9=don't know	21	95	47	31	194
Total		164	434	343	59	1000

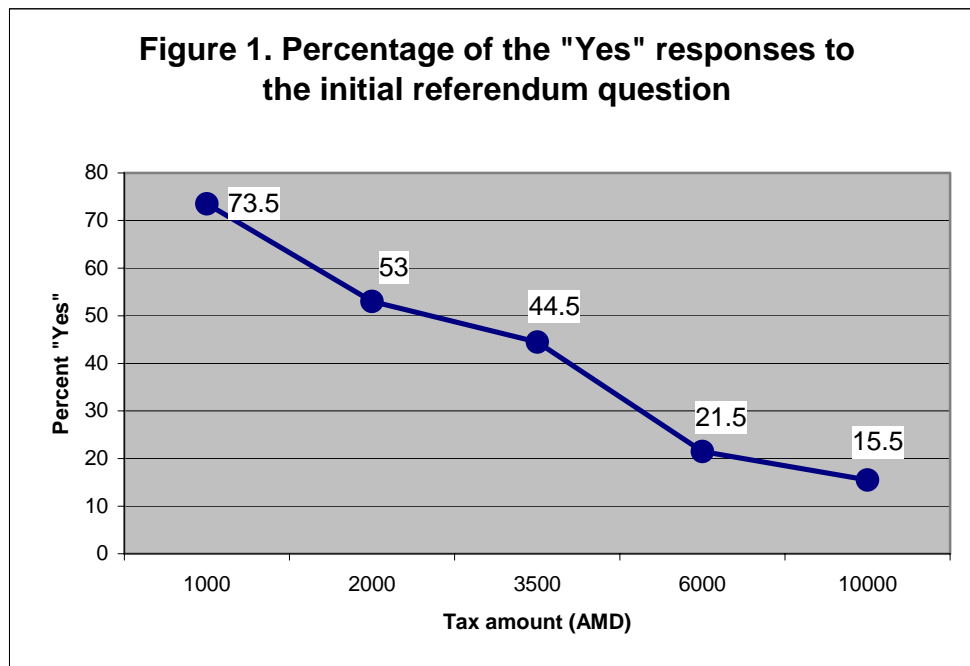
It would seem that the presentation of information about the future of monuments and the hypothetical program had a relatively strong impact on people who were initially unsure about what would happen to the monuments. Of these, 16% remained unsure at the end of the survey, 11% thought that the monuments would improve in the absence of any action, and 73% in the end believed that would deteriorate. (Interestingly, as we shall see in section V, those who did not know what would happen to the monuments report lower WTP values than others.)

Less highly educated people are slightly more likely to express their uncertainty about the future of the monument (before the provision of information and the scenario)

or their expectation that they will remain in the same conditions as they are in, and are less likely to report that they expect the condition of the monument to improve or get worse. These findings are consistent with respondents' initial beliefs being updated by our provision of information in the questionnaire via a Bayesian mechanism (see section V).

C. Responses to the WTP questions

As shown in Figure 1, the percentage of the "yes" responses to the initial referendum question declines monotonically with the tax amount, as predicted by economic theory. The tax amounts we chose for this survey cover the range of WTP values nicely: At the lowest tax amount, 1000 AMD, 73% of the sample is in favor of the program. At the largest tax amount, only about 15% of the sample would be willing to pay the tax to obtain the program. Overall, about 41% of the respondents stated they would be willing to pay the bid amount. Median WTP lies between 2000 and 3500 AMD.



When we combine the responses to the initial and follow-up referendum questions, we get a prevalence of “no”-“no” (NN) and “yes”-“yes” (YY) response patterns, which account for 44.5% and 25.3% of all answers. YN and NY account for 16.3% and 13.9% of the sample, respectively.

Further inspection of the data reveals that of the 445 people that voted against the program in both the initial and follow-up referendum questions, 217 would vote in favor of the program if the tax was lower, 84 would be in favor of the program if it did not impose a tax on their household, and 115 would always oppose the program, regardless of the tax amount.

Those respondents who declined to pay in both the initial and the follow-up referendum question were asked to explain the reasons for their refusal. This question allowed for multiple response categories, but the ones that were selected most frequently by our respondents were “I cannot afford this payment” (64%), “I do not trust the government to do a competent job” (29.2%), “I do not trust the government because it is corrupt” (29.9%), and “other entities should pay for the program” (22.0%). Some respondents voiced concern about other people’s ability to pay, especially among the residents of Yerevan (17.5% versus 12.4% of the sample as a whole), and others stated that the benefits of the program are not worth the cost (13.9%).

Those people who voted in favor of the program in at least one of the two referendum questions (YY, YN and NY) were motivated by bequest motives (“save the monuments for future generations,” 72.8%), option motives (“I might become interested in visiting these monuments in the future,” 22%), altruistic considerations (“for other people to visit,” 41.1%), and pure existence (“conserve these monuments in their own

right,” 54.4%). About 36% of these individuals were also motivated by the fact that the program might stimulate economic growth. Twenty-one percent stated that they would enjoy their visits more or visit more often thanks to the program. We did not detect significant differences between men and women.

We also inquired about the perceived beneficiaries of the program. Results are displayed in table 6. While it is not surprising that over a third of the respondents considers visitors to be among the beneficiaries of the program, that only 61% includes the Armenians among the beneficiaries of the program seems at odds with the obvious interest for and care about conservation demonstrated in other parts of the interview. We were also struck by the share of the sample that includes “special interests” (e.g., large corporations, the tourism industry) among the beneficiaries of the program.

1 All Armenians residing in Armenia	60.8%
2 Domestic tourists	36.7%
3 Foreign tourists	42.6%
4 The people that live near cultural monuments	35.0%
5 Tour operators, hotel and shop owners near the monuments	50.6%
6 Large corporations	14.4%
7 The State	55.7%
8 Other: The Church	2.4%
9 Don't know	1.8%
10 Other: The corrupt govt /Organizations that will be involved	2.6%
11 Other: The whole Armenian nation/culture /future generations	7.1%

* Percentages do not sum to 100 because multiple response options were possible.

IV. A Model of Willingness to Pay

A. A Model of Bayesian Updating and Willingness to Pay

Willingness to pay, WTP , is defined as the maximum amount of money that can be taken away from an individual at the higher level of monument protection to keep his utility unchanged. Let $V(y, p)$ denote the individual's indirect utility, which depends on income and p , the percentage of monuments at risk. Formally,

$$(1) \quad V(y - WTP, p_1) = V(y, p_0),$$

where y is income, p_0 is the proportion of monuments at risk if no intervention is undertaken, and p_1 is the proportion if the government program is implemented. Willingness to pay should thus depend on p_0 , p_1 , income and other individual characteristics. Formally, conditionally on individual characteristics \mathbf{x} ,

$$(2) \quad WTP = WTP(p_0, p_1, y | \mathbf{x}).$$

We further assume that individuals form their own estimate of the pre-policy proportion of monument at risk, p_{oi}^* , subjectively by combining their prior beliefs, which we denote as π_i , with the proportion presented to them in the questionnaire (p_0) through a Bayesian updating mechanism:

$$(3) \quad p_{oi}^* = \frac{\alpha\pi_i + \theta p_0}{\alpha + \theta},$$

where α and θ denote the weights placed on the prior and questionnaire information, respectively.

We combine (2) and (3), and assume the following functional form for WTP :

$$(4) \quad WTP_i = \exp(\mathbf{x}_i \boldsymbol{\beta}_1) \cdot (p_{oi}^*)^{\beta_2} \cdot \exp(\mathbf{USE}_i \boldsymbol{\beta}_3) \cdot \exp(\mathbf{z}_i \boldsymbol{\beta}_4) \cdot \exp(\varepsilon_i)$$

where \mathbf{x} is a $1 \times k$ vector of individual characteristics (including income), \mathbf{USE} is a vector of variables capturing recent and planned visitation patterns, and \mathbf{z} is a vector of attitudes

and beliefs about monuments and about the beneficiaries of proposed conservation measures. The β s are unknown regression coefficients and ε is an error term.

We do not observe π_i and p_{0i}^* —and at any rate in this survey p_0 is not varied to the respondents—so for estimation purposes we proxy them with a vector of variables, C_i , capturing what the respondents thought would happen to cultural monuments in the absence of the program and perceptions of their current state of conservation. In sum, we estimate the WTP equation

$$(5) \quad WTP_i = \exp(\mathbf{x}_i \boldsymbol{\beta}_1) \cdot \exp(C_i \boldsymbol{\gamma}) \cdot \exp(\mathbf{USE}_i \boldsymbol{\beta}_3) \cdot \exp(\mathbf{z}_i \boldsymbol{\beta}_4) \cdot \exp(\varepsilon_i),$$

which, on taking logs, becomes

$$(6) \quad \log WTP_i = \mathbf{x}_i \boldsymbol{\beta}_1 + C_i \boldsymbol{\gamma} + \mathbf{USE}_i \boldsymbol{\beta}_3 + \mathbf{z}_i \boldsymbol{\beta}_4 + \varepsilon_i.$$

B. Statistical Model

We combine the responses to the initial and follow-up referendum payment question to form intervals around the respondent's (unobserved) WTP amount. To illustrate, consider a respondent who was assigned to version 2 of the questionnaire, and said he was willing to pay 2000 AMD. In the follow-up question, he is queried about his vote if the tax were 3500 AMD, and his vote is “against.” We infer from this sequence of responses that his WTP lies between 2000 and 3500 AMD.

Some of our “no-no” (NN) respondents volunteered an exact tax amount for which they would be in favor of the program. We interpret this tax as their exact WTP amount. Other NN respondents were at a loss for an exact tax figure at which they would

vote in favor of the program, so we simply conclude that their WTP must lie between zero and the lower of the two tax amounts they were queried about in the survey.⁹

In sum, we fit a mixed interval-data/continuous-data model of WTP, assuming that WTP follows a two-parameter Weibull distribution with scale σ and shape θ . The cdf

of this variable is $F(WTP) = 1 - \exp\left(-\left(\frac{WTP}{\sigma}\right)^\theta\right)$, its mean is $\sigma \cdot \Gamma(1/\theta + 1)$, where $\Gamma(\bullet)$

is the gamma function, and its median is $\sigma \cdot [-\ln(0.5)]^{1/\theta}$.

The log likelihood function is thus:

$$(7) \quad \sum_{i \in \mathfrak{S}_{YY,YN,NY,NN}} \log[F(WTP_{Hi}; \lambda) - F(WTP_{Li}; \lambda)] + \sum_{i \in \mathfrak{S}_{NN+}} \log f(WTP_i; \lambda),$$

where $\mathfrak{S}_{YY,YN,NY,NNDK}$ is the set of respondents who provided YY, YN, and NY pairs of referendum responses, or a NN sequence followed by a “don’t know” response about the exact tax amount. WTP_L and WTP_H are the lower and upper bound of the interval around these respondents’ WTP (e.g., 2000 and 3500 in the above example). \mathfrak{S}_{NN+} is the set of respondents who would vote against the program at the given tax amounts but report a continuous and positive WTP amount, which we denote as WTP.

C. Determinants of Willingness to Pay for Monument Conservation

Our next order of business is to see if WTP varies systematically with the individual characteristics and beliefs of the respondent, so we specify an accelerated life model based on the Weibull baseline hazard. Formally, the logarithmic transformation of WTP can be written as:

⁹ Based on respondent debriefs, we conclude that many people that said they would not pay for the program in reality hold positive values for conservations, but “protest” certain aspects of the scenario. Also see footnote 12.

$$(8) \quad \log WTP_i = \mathbf{w}_i \boldsymbol{\delta} + \varepsilon_i,$$

where \mathbf{w} is comprised of \mathbf{x} , \mathbf{C} , \mathbf{USE} and \mathbf{z} (see equations (4)-(6)), $\boldsymbol{\delta}$ is comprised of their respective regression coefficients from equation (6), and ε is a type I extreme value error term with scale θ . This means that WTP is a Weibull with scale $\sigma_i = \exp(\mathbf{x}_i \boldsymbol{\beta})$ and shape parameter θ , and that the log likelihood function is:

$$(9) \quad \sum_{i \in \mathfrak{S}_1} \log \left[\exp \left(- \left(\frac{WTP_{Li}}{\sigma_i} \right)^\theta \right) - \exp \left(- \left(\frac{WTP_{Hi}}{\sigma_i} \right)^\theta \right) \right] + \sum_{i \in \mathfrak{S}_{NN+}} \log \left[\frac{\theta}{\sigma_i} \cdot \left(\frac{WTP_i}{\sigma_i} \right)^\theta \exp \left(- \left(\frac{WTP_i}{\sigma_i} \right)^\theta \right) \right]$$

where \mathfrak{S}_1 denotes the subset of respondents for which we specify interval-data observations on WTP.

Briefly, vector \mathbf{x} includes:

- city dummies to account for differences in the cost of living (YEREVAN, GYUMRI, GORIS, and KAPAN; the fact that a respondent resides in a village is captured into the intercept); and
- Socio-demographics, such as a gender dummy (MALE); a dummy denoting college degree or post-graduate education (COLLEGE); a marital status dummy (MARRIED) and a dummy (CHILDREN) for dependents younger than 18, and income per household member (PCAPPINC).¹⁰

¹⁰ Regarding income, to avoid losing observations with missing income, we created a dummy variable MISSINC taking on a value of one if the respondent failed to answer the income question. We then recoded income, replacing missing values with zeros. Both the recoded income divided by the number of household members, PCAPPINC, and MISSINC must be included in the regression. The coefficient on PCAPPINC is the marginal effect of a change in income on log WTP, conditional on knowing the respondent's income. The coefficient on MISSINC captures any systematic differences in WTP between those respondents who did and those who did not report income.

Vector USE is comprised of two dummy variables to capture use and existence values, VISITOR and Q25DUMMY. The former is a dummy variable that takes on a value of one if the respondent has visited cultural heritage sites in the last year. The latter is a dummy indicator that takes on a value of one if the respondent rates the existence of monuments as very important, whether or not he visits them.¹¹

Vector C includes:

- A dummy measuring perceptions of the current state of conservation of the monuments of Armenia. This dummy, POORSHAPE, is equal to one if the respondent judges the monuments of Armenia to be in very poor or poor shape;
- Two dummies measuring respondent expectations about the condition of the cultural heritage sites over the next 10 years. These indicators are WILLGETWORSE, which is equal to one if the respondent expects the state of conservation of the monuments of Armenia to get worse in the next 10 years, and DKFUTURE, which takes on a value of one if the respondents does not know how the state of conservation of the monuments will evolve over the next decade;

Finally, vector \mathbf{z} is comprised of three indicators that suggest whether the respondent recognizes potential for economic growth associated with conservation of cultural heritage sites. The first is ECONGROWTH, which is equal to 1 if the respondent agreed strongly (rating=4) or very strongly (rating=5) that the monuments should be preserved because they contribute to economic growth. The second is FOREIGNTOURISTS, a dummy equal to one if the respondent has pinpointed foreign

¹¹ The existence value is due to the utility an individual derives from the awareness that a good exists, even though the individual does not use it and will not do so in the future. Option value derives from the possibility to use the good in the future, as individuals cannot forecast their future preferences. Finally, bequest value is about the utility from preserving the good for future generations.

tourists as one of the categories of beneficiaries of the program. The third is a dummy indicating that the respondent has recognized large corporations, hotels, tour operators and other tourism-related business as one of the categories of beneficiaries of the program. This dummy is dubbed CORPORATEGAINS.

V. Results

Maximum likelihood estimation of (7) yields an estimate of mean WTP equal to 4125 AMD (s.e. 209), and of median WTP equal to 2310 AMD (s.e. 110).¹² Mean WTP is highest among those persons who visit the monuments (N=501; mean WTP=5463 AMD, median WTP=3595 AMD)¹³ and lowest among those who do not visit monuments now nor plan to do so in the future (N=499; mean and median WTP are 2675 and 1395 AMD, respectively). We interpret the value of the non-users to be the non-use value of the monuments of Armenia covered by the hypothetical program. Those respondents who do not visit the monuments now but would if the plan is implemented report intermediate WTP figures (N=144; 4618 and 3197 AMD, respectively).

¹² This model ignores the fact that some NN respondents reported a zero WTP amount and assumes that the true WTP of these respondents lies between 0 and the lowest amount they refused to pay. On examining the reasons given by the respondents for such zero WTP figures, we noticed that many were expressing distrust of the government, but cared about the cultural heritage sites. We consider these protest responses, which we re-interpreted as implying low, but positive, WTP in our main model. We also estimated a model where we take all responses at face value—a mixture of zeros and Weibull-distributed positive WTP amounts. The latter model produces a mean WTP of 3953 AMD, which is very close to the one from the main model, and median WTP of 1308 AMD. For good measure, we also estimated the Weibull model after excluding from the sample those NN respondents who said they would always oppose the program, regardless of the cost. This results in a mean WTP figure of 4547 AMD, whereas the median WTP is 2797 AMD. We conclude that the estimates of WTP are robust to alternative interpretations of the responses and modeling choices. Mean WTP, in particular, is within 10% of the figure produced by our preferred interpretation of the responses and model.

¹³ This is consistent with the fact that votes in favor of the hypothetical program are often motivated by non-use considerations. Bequest motives, or the wish to conserve these monuments for future generations, accounts for 73% of “in favor” responses to one of the two payment questions, while existence value motives account for 54% of these responses.

Estimation results for the model with covariates are reported in table 7. The most striking feature of table 7 is the large number of significant coefficients. The regression results suggest that the responses to the referendum payment questions are internally consistent, and that WTP is related in predictable ways to individual characteristics and beliefs of the respondents.

The negative and significant coefficient on the city dummies suggests that, all else the same, village residents are willing to pay *more* than city residents of comparable income, family status, education, etc. We had expected persons who have visited cultural heritage sites in the last year to be willing to pay more to preserve monuments, and indeed this expectation is borne out in the data. All else the same, visitors are willing to pay 45% more than persons who have not visited cultural monuments in the last 12 months. Those persons who rated the sheer *existence* of the monuments as very important are also willing to pay more—47% more—than the remainder of the sample.

The answer to the question at the heart of this paper is shown in the panel of table 7 entitled “Perception of current and future condition of the monuments.” Somewhat surprisingly, the belief that monuments are in poor shape and the perception that their state of conservation will get worse in the next 10 years do not lead people to report higher or lower WTP values. However, *uncertainty* about the future of the monuments is associated with *lower* WTP. This is shown by the negative and strongly significant coefficient on the DKFUTURE dummy. The magnitude of the coefficient implies that people who do not know what state of conservation to expect for the next 10 years have WTP amounts that are about 25% lower than those of people with well-defined expectations.

Inspection of the panel of table 7 dedicated to the respondent's beliefs about the contribution of monument conservation to economic growth suggests that such beliefs are probably not very strong among our respondents, and not very strong determinants of WTP. Those respondents who included foreign tourists among the potential beneficiaries of the program, however, tend to have greater WTP (18% larger) than the others, presumably because they associated foreign tourists with inflow of valuable currency.

WTP does depend on respondent sociodemographics. For example, men are—all else the same—willing to pay 14% more than women, probably because of stronger control of the household finances, and married respondents report WTP values that are 21% greater than those of single, divorced, or widowed individuals. Having young children does not significantly affect WTP. More highly educated respondents have higher WTP. Specifically, respondents with college-level education or higher are willing to pay about 44% more. In addition, income is positively associated with WTP, as expected. The coefficient on the missing income dummy is positive and strongly significant, suggesting that those respondents who decline to report their household income tend to have higher WTP amounts. We calculate that the coefficient on income per household member implies an elasticity of WTP with respect to income of about 0.52. This means that if household income—and hence income per household member—were to increase by 5%, WTP would increase by about 2.5%. If household income increased by 10%, WTP would increase by about 5%, and, finally, if household income were to increase by 15%, WTP would increase by about 7.5%. These increases are consistent with the growth per annum in GDP in recent years.

Table 7. Interval-data accelerated life Weibull Model. N=1000.			
variable	coefficient	standard error	t statistic
Intercept (villages)**	7.1299	0.152	46.907
<i>City dummies</i>			
Yerevan**	-0.7411	0.1169	-6.340
Gyumri*	-0.2512	0.1241	-2.024
Goris**	-0.5307	0.2125	-2.497
Kapan**	-0.6464	0.1499	-4.312
<i>Use and non-use</i>			
Visitor**	0.3732	0.0884	4.222
q25dummy**	0.3868	0.0843	4.588
<i>Perception of current and future condition of the monuments</i>			
Poorshape	0.0114	0.0918	0.124
Willgetworse	-0.1015	0.0958	-1.059
Dkfuture**	-0.2752	0.1081	-2.546
<i>Beliefs about economic growth potential and beneficiaries of the program</i>			
Econgrowth	0.0925	0.0861	1.074
Corporategains	0.0559	0.0845	0.662
Foreigntourists*	0.1684	0.0863	1.951
<i>Socio-demographics</i>			
Male^	0.1344	0.0825	1.629
College**	0.3691	0.0971	3.801
Married*	0.1946	0.0928	2.097
Children dummy	0.103	0.0894	1.152
Pcappinc**	0.9649	0.1251	7.713
Missinc**	0.3739	0.1541	2.426
Weibull Shape (θ)**	0.9539	0.0329	28.994

^ = significant at the 10% level. * = significant at the 5% level.

** = significant at the 1% level.

VI. Conclusions

We developed a contingent valuation survey questionnaire to elicit WTP for conservation of cultural heritage sites in Armenia and administered it to a sample of Armenians stratified for residence in urban centers and rural areas.

The questionnaire contained numerous questions about attitudes towards conservation of monuments, monument visitation rates and activities, and subjective perceptions of the condition of the monuments now and in the next 10 years, plus, of course, the WTP questions, which were framed as votes in a referendum over a public

program. We also included numerous questions meant to assess respondent perceptions about the state of the monuments and conservation issues after the provision of information in the questionnaire.

The mean WTP for the program is 4125 AMD. Willingness to pay is higher among the “users” of monuments (i.e., visitors), but even those who have not visited any monuments in the last year would pay for the conservation of cultural heritage sites. Specifically, mean WTP is 5462 AMD among visitors, 2675 AMD among non-visitors, and 4618 AMD among those non-visitors who say that they would visit the monuments if the program were implemented. We interpret the willingness to pay of non-visitors to be the non-use value of conserving cultural heritage sites. The mean WTP of non-visitors is 2675 AMD.

WTP regressions suggest that the responses to the WTP questions were internally valid, in the sense that they depend in predictable ways on beliefs and individual characteristics of the respondents. Interval-data regressions show that WTP is significantly associated with being a visitor and caring about the existence of the monuments in their own rights. Our respondents were only weakly motivated by the belief that the hypothetical program would have spurred economic growth, although there is evidence that when foreign tourists are identified as a category of beneficiaries of the program, WTP for it is higher. More highly educated, male, and married respondents are willing to pay more, and—even more important—willingness to pay is strongly associated with household income per household member. This implies that as the country gets wealthier, willingness to pay for conservation, and hence the benefits of conserving monuments, will increase.

The question at the heart of the paper, however, was the role of the respondent's prior perceptions and beliefs about the fate of the monument. We posited a Bayesian updating model, and cross-tabulations of initial belief with respondent debriefing questions at the end of the survey suggest that this model is appropriate. We find that being uncertain about the future is *negatively* associated with WTP.

This result bears a strong resemblance to previous findings on the effects of uncertainty of climate change risks on WTP for greenhouse gases mitigation. Cameron (2005) finds that respondents' uncertainty over temperature change reduces people's WTP for climate change mitigation. Lee (2002) finds that while prior beliefs of increase in temperatures lead to higher WTP values, prior uncertainty aspects of climate changes effects bear negligible effects on WTP values. We wish to point out that we did not have any particular prior expectation about this effect: The effect of uncertainty about the fate of the monument in the absence of the program is conceptually distinct, for example, from the "option value," which spells out that people are willing to pay to preserve the monument in case they might wish to visit it in the future.

One possible reason why *uncertainty* about the future of the monuments is associated with *lower* WTP might lie with the business-as-usual scenario in the management of cultural monuments. Uncertainty about the fate of the monuments may mirror distrust of the current management practice and an expectation that the hypothetical program would not be significantly better, with the consequently low willingness to pay for it. It is also possible that uncertainty about the monument might reflect uncertainty about the future economic prospects for the country and about the resources available to implement enhanced conservation programs.

What are the implications of our study for monument conservation in Armenia? Since the mean WTP is 4125 AMD (2004 AMD) and there are 779,000 households (but 853,000 “family nuclei”) in Armenia,¹⁴ the total benefits of the program are equal to 3235-3519 million AMD (2004 AMD, or about 6.316-6.832 million US dollars for the number of households or family nuclei respectively). Since the hypothetical scenario posits a one-time payment and a program with effects over 10 years, using a discount rate of 10% this lump-sum figure can be converted into an annual WTP of about 5565 million AMD, or about 1080 million US dollars.

It is generally difficult to find data about the Ministry of Culture’s budget for conservation works,¹⁵ and on perusing a selection of projects for monument conservation, repairs and enhancement that received foreign donation and UNESCO matching funds in 2001¹⁶ and matches mostly closely the description of what the hypothetical program in our survey would do, we obtain that the cost of these projects is just about a million dollars a year. This rough calculation suggests that the benefits justify the cost of the projects, but caution should be used in interpreting these results, due to the difficulty of matching exactly actual projects with those proposed by the hypothetical scenario.

¹⁴ The exact figure for households as per the 2001 Census is 778,666. The Census also reports 852,998 “family nuclei” (<http://docs.armstat.am/census/pdfs/73.pdf>, accessed 26 March 2006).

¹⁵ Gaianè Casnati (Centro Studi e Documentazione della Cultura Armena) (personal communication, 2007) reports that in 2006 the Armenian government spent 720 million AMD for monument conservation and maintenance. She also reports that the government did not begin devoting budget to conservation and maintenance until 2004, and it is unclear whether the 2006 figure would be sustained over the subsequent years.

¹⁶ See www.armeniaforeignministry.com/unesco (accessed 27 March 2007).

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