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**Working Paper**

## The Value of Cultural Heritage Sites in Armenia: Evidence from a Travel Cost Method Study

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**The Value of Cultural Heritage  
Sites in Armenia: Evidence from a  
Travel Cost Method Study**

Anna Alberini and Alberto Longo

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SIEV – Sustainability Indicators and Environmental  
Valuation

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# **The Value of Cultural Heritage Sites in Armenia: Evidence from a Travel Cost Method Study**

## **Summary**

This paper applies the travel cost method to visits to cultural sites in Armenia by domestic visitors. Respondents intercepted at four cultural monuments provided information on their visitation patterns, experience at the site, perception of the state of conservation of the monuments, and rating of the quality of the services and infrastructures. We combine actual trips with stated trips under hypothetical programs that would enhance the conservation of the monuments and improve one of (i) the cultural experience at the site, (ii) the quality of the infrastructure, or (iii) the quality of the services, and use the combined actual and stated trips to fit a panel data model. Our investigation shows that there are significant use values associated with the four study monuments, and that conservation programs and initiatives that improve the cultural experience, or simply make it easier for the respondent to reach and spend time at the monument, are valued by domestic visitors and would encourage higher visitation rates.

**Keywords:** Valuation of cultural heritage sites, Non-market valuation, Travel cost, Consumer surplus, Contingent behavior

**JEL Classification:** Z10

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## 1. 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.

Presumably, cultural heritage sites attract many of the foreign visitors to Armenia,<sup>1</sup> but little is known about the visitation rates by domestic visitors, despite the importance of this information for prioritizing interventions, assigning funding and personnel, and establishing management decisions and policies.

The purpose of this paper is to report on the findings from a travel cost method (TCM) study conducted at four cultural heritage site locations in Armenia in order to place a value on the conservation of these sites. Armenian visitors were intercepted by professional interviewers at Garni, Haghartzin, Khor Virap and Tatev, and were administered a questionnaire that queried them about this and other visits to the

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<sup>1</sup> The number of foreign tourists in Armenia has grown from 31,800 in 1998 to 206,000 in 2003, according to the Ministry of Trade and Economic Development of Armenia. The re-opening of the cultural monuments that were repaired in 2002-03 is thought to play a significant role in the growth of tourist flows to Armenia (<http://www.minted.am/en/tourism.html>). Thirty percent of these foreign visitors are from the European Union, 20% from the United States, and 22% from former Soviet Republics.

monument. The survey was conducted on August 7-25, 2004, and resulted in a total of 500 completed questionnaires.

The travel cost method is one of the possible approaches for non-market valuation, i.e., for placing a monetary value on goods that are not bought and sold in regular markets, such as cultural heritage sites and the conservation of cultural heritage. In our study, we focus on the single-site travel cost model, and rely on both observed behaviors (the actual number of trips to a site) and stated behaviors (the number of trips that would be taken to the site under hypothetical circumstances) to infer the value of conservation.

We feel that the results of this study are interesting for three reasons. First, they provide useful information about the patterns of visitation to selected cultural heritage sites by Armenian nationals, and of the associated activities and expenditures. Second, our survey questions elicit what individuals judge to be the most rewarding and least satisfactory aspects of the visit experience, and their perceptions of the state of conservation of the monuments and of other aspects of sustainable tourism to these places. Third, we combine the actual number of trips and expected trips under hypothetical conditions, and use them to estimate a travel demand function, from which we infer the (use) value people place on the conservation of monuments.

The results suggest that there are significant use values associated with the four study monuments, and that conservation programs and initiatives that improve the cultural experience, or simply make it easier for the respondent to reach and spend time at

the monument, *are* valued by domestic visitors and would encourage higher visitation rates.<sup>2</sup>

To our knowledge, this is the first application of the travel cost method to date to study domestic visitation rates in a transition economy in southwestern Asia. The method has been used previously to assess the use values of an urban museum (Martin, 1994), of attending performances at the Royal Exchange Theatre in Manchester (Forrest et al., 2000), of visiting the historic city of St. Mary, Maryland (Poor and Smith, 2004), and of four instances of cultural tourism in Spain (Bedate et al., 2004). All in all, Pearce et al. (2002) point out that the majority of the studies that estimate the monetary value of cultural heritage sites and cultural goods (see Navrud and Ready, 2002) have employed contingent valuation, thus relying on stated preference methods, and indeed Mourato et al. have used contingent valuation to elicit the willingness to pay for the conservation of monasteries in Bulgaria.

The remainder of this paper is organized as follows. Section 2 describes the study sites, and section 3 the questionnaire and sampling plan. Section 4 describes the data. Section 5 presents the travel cost method and the econometric model of the demand for trips to the four cultural heritage sites. Section 6 presents the model of trips to the four sites under the current conditions and under hypothetical conservation programs. Section 7 concludes.

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<sup>2</sup> The travel cost method is only capable of measuring use values, and thus cannot capture non-use values. (Non-use values are those of people that do not visit the monuments, but wish to conserve them in their own right, for future generations, and in the event they should wish to visit them in the future.) Evidence that Armenian nationals *are* willing to pay for the protection of cultural heritage sites, even if they do not currently visit them nor plan to do so in the future, comes from a companion contingent valuation survey (Alberini, 2004).

## 2. The Study Sites

We gathered the data necessary to do a travel cost method study by interviewing domestic visitors on site at four locations—Garni, Haghartzin, Khor Virap, and Tatev—using a structured questionnaire. An equal number of respondents (125) were interviewed by professional enumerators at each of these sites.

Garni is the only Hellenistic temple in Armenia. It dates back to the first century AD and has an extensive archeological site, along with a modern shelter structure built around the remains of the bath house and its mosaic floor. It is the only major cultural heritage site in Armenia that charges a modest entrance fee. Khor Virap is one of the most visited sites in Armenia because of its religious importance.<sup>3</sup> Haghartzin lies in forest and is one of Armenia's most visited monasteries. The Tatev monastery is part of a complex surrounded by a large fortified wall, and looks down on a gorge, in a beautiful natural environment.

The scenic quality is striking at all of these sites, except perhaps for Khor Virap. With the exception of Mount Ararat as a backdrop, the monastery of Khor Virap does not offer otherwise scenic views. The study sites are popular destinations among Armenian residents. Garni (20km from Yerevan) and Khor Virap (40km from Yerevan) are very close to the capital, Yerevan, and can be reached from the capital in about thirty minutes. The other two sites, Tatev and Haghartzin, are quite far from the capital. Haghartzin is at

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<sup>3</sup> Khor Virap is famous as the place where King Tiridates (Trdat) III imprisoned St. Gregory the Illuminator (the founder of Christianity in Armenia) for 13 years in the late 3<sup>rd</sup> century. Legend has it that, after ordering the execution of a group of Christian virgins led by Hripsime and Gayane, the King experienced a metamorphosis whereby his head turned into the head of a boar. Upon the release of St. Gregory and the conversion of the King to Christianity, he resumed his human aspect. This led to the adoption of Christianity as the country's official religion in 301 AD, which makes Armenia the first Christian nation in the world. It is still possible to visit the subterranean cell where St. Gregory was imprisoned.

a three-hour driving distance (125km) from the capital, while Tatev, located in the south of the country, is about 5 hours away (260km). (See Figure 1.)

The quality of the roads to these destinations, however, varies dramatically across the sites. Khor Virap is located very close to a major highway and can be reached relatively easily. The quality of the road to Garni is good. While reaching Haghardzin is relatively easy, visiting it is somewhat problematic because of the dearth of parking facilities. By comparison, Tatev is difficult to reach, given the poor condition of the local road, which is too steep and narrow for big tourist buses. Regarding visitor services, Khor Virap and Garni have souvenir stands, which are absent in Haghardzin and Tatev.

We wish to make two final points about the four cultural heritage sites of this study. First, Khor Virap, Haghardzin and Tatev have historical and religious significance to the Armenians, while Garni is mostly a historical and archeological site. Second, Garni is very close to another famous cultural heritage site, Geghard. Most people visiting Garni also visit Geghard—a unique monastery that is partly carved out of a cliff—in the course of the same trip, because these two locations are only a few minutes apart. In our study, we decided to consider a visit to Garni/Geghard as part of the same trip, and to intercept people at only one of these two locations (at Garni).



Figure 1. The Study Sites.



### 3. Structure of the Questionnaire and Sampling Plan

The questionnaire is divided into three sections. The first section gathers information about this visit. Specifically, we ask respondents how many trips were taken

to this site over the last twelve months. We also inquire about travel mode, the purpose of the present visit, the use of restaurants, shops and accommodations, and the length of time spent on-site and in the vicinity of the monument. To obtain the key inputs for the travel cost model, we ask respondents (i) how far they live from the site, and (ii) the cost of the trip, along with the size of the party they are traveling with.<sup>4</sup>

Finally, we ask the respondent to rate his level of satisfaction with the current visit and perception of the state of conservation of the cultural heritage site on a scale from 1 to 5, where 1 means “worse possible experience” (“very poor”) and 5 means “best possible experience” (“very good”).

In the second major section of the questionnaire, we propose a hypothetical program that would improve the quality of the site and/or the quality of the experience. People are randomly assigned to one of three hypothetical programs. These programs share a common part—conservation interventions at the site—and then branch into (a) initiatives that would enhance the cultural experience at the site (interpretive materials, small museum), (b) infrastructure improvements, such as repairing local roads to the cultural heritage site, building bathrooms and rest facilities, providing waste management services, and (c) tourism-related services, such as restaurant, cafes, shops, recreational activities and tourism information centers. Variants (a), (b) and (c)—which we dub CULTURE, INFRASTR and SERVICES—are mutually exclusive.

Were the program implemented, we ask, and assuming that the cost of a trip were the same, would the respondent visit the site more often? If so, how many times over the next year? What if the cost of a trip increased by 20%?

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<sup>4</sup> If the respondent mentioned other destinations visited or to be visited on this trip, we urged him to consider, to the best of his ability, only the costs associating with visiting this site and town/village.

The last major section of the survey instrument gathers information on the respondent's other recreational activities, cultural interests and attitudes, and sociodemographics. At the end of the interview, the enumerators were asked to fill out a short section containing debriefing questions.

#### **4. The Data**

##### *A. Individual Characteristics of the Respondents*

We gathered a total of 125 completed questionnaires at each of our survey locales. A total of 167 respondents received the CULTURE variant of the questionnaire, 166 received the INFRASTR version, and 167 were assigned to the SERVICES scenario.

The majority of our respondents (64.80%) are residents of Yerevan. This is not surprising, since Yerevan accounts for a large proportion of the population of Armenia, and the sites are relatively close to it (with the possible exception of Tatev). About 27.6% reside in another city, and the remainder (7.60%) is comprised of residents of villages.

Descriptive statistics of the respondents are reported in table 1. Almost 60% of the people we interviewed were males, and almost 87% were born in Armenia. The average age is about 40 years. Our sample is very highly educated, since almost 55% of the respondents have a University degree or a higher title. Comparison with official statistics for the Armenian population suggest that this sample is indeed more highly educated than the population at large (17% of the Armenian population aged 17 and older has received a University degree).

Three-quarters of our respondents are married, and the average household size is 4.8 persons. The average household income is about 238 US dollars per month.<sup>5</sup> Finally, about 3 percent of the respondents belong to an environmental organization.

Table 1. Descriptive statistics of the respondents.

Variable	Percent of the sample	Mean	Std. Devn.	Minimum	Maximum
Male (dummy)	59.8				
Was born in Armenia (dummy)	86.6				
Has a University degree (dummy)	54.6				
Is married (dummy)	74.4				
Age (years)		40.43	13.21	18	75
Household size		4.79	1,86	1	13
Monthly household income in US \$		237.6	341.32	0	2000
Belongs to an environmental organization (dummy)	3.2				

### *B. Current Visitation Patterns*

Descriptive statistics of the number of visits in the last 12 months are shown in table 2. Table 2 shows that the number of visits ranges from 1 to 51 (at Garni), and that the average number of visits is between 2 and 3.

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<sup>5</sup> ARMSTAT (2003) reports an average annual income of 1,045 US\$ per household for the population of Armenia in year 2001. Moreover, the 2001 Republic of Armenian Population Census indicates that women account for 51.8% of Armenian population, that 62.1% of the Armenians are married, and that the average age is 38. This suggests that our interviewees tend to be wealthier and more educated than the average Armenian, and are slightly more likely to be male and married, but are roughly of the same age as the average Armenian.

Table 2. Frequency of visitation by site: Visits in the last 12 months.

Site	mean	Standard deviation	Minimum	Maximum
Garni	2.82	5.24	1	51
Haghardzin	2.35	4.25	1	41
Khor Virap	2.38	2.85	1	21
Tatev	2.07	3.49	1	31

The majority of our respondents (467) report spending a few hours—from a minimum of a half hour to a maximum of 10—in the town or village where the monument is located. When asked about time spent at the actual monument site, the responses ranged from a half-hour to six hours, for an average of 1.55. Only 24 respondents out of 500 spend one or more nights in the village or town near the monument. Regarding accommodations, six of these people reported camping, 14 stayed with friends or family, and 4 used a rental home. Taken together with the fact that most respondents bring their own meals, this suggests that there is very little expenditure at the monument’s locale.<sup>6</sup>

Three quarters of our respondents travel to the site by their own car and 14.6% of respondents rent a vehicle (cars or motorcycles). Public transportation accounts only 6.4 percent of the visitors. The remainder walks to the site, or reaches it using office cars or minibuses.

The average cost of the trip is 18,538 Armenian Drams (AMD) for the respondent and his or her travel party.<sup>7</sup> When we divide the cost by the number of people (4.31 on

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<sup>6</sup> In addition to “visiting the monument” (40.6% of the respondents) and “religious purposes” (19%), many respondents (23.3% of the sample) mentioned that the reason for their visit was to “take foreign guests.”

<sup>7</sup> At the time of the survey, one US dollars was equivalent to 515 AMD.

average) expenses are incurred for, we obtain cost per trip per person. This ranges from 40 to 25,000 AMD, averages 4,648 AMD, and has a median value of 3,400 AMD.<sup>8</sup>

Regarding their experience at the site, people complained about the quality of the local roads to Tatev, found the cleanliness of the four sites acceptable, praised the beauty of the monuments and their natural settings, and did not report problems with congestion levels. Over three-quarters of the Garni and Khor Virap visitors reported that these are in “good” or “very good” state of conservation, but only about one-third of the Haghartzin and Tatev visitors rated the state of these monuments as “good” or “very good.”

### *C. Contingent Behavior Questions.*

When asked how their visits would be affected by the implementation of the program, assuming that the cost of visiting the site was the same as now, 47.6% of the respondents stated that they would visit more often. When a respondent stated he would visit the site more often after the works were completed, we asked him to tell us how many times he would visit in a year. Intended visits ranged from zero to 50, and averaged 3.49 per year. If the cost of a trip were increased by 20%, about 29% of the respondents would visit more. On average, these persons would visit 3 times a year.

In table 3, we examine contingent behaviors by site. The site where the program would bring—on average—the largest increase in the number of visits is Garni. Khor Virap stands out, relative to the other sites, for the fact that only 20% of the respondents at this locale would visit more often if the program were implemented and there was a

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<sup>8</sup> We note that while everyone reported information about the total cost of the present trip, missing values for the number of people for whom the cost is incurred result in only 469 valid observations for the price of the trip per person.

20% increase in the cost of a visit. By contrast, over 30% of the respondents at the other sites would visit the site more often under the same hypothetical circumstances, although Tatev visitors would increase their visits to this destination less than visitors to the other sites.<sup>9</sup>

Table 3. Hypothetical visitation patterns by site. All questions posit that a program would improve the quality of the site.

Site	Percent who would visit more frequently, at the same cost	Number of planned visits at the same cost (sample average)	Percent who would visit more frequently, at higher cost	Number of planned visits at higher cost (sample average)
Garni	48.8	4.68	32.26	4.26
Haghardzin	48.0	3.51	31.71	3.42
Khor Virap	49.6	3.14	20.16	1.45
Tatev	44.0	2.57	31.45	2.47

Does the fraction of the sample who wishes to visit the site more often if the program is implemented vary across the variants of the program? As shown in table 4, there are negligible differences across locales in the percentages of people who would visit more if the program was implemented. Pairwise t-tests fail to reject the null that there are no differences in the respective percentages across the groups of respondents that were assigned to the different scenarios.

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<sup>9</sup> We conjecture that this is because Tatev is far from the capital, Yerevan, where most of our respondents come from. It is difficult to visit Tatev on a daily trip from the capital because of the time it takes to reach it. Matters are further complicated by the lack of accommodations. We may reasonably expect that an improvement of the quality of the roads and of the services at the site might enhance the enjoyment of the visit.

Table 4. Hypothetical visitation patterns by scenario. Percentage of the sample who...

Description	Scenario 1: Culture	Scenario 2: Infrastructure	Scenario 3: Services
...would visit more often if the program were implemented and the cost of a trip were the same	46.11	48.80	47.90
..would visit more often if the program were implemented and the cost of a trip increased by 20%	29.88	28.92	27.88

One concern we had when we drafted the survey questionnaire was that people would not accept the hypothetical scenario and the contingent behavior questions. Fortunately, interviewer debriefs suggest that virtually everyone (97.6 percent of the sample) was comfortable with the hypothetical program and the related questions. Over 95 percent of the respondents appeared to answer the questions in an honest and truthful manner.

## 5. The Travel Cost Model.

We use the actual trips to the site in the last 12 months and the trips per year the respondent expects to make if the program is implemented to fit single-site travel cost models. These models allow us to estimate (i) the surplus associated with visits at the current conditions, plus (ii) the welfare change associated with the program.

### *A. The Single-site Model*

In a single-site travel cost method (TCM) model, it is assumed that an individual's utility depends on aggregate consumption,  $X$ , leisure,  $L$  and trips  $r$  to the site:

$$(1) \quad U = U(X, L, r).$$



We further assume weak complementarity of trips with quality at the site,  $q$ . In other words,  $\partial U / \partial q = 0$  when  $r = 0$  (when a person does not visit the site, his or her utility is not affected by its quality), and  $r$  is increasing in  $q$ . The individual chooses  $X$ ,  $L$  and  $r$  to maximize utility subject to the budget constraint:

$$(2) \quad y + w \cdot [\bar{T} - L - r(t_1 + t_2)] = X + (f + P_d \cdot d) \cdot r$$

where  $y$  is non-work income,  $w$  is the wage rate,  $\bar{T}$  is total time,  $t_1$  is travel time to the site,  $t_2$  is time spent at the site,  $f$  is the access fee (if any),  $P_d$  is the cost per kilometer, and  $d$  is the distance to the site.<sup>10</sup> This yields the demand function for trips:

$$(3) \quad r^* = r^*(y, w, p_r, q)$$

where  $p_r = w(t_1 + t_2) + f + p_d \cdot d$  is the full price of a trip.

In this study, we assume that the demand function is log linear. Formally,

$$(4) \quad r^* = \exp(\beta_0 + \beta_1 w + \beta_2 p_r + \beta_3 q) .$$

In our econometric model below,  $r^*$  is the expected number of trips. To estimate the coefficients in equation (4), it is necessary to ask a sample of visitors to report the number of trips they took in a specified period (year or season), cost per trip  $p_r$ , plus  $w$ ,  $y$ , and other individual characteristics that might affect the demand for visits to the site.

Since  $q$ —the quality of the site—does not change over time, to estimate the coefficient on  $q$ ,  $\beta_3$ , we devised a hypothetical program that would deliver an improvement in  $q$ , and asked our respondents to tell us how many trips they would take if

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<sup>10</sup> This model further assumes that travel time and time spent at the site are exogenous, that there is no utility or disutility from traveling to the site, and that each trip to the site is undertaken for no other purpose than visiting the site. It also assumes that individuals perceive and respond to changes in travel costs in the same way they would to changes in a fee for being admitted to the site (Freeman, 2003). Finally, the model assumes that work hours are flexible.

the program was implemented under two alternative assumptions for  $p_r$ . Specifically, we first instructed respondents to hold  $p_r$  at the same level as the current cost of the trip, and then we asked them to consider a *new* cost of the trip, this new cost being equal to  $(p_r \times 1.2)$  (i.e., a 20% increase).

This means that we have a total of three observations on trips for each respondent. The first is the actual number of trips to the site in the last year, while the second and the third are the number of trips the respondent says he would take if the program is implemented, assuming no change, and a 20% increase, respectively, in the cost of the trip. This design is summarized in table 5. The quality of the site,  $q$ , is here the state of conservation of the monument and additional amenities or services offered by the hypothetical public program.

Table 5. Scenarios used in the questionnaire.

Scenario	Nature of the scenario	Price	Quality
1	Actual	$p_r$ (actual cost of the trip reported by the respondent)	Current conditions
2	Hypothetical	$p_r$	Improved
3	Hypothetical	$1.2 \times p_r$	Improved

Equation (4) means that as the quality of the site is improved through the program, the demand function shifts out, implying that for all trip prices people will take more trips. The increase in expected trips is  $r^* \cdot \beta_3 \cdot \Delta q$ , where  $\Delta q$  is the quality change. The percentage change in expected trips is thus  $\beta_3 \cdot \Delta q$ .

### B. Welfare Measures

Once the demand function has been estimated, the consumer surplus provides an approximation of the welfare associated with visiting the site. Formally, based on equation (4), the consumer surplus is equal to:

$$(5) \quad CS(p_0, q_0) = -\frac{1}{\beta_2} r_0,$$

where  $r_0$  is  $r^*$  in equation (4) for the initial levels of quality (here,  $q=0$ ) and price:  $r_0 = \exp(\beta_o + \beta_1 w + \beta_2 p_0)$ .

The surplus change brought by a quality improvement is:

$$(6) \quad \Delta CS = CS(p_1, q_1) - CS(p_0, q_0) = -\frac{1}{\beta_2} [r_1 - r_0],$$

where  $r_1 = \exp(\beta_o + \beta_1 w + \beta_2 p_1 + \beta_3)$ , where  $p_1$  is the new price level. In our questionnaire,  $p_1 = p_0$  in the first contingent behavior question, and  $p_1 = 1.2 \cdot p_0$  in the second.

### C. Econometric Model.

Given the relatively few annual trips to our sites, a count data model is the appropriate model for the number of trips  $Y$ . We specify a Poisson model with individual-specific  $\lambda_{ij}$ :

$$(7) \quad \Pr(Y_{ij} = y_{ij}) = \frac{e^{-\lambda_{ij}} \lambda_{ij}^{y_{ij}}}{y_{ij}!},$$

where  $\lambda > 0$  is the parameter of the Poisson distribution (which is equal to both the expected value and the variance of  $Y_{ij}$ ),  $\lambda_{ij} = \exp(\mathbf{x}_{ij} \boldsymbol{\beta}_1 + p_{ij} \beta_2 + q_j \beta_3)$ ,  $\mathbf{x}$  is a vector of determinants of visits to the cultural heritage site (including income),  $p_{ij}$  is the price per

trip faced by the respondent, and  $q_j$  is a vector of three dummies capturing the presence/absence of a specific type of hypothetical program.  $\beta_1$ ,  $\beta_2$  and  $\beta_3$  are unknown coefficients. The subscripts  $i$  and  $j$  denote the respondent ( $i=1, 2, \dots, n$ ) and the scenario within the respondent, respectively ( $j=1, 2, 3$ , where  $j=1$  refers the current conditions, and  $j=2, 3$  refer to the scenarios with the hypothetical programs (see table 5).

Estimation of the  $\beta$ s is further complicated by the nature of our sample. Because we intercept people on site,  $Y$  is truncated from below at 1, and the people that we are more likely to run into are the most avid visitors, i.e., those persons with the highest  $\lambda_{ij}$ s. Accordingly, if we wish to estimate the parameters  $\beta$ s using the method of maximum likelihood, the correct contribution to the likelihood is:

$$(8) \quad h(y) = \frac{y \cdot \Pr(y)}{\sum_{w=1}^{\infty} w \cdot \Pr(w)} = \frac{y \cdot \Pr(y)}{\lambda},$$

where  $\Pr(\cdot)$  is the Poisson distribution function (equation (7)), and the subscripts have been omitted to avoid notational clutter. This amendment allows us to infer the demand for trips in the population from our on-site sample.

Assuming that the observations on trip frequencies are independent within and across respondents, the likelihood function of the sample is thus  $\prod_i \prod_j h(y_{ij})$ , and the log likelihood function is

$$(9) \quad \sum_i \sum_j \log h(y_{ij}).$$

It is easily shown (see Shaw, 1988) that (8) is simplified to the probability function of a Poisson variate defined as  $Y' = Y - 1$ .

*D. The Dependent Variable and the Choice of the Independent Variables.*

The vector  $x$  includes the following regressors:

- Dummy variables for the site where the interview was conducted;<sup>11</sup>
- Dummy variables for the variant of the program the respondent was told to

consider. The dummies CULTURE, INFRASTR, and SERVICES denote the variants of the program that, in addition to implementing conservation and restoration measures, emphasize provision of cultural and historical information at the site, improve the infrastructure at or near the site, and improve tourist-related services, respectively. These dummies were always assigned a value of zero when  $j=1$ , i.e., the observation on trips refers to *actual* trips.

- The total cost of the trip as reported by the respondent, divided by the number of people for whom this cost was incurred. We label this variable PRICE. We do *not* include the opportunity cost of time in our price variable.<sup>12</sup>

- Household income divided by the number of household members (PCAPPINC).

We created a companion dummy variable, INCMISS, which takes on a value of one if the respondent fails to answer the income question. PCAPPINC is recoded to zero when the

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<sup>11</sup> We include dummies for Tatev, Garni, Haghazdin, and Khor Virap. The model does not, therefore, contain the intercept.

<sup>12</sup> Most theoretical models assume that the opportunity cost of time is the wage rate. Much of the empirical literature (since Cesario, 1976) imputes a fraction (usually, about one-third) of the market wage rate as the opportunity cost of time, but Azevedo et al. (2002) point out that doing so is likely to introduce measurement error into the price variable, which in turn biases the coefficient on the price downward. As in Hanley et al (2003) and Alberini et al. (2005) we prefer to enter the out-of-pocket cost of a trip and income separately.

respondent did not report his or her household income, and both the recoded PCAPPINC and INCMISS are included in the right-hand side of the model.<sup>13</sup>

- Other individual characteristics of the respondent, such as education (measured by a dummy, COLLEGE, denoting whether the respondent has a University degree or better), age, and marital status (the dummy MARRIED).<sup>14</sup>
- A dummy denoting whether the respondent finds the site to be in “very good” condition (GOODSTATE).

Finally, it is important to tackle the issue of substitute sites. Ideally, *if* substitute sites exist, the price per trip to a substitute site should be included in the model. Failure to do so results in a biased estimate of the coefficient on price per trip, the severity of the bias depending on the correlation between the two price variables. In practice, we do not have information about which sites, if any, would be considered reasonable substitute for the study sites. This forces us to omit this variable altogether from the regression model.<sup>15</sup>

## 6. Results

### A. Actual Trips

Our first order of business is to fit the Poisson equation corrected for the on-site nature of sample using only the actual trips taken by the respondents. In other words, the sample is restricted to  $j=1$  and results in a total sample size of 468 (32 observations are

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<sup>13</sup> The coefficient on INCMISS captures any systematic differences in the number of trips among those respondents who did and did not report income. The coefficient on PCAPPINC should be interpreted as the marginal effect of income on trips, conditional on information on income being available.

<sup>14</sup> In our initial runs, we experimented with including age squared, household size, and other variables, but the models were poorly behaved, so we decided to exclude these regressors from the specifications reported in this document.

<sup>15</sup> Similar reasons drove Forrest et al. (2000) and Poor and Smith (2004) to omit the travel cost to a substitute site in their applications of the travel cost method.

lost because of missing observations on the covariates). In this run, we omit the scenario dummies, since in this sample they would all be identically equal to zero. For simplicity, this specification does not include variables about the respondent's marital status, education, and perception of the state of conservation of the monument.

The results of this run are reported in table 6. The coefficient on the site dummies are positive and statistically significant. They imply that, all else the same, people take fewer trips to Tatev than they do to the other sites. This is reasonable, considering the difficulty of traveling to Tatev, due to the distance from the capital and the poor quality of the roads. The coefficients on the Garni, Haghardzin and Khor Virap dummies are not statistically discernible from one another.

Table 6. Single-site travel cost model. Dependent variable: annual number of trips (actual visits only). Poisson model with on-site endogenous sampling. Maximum likelihood estimation. N=468.

Variable	coefficient	standard error	t statistic
Tatev	0.3214	0.1214	2.6474
Garni	1.0231	0.0856	11.9521
Haghardzin	0.9964	0.0955	10.4335
Khorvirap	0.8507	0.089	9.5584
Price	-0.1263	0.0162	-7.7963
Pcappinc	-0.002	0.0007	-2.8571
Incmiss	0.5253	0.2552	2.0583
Log likelihood	-357.73		

The coefficient on price is negative, as expected, and strongly significant. Its magnitude, -0.1263, is reasonable, and implies that, starting at 3 trips per year, an increase in price by 3,000 AMD (a little less than 5 US dollars) reduces the number of trips by one. Trip frequency is negatively related to income, and tends to be greater among those people that did not report their income.

The surplus associated with access at the current conditions are reported in table 7. These figures refer to the average visitor at each site, i.e., they average in-sample predictions.<sup>16</sup> Briefly, they imply that the value of accessing the site in its current conditions is over 21,000 AMD at Garni, 19,000 AMD at each of Haghardzin and Khor Virap, and 13,850 AMD at Tatev.

Table 7. Surplus at current conditions and price by site based on the estimates in table 6. All figures in thousand AMD.

Site	Mean	Standard deviation	Minimum	Maximum
All sites	18.44	5.32	8.21	44.00
Garni	21.68	4.78	9.59	29.13
Haghardzin	19.07	6.00	8.69	44.00
Khor Virap	19.24	4.49	8.21	29.38
Tatev	13.85	2.87	8.58	24.19

### B. Combining Actual and Hypothetical Data

We combine actual and contingent behavior trips to estimate the value of programs that restore the sites and improve their quality. Each respondent contributes three observations to our sample, and we pool the observations from the four sites to estimate a Poisson model with the correction for on-site sampling where  $\lambda_{ij} = \exp(\mathbf{x}_{ij}\boldsymbol{\beta}_1 + p_{ij}\beta_2 + q_j\beta_3)$ .<sup>17</sup> Results based on the full panel of data are displayed in table 8.

<sup>16</sup> As detailed in Englin and Shonkwiler (1995), the value of access for a visitor, or his consumer surplus at the current conditions, is thus the number of visits predicted by the model for this visitor ( $\lambda_i+1$ , where  $\lambda_i = \exp(\mathbf{x}_i\boldsymbol{\beta}_1 + p_i\beta_2)$ ), divided by the negative of the coefficient on price ( $-\beta_2$ ). This formula applies to our sample of visitors, who are likely to visit more frequently than the population of visitors at large.

<sup>17</sup> We constructed the dependent variable for the hypothetical visits ( $j=2, 3$ ) as follows. For  $j>1$ , we assigned the number of trips respondents said that they would take. If they said that they would visit the same number of times as during the previous year, then  $y_j=y_1$ . Once again, correcting for the on-site intercept nature of the sample implies that we estimate a Poisson equation where the dependent variable is the number of visits minus 1.



The first specification (specification I) is our basic model, while specification II is broader and explores the possible effects of individual characteristics and perceptions about conservation. In both specifications, mean actual trips are obtained by setting all the scenario dummies to zero. Both models fit the data well, in the sense that likelihood ratio tests of the null that all slopes are equal to zero reject the null soundly.

In both models we impose the restriction that the coefficient on price,  $\beta_2$ , to be equal to -0.1263—the estimate from running the model on actual trip data only. We believe that this approach is desirable because it “grounds” intended behaviors to observed behaviors, thus providing reasonable and conservative estimates of the benefits of conservation of monuments in Armenia.<sup>18, 19, 20</sup>

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<sup>18</sup> This approach is in the spirit of Azevedo et al.’s point that revealed preference data (i.e., actual trips) should be viewed as complementary sources of values and information with stated preference data (i.e., hypothetical trips) (Azevedo et al., 2003). Revealed preference methods bring the “discipline of the market” to stated preference valuations, while the latter can shed light on consumer preferences for price and quality levels that are currently not observed.

<sup>19</sup> Of course, we attempted to estimate the unrestricted model, but were dissatisfied with the fit of the model and with the implausible value of the unrestricted coefficient on price. All other coefficients, however, were very close to those of the restricted model. Accordingly, we opted for imposing the restriction and for reporting only the results of the restricted maximum likelihood estimation in this paper. We also explored random effects Poisson to allow for the possibility of correlation among the responses provided by the same person. In the unrestricted model we find some evidence of the presence of random effects, but the coefficients on all other variables are virtually the same as those of the model where the observations are independent within respondents. The random effect model does not converge when we impose the restriction that  $\beta_2 = -0.1263$ .

<sup>20</sup> Other researchers have investigated whether the slope of the demand function implied by the responses to the hypothetical questions is different from that implied by actual travel. Results are mixed. For example, Rosenberger and Loomis (1999) find that the slope of the demand function (i.e., the coefficient on price per trip) is the same across actual and hypothetical data, and Alberini et al. (2005) report a similar result in a travel cost method study that examines fishing trips to the Lagoon of Venice by a sample of anglers in the Venice area. By contrast, Azevedo et al. (2003) find that individuals appear to be less sensitive to price in contingent behavior questions than we observe them to be in real life. They are, however, careful to point out that this could be due to the researcher’s poor measurement of the respondents’ travel costs. Finally, Grijalva et al. (2002) observe rock climbers on multiple occasions before and after the implementation of a policy for the management of rock climbing routes in natural parks in Texas, finding that pre-policy responses (a combination of actual and stated trips) are less price-responsive than post-policy behaviors. Our interpretation of the literature is that stated and actual trips may or may not exhibit a different degree of sensitivity to price and to changing other conditions, depending on the study and the context.

The coefficients on the site dummies are positive and significant. The magnitude of the coefficients indicates that people visit Garni more than Haghardzin, that Haghardzin is visited more than Khor Virap, and that in turn the latter is visited more than Tatev.

The coefficients on the scenario dummies suggest that people valued most highly programs that offer conservation *and* improve services like food and lodging, information centers, etc. for visitors, followed by programs that enhance the cultural experience of the visit. In practice, however, the coefficients on the dummies for the SERVICES and CULTURE scenarios are not statistically different from one another. They are, however, statistically different from the coefficient on the INFRASTR scenario.

This specification predicts that at Garni, for example, the average welfare change from the current situation to be 8,871 AMD for the culture-enhancing scenario, 6,458 AMD for the infrastructure-enhancing program, and 10,346 for the service-oriented program. (Once again, these are the averages of in-sample predictions for the visitors we interviewed on-site, not for the population of visitors at large.).

In specification II, the coefficients on the scenario dummies are very close to their counterparts in specification I, whereas somewhat larger differences are observed for the coefficients on the site dummies.<sup>21</sup> We also find that persons with a University degree visit somewhat less frequently (25% fewer times, all else the same), married individuals visit 37% more (about one visit a year, all else the same), and that age has a positive association with demand for trips, although its coefficient is significant only at the 10%.

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<sup>21</sup> A likelihood ratio test shows that adding individual characteristics of the respondents, as we do in specification II, improves the fit of the model significantly. The results of specification II are qualitatively similar to those of specification I.

Most important, the demand for trips is greater among persons who regard the cultural heritage site to be in good shape. Persons who hold this opinion visit about 52% more often—on average, 1.5 times a year more—than the others.

Table 8. Single-site travel cost model. Dependent variable: annual number of trips. Poisson model with on-site endogenous sampling. Maximum likelihood estimation imposing the restriction that the coefficient on price is -0.1263. N=1322.

	Specification I			Specification II		
	Coeff.	Std.error	T statistic	Coeff.	Std. error	T statistic
<i>Site dummies</i>						
TATEV	0.378584	0.063175	5.99259	0.136425	0.09453	1.4432
GARNI	0.981292	0.050782	19.3238	0.621339	0.093056	6.67707
HAGHARDZ	0.850836	0.05438	15.6463	0.526342	0.094028	5.5977
KHORVIRA	0.679794	0.054979	12.3645	0.271389	0.096033	2.826
<i>Scenario dummies</i>						
CULTURE	0.478936	0.057185	8.37526	0.467258	0.057245	8.16246
INFRASTR	0.383777	0.059311	6.47057	0.381805	0.059338	6.43442
SERVICE	0.533546	0.05642	9.4567	0.524222	0.056504	9.27762
<i>Price and income</i>						
PRICE	-0.1263	n/a	n/a	-0.1263	n/a	n/a
PCAPPINC	-4.11E-05	0.000228	-0.1808	0.000372	0.000246	1.5151
INCMISS	0.541384	0.141048	3.83829	0.349232	0.142306	2.4541
<i>Other individual characteristics</i>						
COLLEGE				-0.30248	0.044169	-6.84818
AGE				0.002846	0.001652	1.72246
MARRIED				0.322318	0.058058	5.55164
GOODSTATE				0.420202	0.050361	8.34379

## 7. Discussion and Conclusions

We have conducted a travel cost study with the purpose of placing a value on conservation of cultural monuments in Armenia. The study gathered information about trips to four cultural heritage sites—Garni, Haghartzin, Khor Virap and Tatev—by administering a carefully designed questionnaire to domestic visitors that were intercepted on site.

Our travel cost model of the actual trips to the sites pegs the coefficient on price at -0.1263. This implies that for the average visitor it would take an increase in price of 3000 AMD to see a decrease of one in the annual number of trips to the site. The surplus (what the average person is willing to pay, above and beyond what he spends to visit the site) at the current conditions is almost 22,000 AMD for Garni, 19,000 AMD for Haghardzin and Khor Virap and 13,850 AMD for Tatev.

Actual trips alone do not allow us to estimate the value of conservation works and other initiatives that would enhance the cultural experience of the visitor or make his trip more comfortable, as these programs do not currently exist. To circumvent this problem, we pool the actual trips with intended trips under hypothetical scenarios to estimate the value of public conservation and enhancement programs. In estimating our Poisson model (amended for the on-site nature of our sample), we restrict the coefficient on the price per trip to be equal to the value estimated from the Poisson model of actual trips. This is a somewhat novel approach that brings together the “discipline of the market forces” with the flexibility of questions about hypothetical circumstances.

We find that, all else the same, people equally value the scenario with improved tourist service and the scenario that enhances the cultural experience, and that these are valued a little more than the infrastructure-enhancing scenario. For example, within our sample the welfare change associated with implementation of the culture-enhancing scenario at Garni is 8,871 AMD. It is 6,458 AMD for the infrastructure-enhancing program, and 10,346 for the service-oriented program. These figures are equivalent to about 17, 12, and 20 US dollars, respectively, and are expressed on a per-year basis.

How do we extrapolate these figures to the *population* of domestic visitors? We wish to emphasize once again that by intercepting people on-site, we end up observing only people who have taken at least one trip for this year, and visitors that tend to be more avid than the average. First, we need to calculate the appropriate welfare measure for the average visitor in the population, which must then be multiplied by the number of people that visit each of the selected sites.

For illustrative purposes, we compute out-of-sample predictions for Garni using specification I in table 8, the monthly household income of the average Armenian—which we conservatively estimate this to be 21.28 US dollars, or a little less than half that in our sample<sup>22</sup>--and further assume that the cost of a trip to Garni for the representative domestic visitor is the same as the average in our sample. This time, since the prediction is for the population of domestic visitors, and not for the sample we intercepted on site, the appropriate formula for the consumer surplus is  $\lambda_i / (-\beta_2) = \exp(\mathbf{x}\beta_1 + p\beta_2) / (-\beta_2)$ , which pegs the value of access for the representative domestic visitor at 11,742 AMD a year.

We know from a companion CV survey of Armenian households that 11.80% of the respondents have visited Garni in the last year. Assuming that this percentage mirrors the population share, then the total consumer surplus is 3.1 million (population)  $\times$  0.72 (percentage adults in the population)  $\times$  0.1180  $\times$  11,742 AMD=3,093 million AMD (=6 million US dollars per year).

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<sup>22</sup> To arrive at this estimate, since the average annual income of an Armenian household was 1045 US dollars in 2001, we increased this figure by 10% to conservatively account for growth, divided it by 12, and further divided it by 4.5, the number of household members of the average Armenian households.

For the average visitor in the population, the welfare change for the public program with an emphasis on the cultural experience is 7,210 AMD, that for the infrastructure program 5,490 AMD, and that for the SERVICE program 8,270 AMD per year. When aggregated over the population of visitors—and ignoring those persons who start visiting the site after the conservation program is implemented—the total welfare change is thus 3.690 million US dollars a year for the cultural program, 2.800 million US dollars a year for the infrastructure program, and 4.230 million US dollars for the services program.

Clearly, these figures suggest that public programs that maintain, restore, and enhance the cultural experience at the monuments, or make it easier to get and spend time there, *are* highly valued by Armenian visitors. One interesting finding is that people value improved hospitality services. This leads to speculate that, although people do not spend much on food and lodging at the site now, they may do so in the future as they become wealthier and accommodations and eating establishments become increasingly available. Our survey respondents complained about the quality of many of the roads to the site, and indeed they would be prepared to pay for improved road quality, although not quite as much as they would be prepared to pay for programs that emphasize the cultural experience and tourist services.

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- (lxv) This paper was presented at the EuroConference on “Auctions and Market Design: Theory, Evidence and Applications” organised by Fondazione Eni Enrico Mattei and sponsored by the EU, Milan, September 25-27, 2003
- (lxvi) This paper has been presented at the 4<sup>th</sup> BioEcon Workshop on “Economic Analysis of Policies for Biodiversity Conservation” organised on behalf of the BIOECON Network by Fondazione Eni Enrico Mattei, Venice International University (VIU) and University College London (UCL), Venice, August 28-29, 2003
- (lxvii) This paper has been presented at the international conference on “Tourism and Sustainable Economic Development – Macro and Micro Economic Issues” jointly organised by CRENoS (Università di Cagliari e Sassari, Italy) and Fondazione Eni Enrico Mattei, and supported by the World Bank, Sardinia, September 19-20, 2003
- (lxviii) This paper was presented at the ENGIME Workshop on “Governance and Policies in Multicultural Cities”, Rome, June 5-6, 2003
- (lxix) This paper was presented at the Fourth EEP Plenary Workshop and EEP Conference “The Future of Climate Policy”, Cagliari, Italy, 27-28 March 2003
- (lxx) This paper was presented at the 9<sup>th</sup> Coalition Theory Workshop on "Collective Decisions and Institutional Design" organised by the Universitat Autònoma de Barcelona and held in Barcelona, Spain, January 30-31, 2004
- (lxxi) This paper was presented at the EuroConference on “Auctions and Market Design: Theory, Evidence and Applications”, organised by Fondazione Eni Enrico Mattei and Consip and sponsored by the EU, Rome, September 23-25, 2004
- (lxxii) This paper was presented at the 10<sup>th</sup> Coalition Theory Network Workshop held in Paris, France on 28-29 January 2005 and organised by EUREQua.
- (lxxiii) This paper was presented at the 2nd Workshop on "Inclusive Wealth and Accounting Prices" held in Trieste, Italy on 13-15 April 2005 and organised by the Ecological and Environmental Economics - EEE Programme, a joint three-year programme of ICTP - The Abdus Salam International Centre for Theoretical Physics, FEEM - Fondazione Eni Enrico Mattei, and The Beijer International Institute of Ecological Economics
- (lxxiv) This paper was presented at the ENGIME Workshop on “Trust and social capital in multicultural cities” Athens, January 19-20, 2004
- (lxxv) This paper was presented at the ENGIME Workshop on “Diversity as a source of growth” Rome November 18-19, 2004
- (lxxvi) This paper was presented at the 3rd Workshop on Spatial-Dynamic Models of Economics and Ecosystems held in Trieste on 11-13 April 2005 and organised by the Ecological and Environmental Economics - EEE Programme, a joint three-year programme of ICTP - The Abdus Salam International Centre for Theoretical Physics, FEEM - Fondazione Eni Enrico Mattei, and The Beijer International Institute of Ecological Economics
- (lxxvii) This paper was presented at the Workshop on Infectious Diseases: Ecological and Economic Approaches held in Trieste on 13-15 April 2005 and organised by the Ecological and Environmental Economics - EEE Programme, a joint three-year programme of ICTP - The Abdus Salam International Centre for Theoretical Physics, FEEM - Fondazione Eni Enrico Mattei, and The Beijer International Institute of Ecological Economics.



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