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Original article

Comparing cultural heritage values in South East Asia – Possibilities and difficulties in cross-country transfers of economic values

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Abstract

Benefit transfer refers to the transfer of economic values from a primary valuation study (study site) to a site where we need to conduct policy analysis (policy site). Due to the considerable costs and time required to conduct primary valuation studies, using benefit transfers to estimate the values for sites not yet valued is likely to attract policy interest. While benefit transfer is being increasingly applied in studies on environmental goods, its application in the field of cultural heritage resources is rare. The unique nature of these public goods, and differences in the size and demographic characteristics of the affected populations lead to a significant risk of benefit transfer providing irrelevant estimates for cultural heritage. In this study, we compared the results of two contingent valuation (CV) studies involving historic temples in Thailand and Vietnam, tested the validity and reliability of benefit transfers between the two sites, and explored the possibilities and difficulties in such transfers. We found that the error in transferring unadjusted mean willingness-to-pay (WTP) ranged from 46% to 129%. Adjustments for differences in purchasing power parity (PPP), income level and income elasticity between the sites substantially increased rather than decreased transfer errors in many instances. Function transfers did not perform better than unadjusted unit transfers. These results suggest that there are other important factors – possibly physical, cultural and institutional variables – that need to be taken into account in explaining the differences in WTP for cultural heritage aside from the usual income and socio-economic variables captured in CV studies. Until we are able to identify these other factors and measure their impacts, the potential policy use of benefit transfer in the case of cultural heritage goods remains limited.

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Keywords: Benefit transfer; Contingent valuation; Cultural heritage; Willingness-to-pay

1. Introduction

Benefit transfer refers to the transfer of economic values from a primary valuation study (study site) to a site where we need to conduct policy analysis (policy site). Due to the lack of time and resources to conduct primary valuation studies, benefit transfer is being increasingly used to assess environmental and health impacts in cost–benefit analyses of development projects and environmental programs and policies [1]. This has led to the need to assess the validity and reliability of

benefit transfers by conducting similar valuation studies (most often, contingent valuation (CV) studies) at different sites, both within and across countries. These benefit transfer validity studies have addressed a wide variety of environmental goods and health impacts: [2] and [3] tested benefit transfers for water quality improvements, within and across countries, respectively, and [4] conducted a benefit transfer test across two countries for acute respiratory illnesses from air pollution. Q1
 Meanwhile, [5] estimated and compared the benefits of agricultural wildlife management on peat meadow land, and [6] conducted a benefit transfer validity test involving the avoidance of health effects from water pollution. In a CV study conducted in five European countries, [7] measured and compared the benefits of avoiding respiratory illnesses related

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to air and water quality. [8] transferred the willingness-to-pay (WTP) for health-risk reductions while [9] tested the benefit transfer of mortality risk valuation, and [10] transferred the WTP for air pollution reduction caused by road traffic.

Benefit transfer studies in the field of cultural resources, however, are rare [11,12]. Errors in benefit transfers involving these public goods are potentially large due to differences between the study and policy sites (including the definition of the good itself, the extent to which it will change, and whether the good is of local, national, regional or global significance), differences in market characteristics (e.g., the size and other characteristics of the affected populations as well as socio-economic and attitudinal characteristics), differences in methodological variables (e.g., the elicitation format and payment vehicle in CV surveys, survey mode, response rate, and sample size), and other differences in cultural and political contexts [12,13].

Due to the unique nature of cultural heritage goods, the possibilities for benefit transfers seem to be limited. EFTEC [12] argued that economic values associated with cultural heritage assets are likely to be highly site and good-specific. It pointed out that geographical location is an important consideration in assessing the appropriateness of a study for transfer purposes. For instance, similar assets may be valued differently in different countries due to different cultural and historical associations. Another feature which is important in benefit transfer is whether the cultural heritage site is of national or international importance (which determines both the level of WTP per household and the number of households affected by a change in the quality/quantity of the good; see [12,13]).

In addition, the market characteristics of two cultural heritage goods are normally different. It is unlikely that the populations affected by the goods at the study and policy sites have identical characteristics especially in terms of size and demographic characteristics [14]. Socio-economic characteristics are also often different between countries, particularly when comparing a developing country with a more developed country [12,13]. Other issues associated with population and population characteristics that may have an impact on benefit transfer are the validity of transferring per household or per person values, the distinction between user and non-user values, and the distance from the good in question. For example, unit WTP estimates for users of cultural heritage assets are higher than those for non-users [15]. [16] argued that where a resource site generates use value, the density of its users will be higher near to the site. Furthermore, as users typically hold higher values than non-users, then we would expect average values to decay with increasing distance from the site.

From economic theory, one would expect individuals with higher incomes to have higher WTP values than those with low incomes. When using a Dichotomous Choice (DC) elicitation format in a CV study, we also expect the share of respondents willing to pay (and the probability of a respondent saying “yes” to paying) a particular price to decrease (increase) as the price they are asked to pay increases

(decreases). From an economic viewpoint, we would also expect that respondents would be willing to pay more for a larger amount of a desired good. This is referred to as a scope test, as we observe how WTP changes when the size or scope of a good changes [17].

It might be expected that respondents with positive attitudes towards the goods would be willing to pay more for it. However, respondents with positive attitudes may still refuse to pay due to strategic reasons such as budget constraints, etc. (see [18]).

CV studies employ different methodologies in terms of elicitation format, payment vehicle, survey mode, response rate, per individual vs. per household WTP, and so on, which can lead to different WTP results. Meta-analytical reviews of CV literature reveal some methodological patterns such as the Dichotomous Choice (DC) elicitation format producing higher WTP values than the Open-Ended (OE) or Payment Card (PC) formats, since the DC format may incur a ‘yea-saying’¹ problem [19,20]. One would expect that voluntary payments would yield higher WTP estimates than compulsory payments like taxes, since voluntary payments could lead to free-riding behavior [21]. Survey modes could also influence WTP estimates [22], but results from empirical comparisons of mail and in-person surveys are mixed. With regard to time of payment, one would expect that one-time payments would provide lower WTP estimates than (the present value of) annual or monthly payments, due to human discounting errors [23]. It is generally assumed that the higher the response rate, the lower the mean WTP estimates, since the survey would have captured more of the less interested respondents with lower WTPs [24]. Results are mixed when comparing per person and per household WTPs [25], but [26] found that, under strict conditions, household WTP was higher than individual WTP.

Noonan [27] conducted a meta-analysis of 65 CV studies in order to assess systematic patterns in the WTP estimates for cultural resources. He found that studies in the cultural field were generally consistent with expectations. Characteristics of the goods being valued as well as features of the survey methods influenced WTP estimates, e.g., the distribution of WTP estimates was influenced by survey design features, familiarity with the good, and whether the scenario involved more abstract goods. Contextual factors such as differences in cultural settings between countries may also influence WTP (e.g., see [9]). Thus, benefit transfers in the case of cultural heritage goods could lead to potentially large errors.

The aim of this study was to compare two CV studies on cultural heritage sites in Thailand and Vietnam, test the validity and reliability of benefit transfers between the two sites, and discuss the possibilities and difficulties in such transfers of values.

The structure of this paper is as follows: Section 2 presents the two surveys with their data, and compares them; Section 3 describes the results in terms of respondents’ attitudes and

¹ The tendency of some respondents to agree with an interviewer’s request regardless of their true views [28].

WTP for the preservation of cultural heritage, factors that affect their WTP, and transfer errors found in the validity testing; while Section 4 discusses the possibilities and difficulties in benefit transfers in the case of cultural heritage goods, and presents conclusions.

2. Description and comparison of the two surveys

Two CV surveys were conducted to estimate the economic benefits of preserving and restoring historic temple sites in Thailand and Vietnam, respectively. These two surveys had many similar design features, including asking the same attitudinal questions and using the same valuation scenario description, bid design, payment vehicle, and analysis coding system for the elicitation responses. This made it easier to isolate the effect on WTP from differences between the sites and the affected populations.

In the following sub-sections, we describe in detail the characteristics of each survey, present the primary results of the two surveys, and identify the similarities and differences between them.

2.1. The Thailand survey – historic temples in the central region of Thailand

The Thailand survey, conducted by Seenprachawong [29], was designed to investigate the preferences of individuals in the Bangkok Metropolitan Area (BMA) towards the preservation and restoration of historic temples in the central region of Thailand. These temples are considered to be the finest examples of Thailand's ancient cultural structures. The survey selected ten historic temples at risk of deterioration (listed in Appendix A). Text and photos were used to describe the current state of the temples, followed by a description of the proposed program to preserve and restore them. Photographs were used to illustrate the effect of the preservation program, which is essentially the good that the respondents were asked to value. Finally, the respondents were asked whether they were willing to pay for this preservation program in terms of voting “yes” or “no” to paying a stated amount (which was varied among sub-samples). After this referendum type DC CV question, respondents who were not willing to pay anything were asked to state their reasons. The questionnaire also included extensive sections with attitudinal and demographic questions.

Two payment vehicles were used; a one-time surcharge on income tax and a one-time voluntary donation. Voluntary payments encourage free-riding, as respondents have an incentive to overstate their WTP to secure provision and to reduce real payments once provision is secured [21]. To overcome this incentive incompatibility of the voluntary contribution payment vehicle, a matching grant was included in the hypothetical scenario. In addition, the questionnaire followed the approach of Cummings and Taylor [30], and included an explicit discussion on the hypothetical bias problem to reduce this bias (i.e., a “cheap talk” script). A secret ballot was used to reduce enumerator bias. Each respondent received a card that specified a predetermined

payment amount to which he/she was asked to answer “yes” or “no”. The card was then put in a sealed envelope to prevent the interviewer from knowing the respondent's answer. The survey sample group was split into four sub-samples, in order to test for the effect of different payment vehicles (tax vs. donation) on WTP, and to test for the scope effect (two temples vs. ten temples) on WTP also.

The survey was conducted in the BMA because it offered logistical advantages, and residents in the BMA could be assumed (based on general income and education levels) to have knowledge and attitudes that would be representative of other provinces in the central region of Thailand. In-person interviews were administered from January to February 2005. The number of households in the BMA was 1,703,128. With the help of the National Statistical Office, a stratified random sample was obtained from the Socio-Economic Status Survey population in the BMA. The BMA is divided into 48 strata. Each stratum is homogenous in the sense that it belongs to a specific district that includes similar surrounding environments. A simple random sample of 10–25 households was chosen from each stratum and a total of 800 households was selected for interviews from the 48 strata. For a proper comparison with the voluntary payment vehicle, this study screened out households that did not pay income tax (approximately 18% of the sample).

Out of the 800 households, 237 could not be located and 43 households refused to participate in the survey. Thus, 520 respondents were interviewed: 280 households were asked regarding their willingness to pay for ten temples and 240 households were asked for their willingness to pay for two temples. Half of the respondents in each of these two groups were asked if they would pay a one-time surcharge on their income tax, and the other half, a one-time donation to a trust fund.

The results showed that the survey did pass the scope test, indicating that the respondents would be willing to pay more for a greater number of temples. Meanwhile, the payment vehicle test showed that there was no significant difference in WTP between the two modes of payment, indicating that it did not matter if the payment vehicle was in the form of income tax or a donation. Therefore, we pooled the data of the two sub-samples when calculating the mean WTPs, which were approximately 204 Baht² (US\$5.09) and 251 Baht (US\$6.27) for two and ten temples, respectively.

2.2. The Vietnam survey – temples of the My Son world heritage site

The Vietnam survey, conducted by Tuan [31], was designed to estimate the economic benefits of preserving temples at My Son, a UNESCO world heritage site, located in Quangnam Province in the central region of Vietnam. This is a large complex of religious temples, originally consisting of more than 70 temples out of which only 25 remain today. According

² Exchange rates in February 2006: 1US\$ = 40 Thai Baht.

to the Global Heritage Fund [32], this unique site is now in a state of significant disrepair, and urgently requires restoration and preservation.

A stratified sample consisting of 250 households, representative of households in Quangnam Province, was obtained (see [33] for details of the selection procedure). In-person interviews were conducted in August 2005. Nine respondents refused to be interviewed, which gave a net sample of 241 respondents.

The questionnaire began with a series of questions posed to obtain information about respondents' perceptions and attitudes towards the My Son temples. These attitudinal questions were identical to the Thailand questionnaire. Then the respondents were presented with the valuation scenario of the temples, consisting of a description of the site in terms of text, maps, and photos. The respondents were provided with background information on the current condition of the site and a status quo scenario where the deterioration would continue due to insufficient resources for preservation. Then, the proposed preservation plan and its effect were presented. The respondents were told that the plan would improve the condition of the My Son temples and preserve the site for the future. (See [33] for details of the valuation scenario describing the goods the respondents were asked to value.)

A one-time increase in tax was used as the payment vehicle. Since Vietnamese respondents were not familiar with the referendum type format³, an adapted DM format⁴ found to work well in Vietnam was used. As in the Thai instrument, four price levels in local currency were used. After the valuation section, debriefing questions were asked in order to determine what motivated the respondents' willingness or refusal to pay. The questionnaire also included socio-economic data such as gender, age, education, employment status, and income. The mean WTP for preserving the My Son temples was found to be 43,495 VND⁵ (US\$2.74).

2.3. A comparison of the two surveys

In a DC⁶ CV study, a general valuation function would be in the form of:

$$\text{Prob.}(\text{yes_to_pay}) = \beta_0 + \beta_1 X_i + \beta_2 C_i + \beta_3 A_i + \beta_4 S + \beta_5 M_s + \beta_6 Q_s + \varepsilon$$

where Prob.(yes_to_pay) is the probability of saying "yes" to paying the bid (amount) X.

³ In the past 60 years, no referendum has been conducted in Vietnam [34].

⁴ The survey in Vietnam adapted the dissonance-minimizing (DM) format proposed by Blamey et al. [19] for the survey questionnaire. The DM format is actually an extension of the DC format and allows respondents to choose from multiple reply options, rather than having just the discrete option of voting "yes" or "no" towards supporting the protection or provision of a public good (see Appendix C for details).

⁵ Exchange rates in February 2006: 1US\$ = 15,900 VND.

⁶ Though the Vietnam survey used the DM format, the results of the DM question were coded in discrete choice style (i.e., option "yes" was coded as "yes" while other options were coded as "no") in the data analysis.

Here it depends on:

X_i = the bid amount respondent i is asked to pay,
 C_i = the socio-economic characteristics of respondent i (including income),
 A_i = attitudes of respondent i ,
 S = availability and quality of substitute sites,
 M_s = methodological characteristics of survey s ,
 Q_s = site characteristics of the good being valued in survey s ,
 β_j ($j = 0, 6$) are sets of parameters, and
 ε is the random error.

In stated preference surveys like CV, only the first three variables (X_i , C_i , and A_i) are usually included in the valuation function. However, when performing benefit transfers, we also need to consider the two categories of variables, M_s and Q_s .

Tables 1, 2, and 3 summarize and compare the two surveys with respect to these groups of variables: characteristics of the goods, characteristics of the two markets, and methodological variables of the two surveys, respectively.

As shown in Table 1, the characteristics of the two goods are not identical. The differences include number of the public goods, their location and their geographical level of significance. In the Thailand survey, the good being valued was the conservation program for the ten (and two) temples at risk of deterioration and these temples were located in different provinces in the central region of Thailand whereas in the Vietnam survey, My Son was a large complex of (25 remaining) temples, located within a small area. With respect to the level of significance, the temples in Thailand can be considered as national public goods, while the My Son temples in Vietnam are both national and global public goods (since My Son is on the UNESCO list of world heritage sites).

Table 2 compares the characteristics of the two markets. In the Thailand survey, Bangkok residents were asked about their WTP for the preservation of historic temples in the central region of Thailand, while in Vietnam, we asked people in Quangnam Province about their WTP for preserving temples in the same province. This means that the populations selected for these two surveys were different with respect to geographical scope.

Regarding distance from the goods, the Thailand survey respondents were located in Bangkok, which was about 300 km away from the goods in question. In the Vietnam survey, the respondents were located in the same local province as the My Son temples. If there is a distance decay effect, one would expect the Vietnam survey to yield higher WTP estimates than the Thailand survey, all other things being equal.

Table 2 also presents the socio-economic characteristics of the respondents of the two surveys. The Thailand sample group was younger, more educated, and had much higher reported incomes than the Vietnam sample. The reported average monthly household income (converted into a common currency, US\$) of the Thai respondents was nearly eleven times higher than that of Vietnamese respondents. If we use

Table 1
A comparison of the characteristics of the goods valued in the two surveys.

Selection criteria	Thailand survey	Vietnam survey
Description of the goods	This survey selected ten historic temples at risk of deterioration as the goods to be valued. Located in different provinces in the central region of Thailand.	My Son is a complex of religious temples, of which 25 remain today. Located in Quangnam Province in the central region of Vietnam.
Valuation scenario	From the status quo (i.e., the current state of historic temples at risk of deterioration) to a proposed preservation program to preserve and restore these temples.	From the status quo (i.e., the current condition in that the deterioration continues) to a proposed preservation plan to preserve and restore the site.
Level of significance	National public goods (these historic temples are considered to be the finest examples of ancient cultural structures in Thailand).	National and global public goods (a UNESCO world heritage site).

Purchasing Power Parity (PPP) to adjust the income levels in the two countries, the difference is reduced to about seven times. However, if we use PPP at the city/site specific level (Bangkok and Quangnam Province), the difference is considerably increased up to 55 times. The difference in absolute income levels between the two samples coupled with other differences in the socio-economic characteristics of the two surveys could have significantly affected the respective WTP results and therefore, would similarly compromise the accuracy of a benefit transfer between the two surveys.

Table 3 compares the study design of the two surveys. In Thailand, both tax and donation were used as payment vehicles, but the results showed that there was no significant difference in WTP between these two payment vehicles. In Vietnam, however, all the respondents were asked their WTP in terms of a tax.

In Thailand, individual respondents were asked if they themselves would be willing to pay (to preserve the temples), while in Vietnam the household head was asked if his household would be willing to pay. One would expect that the WTP of an individual would be lower than the WTP of a household. Thus, using individual WTPs to predict household WTPs would be expected to yield underestimates.

In terms of elicitation format, the Thailand survey used a referendum DC format while in Vietnam, the dissonance-minimizing (DM) format (from Blamey et al. [19]) was used. According to [19], the DM format allows respondents to express multiple attitudes in the CV questions in order to reduce their dissonance. This format is thus expected to reduce yea-saying (commonly arising in the DC format), thereby producing lower WTP estimates. The difference in political context between the two countries (where Vietnamese are not used to referenda) thus affected the choice of the elicitation format.

With respect to sensitivity to scope, only the Thailand survey tested this and found that the WTP was significantly higher for ten than for two temples. The question to consider here is whether the 25 temples at the My Son site are more comparable to the two temples at the two sites in Thailand, or the ten temples at the ten sites in Thailand.

Although many differences were found between the two surveys, we also found similarities between them. The latter were: (i) the scenario description (from the status quo to

a proposed preservation program), (ii) the direction of change (WTP for an improvement), (iii) the payment vehicle (tax), (iv) the funding mechanism (special fund solely for the preservation of the temples in question), (v) the time of payment (one-off payment), (vi) the analysis coding system for the elicitation responses⁷ (binary, discrete choice), and (vi) the number of price levels (4 amounts). See Tables 1–3.

In Table 4, we list out the differences between the two surveys, and how they are expected to affect the WTP results of each. The net effects of these differences are, however, difficult to predict as we cannot ascertain the magnitudes of the expected positive and negative effects on the WTPs, and cannot even predict the direction of some effects. If we perform a benefit transfer between these two cultural heritage surveys without accounting for these differences (i.e., do a naïve transfer), the transferred WTP estimates could be potentially irrelevant or useless. Factors affecting the estimates in different directions could cancel one other out and provide lower transfer errors. Even adjustments for only a few of these factors might not provide a more accurate estimate as other factors would still be present.

In the following sections, we compare the results of the two surveys and test the validity and reliability of different methods of benefit transfer between them.

3. Results

3.1. Public attitudes towards the preservation of cultural heritage

Table 5 presents the responses to five attitudinal statements, sought to uncover the respondents' underlying motives for supporting the preservation of cultural heritage temples. The first question asked the respondents was how important it was to preserve cultural heritage temples so that they and their families could visit them ("now"). This question was intended to reveal whether the respondents had any direct use for the temples. About 79% and 89% of the respondents agreed with

⁷ As explained in [19], the DM format provides respondents with many options to select from Appendix C. For the data analysis, option "yes" was coded as "yes" while other options were coded as "no" (i.e., discrete choice style).

Table 2

A comparison of population characteristics of the two surveys.

Selection criteria	Thailand survey	Vietnam survey
Respondents	Non-local residents (Bangkok residents), household survey.	Local residents (residents of Quangnam Province), household survey.
Distance from the site	About 300 km	Within 100 km
Sex (1 for male, sex = 0 for female); Mean (std. dev.)	0.49 (0.50)	0.49 (0.50)
Age (the respondent's age in years); Mean (std. dev.)	34.06 (12.32)	43.18 (11.09)
Education (the respondent's number of years at school); Mean (std. dev.)	13.54 (4.25)	9.14 (3.51)
Income (reported monthly household income in US\$); Mean (std. dev.)	782.45 (628.83)	71.37 (47.47)
Adjusted income (PPP-adjusted ^a monthly household income (US\$))	2462	349
Number of respondents (<i>N</i>)	520	241

Note: ^aGDP/capita in 2005 for Thailand and Vietnam were US\$8368 and US\$3025, respectively. Nominal GDP/capita in 2005 for Thailand and Vietnam were US\$2659 and US\$618, respectively (Source: IMF 2005). Thus, the adjustment factors (equal to PPP-adjusted GDP per capita/Nominal GDP per capita) were 3.15 and 4.89 for Thailand and Vietnam, respectively. The monthly household incomes at PPP-adjusted exchange rates were calculated by multiplying the reported monthly household incomes with the adjustment factors.

this statement for the Thailand and Vietnam surveys, respectively.

Another probing statement on the non-use values of respondents was as follows: "It is important to have these temples so that other people can visit them now". Agreement with this statement would suggest that a historic temple was recognized for its non-use values (option and existence/altruistic values). Most of the respondents in both surveys agreed with this statement.

Bequest value is a type of option value which captures the belief that even if we do not use our cultural assets now, we have a duty to pass them on to our children so that they can benefit from them. Nearly all the respondents in both surveys agreed with the statement on this, indicating that they believed that historic temples were of value because of the benefits they could provide to future generations.

The other statements sought to uncover whether the respondents felt that historic temples had "existence value" and therefore, that they had a duty to protect them. The majority agreed that they did have such a moral duty.

It is worth noting that among the five attitudinal statements (in Table 5), nearly all the respondents agreed with the last four in both the Thailand and Vietnam surveys (there were no significant differences in these statements between the two surveys). However, a lower percentage of Thai respondents agreed to the first statement (there was a significant difference in this statement between the two surveys), which was on the use values of the temples. This significant difference could be explained by the fact that Thai respondents had more substitute sites to visit than the Vietnamese respondents. The former were residents of Bangkok, living far away from the historic temples in central Thailand. Thus, they had more cultural heritage sites to visit than just these temples. Conversely, the Vietnamese respondents were locals living quite close to the My Son temples in the same province. Thus, My Son would, in all likelihood, be their first choice if they wanted to visit a cultural heritage site. The lack of availability of substitute sites would reasonably lead to higher WTP estimates in the Vietnam survey as compared to the Thailand survey, all other things being equal.

Table 3

A comparison of methodological characteristics of the two surveys.

Selection criteria	Thailand survey	Vietnam survey
Payment vehicle	Increase in income tax, and voluntary donation in split samples.	Increase in income tax.
Choice mechanism	Individual decision to vote "yes" or "no" (individual's WTP).	Family decision to choose option "yes" or "no" (household's WTP).
Funding mechanism	Special fund solely for the preservation of temples at risk in the central region of Thailand.	Special fund solely for the preservation of the My Son temples.
Time of payment	One-time payment	One-time payment
Elicitation format	DC (binary, discrete choice)	DM (coded as binary, discrete choice)
Stated prices in local currencies	50; 100; 200; and 500 Thai Baht (4 amounts)	5000; 20,000; 50,000; and 100,000 VND (4 amounts)
US\$ equivalent	1.25; 2.5; 5.0; 12.5	0.31; 1.26; 3.14; 6.29
PPP-adjusted prices in US\$	3.93; 7.87; 15.74; 39.34	1.52; 6.17; 15.37; 30.79
Scope test	Yes; 2 temples vs. 10 temples at different sites.	No; One site (a complex) with many temples.

Note: Exchange rates in February 2006 were 1US\$ = 40 Thai baht and 1US\$ = 15,900 VND.

Table 4
List of factors expected to affect the WTP results in the two surveys.

1. Factors that could contribute to a *higher* WTP in the Thailand survey compared to the Vietnam survey.
 - Income (both actual and PPP-adjusted).
 - Education (which could be proxies for income and knowledge of/interest in cultural heritage).
 - Referendum DC vs. DM format (as [19] argued, the DM format can reduce the yea-saying problem that may occur in the DC format, and provide lower WTP).
2. Factors that could contribute to a *lower* WTP in the Thailand survey compared to the Vietnam survey.
 - Level of significance (national public goods vs. global public goods).
 - Distance from the site (about 300 km vs. within 100 km), i.e., the distance decay effect on WTP.
 - Availability of substitute cultural heritage sites.
 - Choice mechanism (individual's WTP vs. household's WTP).
3. Factors with *unknown* direction of effect on WTP.
 - Knowledge and attitude characteristics.
 - Other socio-economic characteristics (gender, age).

3.2. Determinants of the WTP

The respondents' WTP was modeled using logistic regression with the bid amounts and socio-economic variables as the explanatory variables for whether people said "yes" or "no" to paying the stated amounts. This is the common approach taken in CV studies to test the validity of WTP results by examining how well a model corresponds to economic theory whereby individuals with higher incomes are expected to have a higher WTP than those with lower incomes. Table 6 reports the results of the logit models.

As expected, the relationships between WTP responses and some socio-economic respondent characteristics were found to be logical and in line with economic theory. The bid variable was negative and significant in all the models, indicating that the probability of saying "yes" to paying decreased as the amount stated (i.e., the price) increased. Income was positive and significant in all the models, suggesting that a respondent with higher income had a higher probability of answering "yes" to paying. Education was also positive in all the models and significant (at 10% level) in the Vietnam study and pooled models, implying that the probability of a "yes" response was higher for a respondent with 12 years of schooling or more. Education might be a proxy for income as well as for increased knowledge about and interest in cultural heritage sites. The results showed that the respondents' attitude was positive, but significant (at 10% level) only in the Vietnam survey. Other socio-economic variables such as sex and age were not significant.

3.3. Mean WTP and WTP as a fraction of income

Table 7 reports the WTP estimates from the two surveys. Mean WTP values were computed using the sample means of all variables in the logit models. As mentioned earlier, the

Thailand study performed two methodological tests: the payment vehicle test and the scope test. As the null hypothesis of equality between tax and donation payment failed to be rejected, we pooled the data of the two sub-samples for further analysis. It was also found that respondents would pay significantly more for ten than for two temples – this passed the between-sample scope test.

It was observed that the WTP values constituted a much smaller part of annual household income in the Thailand survey compared to the Vietnam survey, but this could be due to the fact that the former asked for individual WTP whereas the latter asked for household WTP.

3.4. Analysis of the income elasticity of WTP

The income elasticity of the WTP (ϵ_{WTP}) was calculated using the following equation:

$$\epsilon_{WTP} = \frac{y}{WTP} * \frac{\partial WTP}{\partial y}$$

For the Thailand survey, the estimated income elasticity of the WTP (ϵ_{WTP}) was 0.28, which is greater than zero but smaller than unity (1). This means that the good in question was income inelastic and therefore, the WTP was not very sensitive to changes in income. This suggests that improvements in cultural heritage goods would be relatively more attractive/meaningful to low-income people rather than to high-income people.

For Vietnam, the income elasticity of the WTP was 3.67, which is greater than unity, and thus, income elastic. This implies that cultural heritage is a luxury good⁸ for people at the respondents' income level. This result might be reasonable in view of the fact that the survey respondents were the locals of Quangnam Province, which is a poor province in Vietnam with a reported monthly household income of about US\$70 and a GDP per capita of about 35% of the national average [35]. For this poor local population, a visit to a cultural heritage site might well be viewed as a luxury good.

The income elasticity of the Vietnam survey is much larger than the elasticities reported by Kriström and Riera [36] and Hokby and Soderqvist [37]. [36] estimated the income elasticities of WTP for environmental improvements from a number of European data sets. They found that the income elasticity of WTP was consistently less than one, with a few exceptions. [37] presented 21 estimates of the income elasticity of WTP for environmental services in Sweden ranging between -0.71 and 2.83. However, our results (3.67) are fairly close to the results of Navrud and Vondolia [38] of 2.99. In addition, [38] found the income elasticity of WTP for environmental protection to be very high for poor local residents in

⁸ Theoretically, luxury goods are defined in reference to income elasticity of demand, not of WTP, and thus, we should use this term with caution. The term "luxury good" or "normal good" is, however, used quite often in studies that investigate the income elasticity of WTP for environmental goods (e.g., [37,36]).

Table 5
Respondents' attitudes towards the importance of cultural heritage.

Variables and values	Description	Thailand mean (std. dev.)	Vietnam mean (std. dev.)	t-test (p-value)
Attitude1 (use value)	It is important to have these sites so that you and your family can visit them now (1 = yes, 0 = no).	0.79 (0.40)	0.89 (0.31)	0.000
Attitude2 (non-use)	It is important to have these sites so that other people can visit them now (1 = yes, 0 = no).	0.99 (0.10)	0.97 (0.18)	0.077
Attitude3 (bequest)	It is important to have these sites so that future generations can visit them (1 = yes, 0 = no).	0.98 (0.14)	0.99 (0.09)	0.213
Attitude4 (existence)	It is important to have these sites because they inspire pride in our heritage (1 = yes, 0 = no).	0.98 (0.12)	0.97 (0.18)	0.537
Attitude5 (existence)	It is important to have these sites to remember events in history (1 = yes, 0 = no).	0.97 (0.16)	0.98 (0.11)	0.230

Ghana (1.77–2.99) and below unity (0.17–0.84) for a high-income population (foreign tourists).

The above income elasticities of WTP for Vietnam and Thailand were calculated at the mean income levels in each country. Since the income levels in the two countries are very different, this could explain the difference in elasticities. We therefore calculated and compared the elasticities at a common income level⁹, which was somewhat lower and much higher than the average incomes for Thailand and Vietnam, respectively. Using a common income level, we found that the income elasticities of WTP were reduced to 0.27 and 1.62 for the Thailand and Vietnam surveys, respectively. Even if the income elasticity of Vietnam is much smaller at this higher, common income level, and within the range of elasticities found in other studies, there is still a large difference between the two countries. Thus, there must be other factors than income level that should be considered in explaining the difference in elasticities. This also suggests that adjusting for differences in income level only, which is common in practice, will not be sufficient to avoid transfer errors in cultural heritage benefit transfers.

3.5. Benefit transfer tests

In this section, we report on tests conducted on the validity and reliability of unit value transfers and function transfers of WTP estimates between the two sites.

3.5.1. Equality of unit value transfers and functional transfers

We used a *t*-test to examine whether mean WTP values were the same in the two surveys and the likelihood ratio (LR) test to investigate the equivalency of the coefficients of the estimated WTP functions (presented in Appendix C).

For unit value transfers, the results (Table 8) showed that mean WTP values (at the PPP-adjusted exchange rate) were not significantly different when we transferred values from Vietnam to Thailand (with two temples) and vice versa.

⁹ A common income level is the range of income (converted into US\$ at a PPP-adjusted exchange rate) that respondents of the two surveys have in common. In order to obtain the common income level, we removed observations that were out of this range from both surveys.

However, the mean WTP values in the other cases were significantly different. For function transfers, the results of the LR-test indicated that the null hypothesis of equal WTP functions was rejected at the 1% level in all cases.

3.5.2. Transfer errors

The general definition of transfer error (TE) is:

$$TE = \left[\frac{\widehat{WTP}_s - WTP_p}{WTP_p} \right] * 100$$

where WTP_p is the mean WTP of the policy site; and WTP_s is the mean WTP of the study site. (See Appendix C for how to calculate the transfer errors when conducting adjusted unit value transfers and valuation function transfers.)

Table 9 shows that transfer errors varied greatly, depending on the techniques used in the benefit transfer. Transfer errors ranged from 46% to 129%; 13% to 208,576,416%; and 91–705% for naïve unit value transfers, unit value transfers with income adjustments, and function transfers, respectively.

For the unit value transfers with income adjustments, transfer errors could be extremely large, dependent on the income elasticity of WTP used. In the standard case, with income elasticity assumed to be 1 (i.e., unity), transfer errors varied between 79% and 4524%. However, since we found that the income elasticities (in this study) differed from unity, we used the actual elasticities instead. We considered two approaches in the calculation of the elasticities: (i) calculating at the mean income level in each country, and (ii) calculating at a common income level. We also investigated the effects of using the income elasticity at the study site as well as the income elasticity at the policy site. Even though in most real benefit transfer exercises, only the elasticity at the study site would be known, the policy site elasticity could be a better predictor of how the WTP would change at the policy site, especially if this elasticity was calculated at the same income level as the study site that the WTP value was transferred from.

Using the income elasticity at the *study site*, we found that transfer errors were substantially reduced when using the elasticity calculated at a common income level compared to when it was calculated at the absolute mean income level in each country. The same was true for the case where we used

Table 6
Estimated parameters of the logit models.

Variables	Description	Thailand coefficient (<i>p</i> -value)	Vietnam coefficient (<i>p</i> -value)	Pooled coefficient (<i>p</i> -value)
Constant		0.109 (0.859)	−8.030 (0.000)	0.342 (0.467)
Bid	Bid amounts	−0.068 (0.000)	−0.126 (0.000)	−0.075 (0.000)
Male	If respondent is male	−0.240 (0.230)	0.263 (0.647)	−0.055 (0.737)
Age	The respondent's age	−0.010 (0.274)	0.015 (0.616)	−0.005 (0.512)
Education	Years of schooling (edu ≥ 12)	0.423 (0.158)	1.318 (0.062)	0.404 (0.060)
Income	Respondent's income	0.0002 (0.000)	0.019 (0.000)	0.0002 (0.000)
Attitude	Respondent's attitude	0.529 (0.209)	1.646 (0.104)	0.258 (0.422)
<i>Summary statistics</i>				
Log-likelihood		−303.63	−64.04	−438.19
Pseudo- <i>R</i> ²		0.16	0.64	0.17
Chi-squared		113.38	233.55	161.24
No. of observations		520	231	751

Note: The LR-test was used to see whether the two surveys originated from one and the same underlying sample. Towards this purpose, the two data sets were pooled and the logit model was estimated for the data set as a whole. The outcome of the LR-test led us to reject the null hypothesis that data from the two surveys could be pooled in the same model. However, we included this pooled model in our study because it had to be used to reject/accept the null hypothesis of equality of function transfer (Hypothesis 3), described in Appendix C.

the income elasticity at the *policy site*, although the reduction of transfer errors was somewhat lower. Thus, our expectations in terms of reduction in transfer errors were supported. Unexpectedly, exchange rates with national PPP-adjustments provided lower transfer errors than city-specific PPP-adjusted exchange rates. We also derived the income elasticities of WTP that enabled a perfect prediction of WTP at the policy site (i.e., zero transfer error) to be made.

The results (Table 10) showed that the income elasticities of WTP that would give zero transfer error varied from 0.04 to 0.16, depending on whether the WTP estimate was derived from the Thailand sub-samples (for two or ten temples) and whether we used the PPP-adjusted exchange rate at the national average or city-specific income level. This means that if the income elasticities of the two sites are close to zero and the difference in income elasticities between the two surveys is small, we could obtain a perfect transfer of WTP from the study site to the policy site. This also shows that the naïve unit value transfer (which implicitly assumes a zero income elasticity) is a simple, and in many cases, more reliable value transfer technique than the more advanced unit value transfers described above, especially when the latter are based on the income elasticity at the study site which is commonly used in benefit transfers.

The results showed that transfer errors clearly reduced when we moved from using the income elasticity at the study

site to using the income elasticity at the policy site. Thus, if we use the income elasticity at the study site in a benefit transfer, this could lead to serious biases in the transferred estimates. If the income elasticities of the two sites were closer, however, then the income elasticity of the study site would be a good predictor for the income elasticity at the policy site.

A comparison between unit value transfers and function transfers showed that unit value transfers of unadjusted mean WTPs and adjusted mean WTPs, using the income elasticity at the policy site, produced lower transfer errors than functional transfers of the same. However, unit value transfers of adjusted mean WTPs, using unity income elasticity and the income elasticity of the study site, resulted in substantially higher transfer errors than function transfers in the same scenarios.

The overall range of transfer errors in this study is considerably higher compared to that found in similar benefit transfer validity tests involving environmentally related health effects. Alberini et al. [39] transferred U.S. WTP estimates to avoid an episode of ill health to Taiwan, and found an average transfer error across four different possible transfers of 34% (calculated by Ready and Navrud [13]). Meanwhile, Chestnut et al. [40] transferred the U.S. estimates of median WTP to Bangkok, Thailand, and found transfer errors ranging from 18% to 35%, depending on the ill-health episode valued (cited in [13]). Barton and Mourato [6] found transfer errors of 87–130% when transferring WTP values to avoid ill health episodes from Portugal to Costa Rica, and Abou-Ali and Belhaj [10] transferred the WTP values for air quality improvements from Morocco to Egypt and found transfer errors of 60–220%.

Ready and Navrud [13] reviewed cross-country benefit transfer studies conducted to date and found that the average transfer error for cross-country benefit transfers was in the range of 20–40%, while individual transfer errors were as high as 100–200%. Thus, the lowest transfer errors observed in our study on cultural heritage are of similar magnitude as those found in cross-country benefit transfers in Europe and the U.S. for environmental goods and health impacts.

Table 7
Mean WTP estimates (US\$).

	Thailand		Vietnam
	2 Temples	10 Temples	
Mean WTP (non-adjusted exchange rate), US\$	5.09	6.27	2.74
Mean WTP (PPP-adjusted exchange rate), US\$	16.03	19.72	13.39
WTP as a percentage of income (%)	0.05	0.07	0.32

Table 8
Results of validity testing based on the *t*-test and LR-test.

	Thailand (2 temples)	Vietnam	Thailand (10 temples)	Vietnam
Unadjusted mean WTP (unit value transfer; <i>t</i> -values (and <i>p</i> -values))	5.71 (0.01)	−3.43 (0.01)	8.55 (0.01)	−6.23 (0.01)
PPP-adjusted mean WTP (unit value transfer; <i>t</i> -values (and <i>p</i> -values))	1.34 (0.09)	−1.22 (0.11)	3.20 (0.01)	−3.55 (0.01)
Functional transfer (LR (and <i>p</i> -values))	177.28 (0.01)	177.28 (0.01)	198.54 (0.01)	198.54 (0.01)

Note: The figures in bold mean that we could not reject the null hypothesis that there was no significant difference (at the 5% level) in mean WTPs between the two surveys.

4. Possibilities and difficulties in benefit transfers involving cultural heritage goods

Two hypotheses that benefit transfer studies in the field of environmental economics generally support are: (1) the more

Table 9
Results of benefit transfers in terms of transfer errors (TE).

Transfer methods	Policy site	TE (%)	
		2 Temples	10 Temples
Unadjusted mean WTP	Thailand	−46	−56
(Naïve unit value transfers)	Vietnam	86	129
Adjusted mean WTP (Unit value transfers with income elasticity of 1)	Thailand – NAER ^a	489	379
	Vietnam – NAER	−83	−79
	Thailand – CSER ^b	4524	3659
	Vietnam – CSER	−98	−97
Adjusted mean WTP (Unit value transfers with income elasticity calculated at mean income levels in each country (0.28, 3.67); using income elasticity at the study site)	Thailand – NAER	108,143	87,888
	Vietnam – NAER	−31	−15
	Thailand – CSER	208,576,416	169,547,646
	Vietnam – CSER	−61	−52
Adjusted mean WTP (Unit value transfers with income elasticity calculated at a common income level (0.27, 1.62); using income elasticity at the study site)	Thailand – NAER	1885	1514
	Vietnam – NAER	−29	−13
	Thailand – CSER	56,109	45,592
	Vietnam – CSER	−59	−50
Adjusted mean WTP (Unit value transfers with income elasticity calculated at mean income levels in each country (0.28, 3.67); using income elasticity at the policy site)	Thailand – NAER	44	17
	Vietnam – NAER	−100	−100
	Thailand – CSER	157	109
	Vietnam – CSER	−100	−100
Adjusted mean WTP (Unit value transfers with income elasticity calculated at a common income level (0.27, 1.62); using income elasticity at the policy site)	Thailand – NAER	41	14
	Vietnam – NAER	−95	−94
	Thailand – CSER	144	98
	Vietnam – CSER	−100	−100
Function transfer	Thailand	705	554
	Vietnam	−91	−91

Notes: ^aNAER = PPP-adjusted exchange rate at the national average income level; ^bCSER = PPP-adjusted exchange rate at the city-specific income level, with the GDP/capita of Bangkok in 2005 at 2.74 times higher than the Thailand national average (Source: www.nesdb.go.th) and the GDP/capita of Quangnam in 2005 equal to 0.35 times that of Vietnam's national average [35].

similar the study site and the policy site, the higher the validity of the benefit transfer; and (2) the more information is being used in the benefit transfer, the better will it predict values at the policy site [1]. The former refers to similarities in terms of the definition of the good itself, the level of its provision, the extent to which it will change, and the affected population while the latter advocates the use of functional transfers as opposed to unit value transfers. Rosenberger and Phipps [41] argue that functional transfers can reduce generalization errors compared to unit value transfers. This is due to functional transfers enabling the calibration of the function to take differences between the study site and the policy site into account.

As [12] argued, cultural heritage goods are highly heterogeneous; one is unlikely to find two cultural heritage sites that are exactly the same. Each cultural heritage site has its own distinctive features or uniqueness in terms of physical characteristics. It is thus unlikely that a perfect match can be found between a study site and a policy site. In addition, the valuation studies on cultural heritage goods so far have been heterogeneous in nature and limited in number (about 60 valuation studies on very different cultural heritage goods; see [32]).

This study found that there was a significant difference in the income elasticities of WTP between the two surveys in Thailand and Vietnam. This can be partly attributed to differences in the income levels. In other words, if the income levels in the two countries were similar, the difference in their income elasticities of WTP would be smaller (although still significant). It is clear that there are factors other than income that are needed to explain the difference in WTP. This makes it difficult to conduct a benefit transfer between the two countries as income (in terms of e.g., GDP per capita) is the one

Table 10
Calculations of income elasticities of WTP when transfer error equals zero.

Policy site	2 Temples	10 Temples
Thailand – NAER ^a	0.08	0.16
Vietnam – NAER	0.08	0.16
Thailand – CSER ^b	0.04	0.10
Vietnam – CSER	0.04	0.10

Notes: ^aNAER = PPP-adjusted exchange rate at the national average income level; ^bCSER = PPP-adjusted exchange rate at the city-specific income level.

variable that we usually have statistics on at the policy site and can adjust for.

We also found that using the income elasticity at the *study site* in the transfer led to serious biases in the transferred WTP estimates. This is a weakness of benefit transfers, since in most cases (where a primary valuation study at the policy site has not been conducted), one would only have and use the income elasticity derived at the study site (or unity income elasticity) in the transfer, while the theoretically correct value to use would be the income elasticity at the policy site. Using mean WTPs, which are PPP-adjusted (at the national average income level) for differences in income level, and using the income elasticity at *policy site*, yield much lower transfer errors than when using study site elasticity, but only slightly lower errors compared to using unadjusted WTPs.

Thus, in practice, when the income elasticity at the policy site is not available, an unadjusted unit transfer would be the best method. This is especially so since we also found that function transfers produced larger transfer errors than the two unit transfer methods (using adjusted and unadjusted WTPs). This latter result implies that the more information is used in a benefit transfer, the less robust will be the validity of the results. This is inconsistent with results observed in benefit transfer studies in environmental economics – [42–44,5] found that functional transfers outperformed unit value transfers.

A feasible explanation for our finding would be the considerable differences between the two sites in question in terms of physical and market characteristics. Physical differences across sites are a typical challenge for benefit transfers involving cultural heritage goods. For environmental goods, as [41] argued, a gain in accuracy in functional transfers compared to unit value transfers may be more a function of similarities of the sites than the calibration of site characteristics in the functional transfers. This is because WTP functions in valuation studies usually include only variables measuring socio-economic characteristics of the respondents (including income) and not physical characteristics of the site (because these characteristics are constant in individual models). However, these physical characteristics are important for calibrating values across sites (see [41]).

As we have discussed, physical differences across cultural heritage goods are likely to be larger than for both environmentally related health impacts and environmental goods. This makes it more difficult to capture these physical differences in benefit function transfers involving cultural heritage goods. Thus, even if we make more corrections for differences in income and socio-economic characteristics, transfer errors would not be reduced but could rather increase since we are not at the same time correcting for other important differences between the sites.

To conclude, benefit transfers involving cultural heritage goods can be highly unreliable due to the lack of knowledge about which factors affect the WTP for a heterogeneous group of cultural heritage goods, and the lack of data on factors that we know do influence WTP (such as the income elasticity of WTP at the policy site). If one still decides to perform transfers,

our results suggest that one could do just as well (or badly) by performing a simple unadjusted unit value transfer rather than attempting the more complex benefit transfer methods. The results of this study imply that benefit transfers will not provide accurate WTP estimates for cultural heritage goods to be used in cost–benefit or other policy analyses until we have performed more primary valuation studies designed to gain more knowledge about factors that determine the WTP for such goods and which we can find data on at the policy site.

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Appendix A.

Description of the ten historic temples in the Thailand survey.

Temple name	Location	Year built (A.D.)
1) Indraram	Amphawa District, Samut Songkram Province	1757
2) Bangkaeyai	Amphawa District, Samut Songkram Province	1814
3) Klang	Muang District, Samutprakan Province	1756
4) Ubosataam	Muang District, Uthaitani Province	1781
5) Kiean	Wiseschaichan District, Anghong Province	1657
6) Chomprasart	Muang district, Samut Sakorn Province	1605
7) Taprakaohai	Muang District, Pitsanulok Province	1588
8) Yaitakinaram	Muang District, Nakonnayok Province	1780
9) Chalor	Bangguay District, Nonthaburi Province	1757
10) Amphawan	Banna District, Nakonnayok Province	1595

Appendix B.

CV question used in the Vietnam survey

Suppose the preservation plan for My Son is implemented, and each household would have to pay a (one-time) fee of ... VND in tax increase. This fee is to be used for no other purpose than preserving My Son. If the majority of people

support this plan, this fee will be collected, and My Son will be preserved. Otherwise, My Son will continue to deteriorate.

Do you agree to pay for the implementation of this preservation plan? (Please choose the one option which most closely resembles your view.)

1. Yes (go to IV3)
2. No (go to IV1)
3. Yes, if I have money (go to IV1, select option 1)
4. Yes, but it's too expensive (go to IV1, select option 2)
5. Yes, if an acceptable method of paying is found (go to IV1, select option 3)
6. Yes, if other people agree (go to IV1, select option 4)
7. Yes, if the period of payment is extended (go to IV1, select option 5)
8. Others (specify) ...
9. Don't know

Appendix C.

Testing the validity and reliability of the benefit transfers

The validity and reliability of estimates were statistically tested using two main approaches: unit value transfers and function transfers.

1. **Unit value transfers:** Both unadjusted and adjusted unit value transfers were performed. The statistical hypotheses tested were:

Hypothesis 1: Equality of unadjusted mean WTP

$$H_0 : WTP_p = \widehat{WTP}_s$$

Hypothesis 2: Equality of adjusted mean WTP

$$H_0 : WTP_p = \widehat{WTP}_s(Y_p/Y_s)^\varepsilon = \widehat{WTP}_p$$

where WTP_p is the mean WTP of the policy site; WTP_s is the mean WTP of the study site; \widehat{WTP}_p is the mean WTP estimated at the policy site using income adjustments; Y_p is the average income of the policy site; Y_s is the average income of the study site; and ε is the income elasticity of WTP.

The transfer errors were calculated using the formulas below.

$$TE_{\text{unadjusted}} = \left[\frac{\widehat{WTP}_s - WTP_p}{WTP_p} \right] * 100$$

$$TE_{\text{adjusted}} = \left[\frac{\widehat{WTP}_p - WTP_p}{WTP_p} \right] * 100$$

2. **Function transfers:** This approach transfers the entire value function estimated for the study site to the policy site. The statistical hypothesis was as follows:

Hypothesis 3: Equality of WTP functions

$$H_0 : \tilde{\beta}_p = \hat{\beta}_s$$

$$H_0 : \tilde{\sigma}_p^2 = \hat{\sigma}_s^2$$

where β is the vector of coefficients and σ^2 is the variance–covariance matrix.

The transfer errors were computed using the following formula:

$$TE_{\text{adjusted}} = \left[\frac{\widehat{WTP}_p - \widehat{WTP}_p}{\widehat{WTP}_p} \right] * 100$$

where

$$\widehat{WTP}_p = \hat{\alpha}_s + \hat{\beta}_s * \bar{X}_p$$

where \widehat{WTP}_p is the estimated mean WTP of the policy site; \widehat{WTP}_p is the predicted mean WTP of the policy site based on the estimated WTP function ($\hat{\alpha}_s$ and $\hat{\beta}_s$) at the study site; and \bar{X}_p is the vector of mean values for the explanatory variables at the policy site.

The first and second hypotheses were tested using a *t*-test or *Z*-test. The *t*-test assumes that the underlying distribution of the population sample is normal, while the test statistic has a student distribution. For large samples, the test statistic for these two tests is the same:

$$t = Z = \frac{(WTP_p - \widehat{WTP}_s)}{s/\sqrt{n}}$$

where WTP_p is the estimated mean WTP value at the policy site; \widehat{WTP}_s is the estimated mean WTP value at the study site; *s* refers to the standard deviation of the estimator; *n* is the number of observations; and *n* – 1 is the degrees of freedom.

Hypothesis 3 was tested using the Likelihood Ratio (LR) test as follows:

$$LR = -2(LL_{\text{pooled}} - (LL_1 + LL_2))$$

where LL_{pooled} is the outcome of the log-likelihood function; the subscripts '1' and '2' refer to the Thailand sample and Vietnam sample respectively; and the subscript 'pooled' refers to the pool of these two samples. The degrees of freedom are equal to the number of restrictions imposed.

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