Journal of Leisure Research
2006, Vol. 38, No. 1, pp. 46-60

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A Comparison of the Effect of Multiple Destination Trips on Recreation Benefits as Estimated by Travel Cost and Contingent Valuation Methods

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This paper investigates the empirical magnitude of multiple destination/purpose trip bias in the Travel Cost Method (TCM), and the performance of an empirical solution for that method. For the study area, we find that ignoring the multiple destination/purpose trip distinction does result in a substantial difference in per trip values for the TCM. However, based on a comparison with Contingent Valuation Method derived values for these two trip types, an empirical correction to the Travel Cost Method appears to adequately differentiate the values of single and multiple destination trips. If the multiple destination trip distinction is ignored in estimation it substantially underestimates recreation benefits derived from the Travel Cost Method in our case study.

KEYWORDS: *Contingent valuation method, multiple destination trip bias, recreation demand, travel cost method, willingness to pay.*

Introduction

The Travel Cost Method (TCM) and Contingent Valuation Method (CVM) are commonly used methods to value publicly provided outdoor recreation opportunities. While there are several types of TCM models, traditional TCM models estimate a demand function for the number of trips using the cost of traveling to the site as a proxy for price. Economic benefits are derived from this demand curve by integrating under this demand curve between the current price and vertical intercept of the demand curve, i.e., the price that at which no one would visit. One purpose of this paper is to empirically demonstrate a solution to an empirical problem that arises when one of the key assumptions of the TCM demand model is violated: interpretation of travel costs as the price of an outdoor recreation trip. Specifically, if a person visits multiple site destinations on one trip from home, it would be incorrect to interpret the entire trip cost to any one of the sites the visitor might be sampled at as the price of a trip to that site (Haspel & Johnson,

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Author note: Jennifer Alfs and Wendy Doyle, Colorado State University provided valuable research assistance in preparing the data and the travel cost demand models used in this paper. The paper has greatly benefited from the thorough review by four anonymous referees. Any errors are those of the author. Support for this research was provided by W1133 regional research project.

1982). If these multiple destination observations are treated in the same way as single destination trips, Haspel & Johnson claim the TCM will yield a biased estimate of the recreation benefits of a site.

The second purpose is to investigate whether the multiple destination trip distinction influences benefit estimates derived from CVM. As a stated preference approach, it is plausible that the differing nature of single destination and multiple destination trips might be reflected in the benefit estimates reported by visitors.

One way of dealing with the multiple destination trip problem in TCM is to identify multiple destination trip taking individuals and drop them from the sample for the purposes of estimating the benefits per person (Smith & Kopp, 1980). However, this could lead to a biased estimate of total recreation site benefits if the multiple destination visitors have substantially different benefits than single destination visitors. This bias may result in a misallocation of budget and management effort at these sites as compared to sites visited primarily as a single destination.

Related to the multi-destination problem is the multi-purpose trip problem. Here, some proportion of a person's total trip travel cost and travel time are incurred for other trip purposes that may not be related to the natural resource based outdoor recreation activity the analyst is attempting to value. Examples of multiple purpose trips include trips taken to the area with the main reason to visit family, friends or on business. The other purposes may occur at basically the same destination or at destinations en route. If we are interested in estimating the economic value of the single recreation site, we may have a mis-specification problem as we observe only the overall multiple purpose trip demand function, not the site-specific trip demand function. That is, we observe the total trip price, but know little about the price for the individual site or activity we wish to value.

Whether the bias in the TCM estimate of benefits is statistically significant has not been evaluated in most previous papers on this topic because the authors did not have standard errors or confidence intervals for their benefit estimates (Smith & Kopp, 1980; Haspel & Johnson, 1982). However, Mendelsohn, Hof, Peterson and Johnson (1992) developed standard errors for their consumer surplus estimates and calculated a t-statistic of 1.94 for the test of equality of consumer surplus for single destination trips ($10) and multiple destination trips ($17). The t-statistic suggests no difference at the 5% level, but would imply statistical difference at the 10% level.

Mendelsohn et al. (1992) have also suggested treating multiple destinations as a distinct site bundle, and estimating a separate demand function for it as part of a system of demand functions. This works well if there are just a few combinations of sites frequently visited. Similar in spirit to the approach we adopt below, losses in economic benefits from closing a single site in this demand system involves losses from both the single destination visitors and those on multiple destination trips that include the closed site. However, the system of demand equations approach is not estimatable if there are a large number of possible combinations of sites, and few observations for each combination.[1] This makes the need for a more parsimonious approach to modeling multiple destination trips attractive.

An alternative approach first proposed by Parsons and Wilson (1997), is much easier to implement as it allows pooling of the single and multiple destination trip data along with identification of this trip type via the addition of two variables. Thus, Parsons and Wilson's approach is practical to do when there are too many combinations of multiple destination trip bundles to estimate separate demand curves, and it avoids the econometric complexity of having to estimate a system of inverse demand functions as in Mendelsohn et. al (1992).

Like the Mendelsohn, et al. approach, Parsons and Wilson (1997) treat the visits to other recreation sites as possible complements to the study site, and include multiple destination trips in the demand estimation. These multiple destination (MD) trips are distinguished from single destination (SD) or primary purpose trips by a dummy variable in the regression. The dummy variable and its interaction with price captures the shift and rotation of the demand function, respectively, due to the existence of complementary activities and/or sites (Parsons & Wilson, 1997). In essence the dummy variable is correcting or modifying the reported total trip cost for the multiple destination or multiple purpose nature of the trip (Parsons & Wilson, 1997).

Of course, another approach to dealing with this type of travel behavior is to adopt a valuation method such as CVM. If the CVM question is constructed to ask what the person would pay to visit the site of interest on their trip, then this may not suffer from the multiple destination trip bias problem. CVM makes no assumptions, or restrictions on the type of trip a person is valuing when they respond to a willingness to pay question, so an appropriate CVM question should be able to elicit the value of the site whether as a primary destination or one of many visited on a longer trip. Being a stated preference approach, CVM responses should reflect the respondent's view of what the incremental benefits the particular recreation site provided to the total trip value, if this was not the sole destination or trip purpose.

We are not aware of any journal literature that compares CVM derived values for single versus multiple-destination trips, nor any that compare the resulting figure to those derived from the TCM. This omission in the literature is interesting given the large number of past TCM and CVM comparisons. Not long after the inception of the two methods, researchers started comparing the values derived from CVM to those from TCM (Bishop & Heberlein, 1979; Knetsch & Davis, 1966; Sellar, Stoll, & Chavas, 1985). At first these comparisons were made under the belief that since TCM was a revealed preference measure, it reflected a criterion type validity test of the stated preference CVM. In the late 1980's the recognition that both TCM and CVM were based on maintained hypotheses led to recasting the com-

[1]I would like to thank an anonymous reviewer for pointing out this difficulty with the system of demand equations approach.

parisons as convergent validity tests (Mitchell & Carson, 1989). The most comprehensive comparison of a large number of TCM and CVM willingness to pay estimates for recreation was conducted by Carson, Flores, Martin and Wright (1996). They found that CVM values per day for recreation were slightly lower than TCM values. However, the two values were highly correlated (.78 or higher) and the correlation is statistically significant ($p < .01$). As noted above, these comparisons dealt with single destination trips where the TCM was appropriate.

This paper conducts a comparison of TCM and CVM for both single and multiple destination trips using data on visits to the Snake River in Jackson Hole, Wyoming as a case study. This stretch of the Snake River is well suited for a case study of multiple destination trips since it just south of Grand Teton National Park, and a majority of visitors come for the National Park, rather than the Snake River. That is, we are more likely to get a substantial number of multiple destination visits to the Snake River, given the presence of Grand Teton National Park and the proximity to Yellowstone National Park.

The purposes of our analyses are to evaluate:

(1) Whether the single and multiple destination trip data exhibit the same behavioral TCM regression coefficients ($\beta_{sd}^{TCM} = \beta_{md}^{TCM}$) and the same CVM logit coefficients ($\gamma_{sd}^{CVM} = \gamma_{md}^{CVM}$).
(2) Whether the difference between a count data TCM derived estimate of consumer surplus for all trips (TCM-CS_{ALL}) and consumer surplus for single destination (TCM-CS_{SD}^{PW}) as calculated from the Parson and Wilson (PW) model are different by comparing confidence intervals of the estimates (i.e. TCM-CS_{ALL} = TCM-CS_{SD}^{PW}).
(3) Whether the consumer surplus from Parsons and Wilson (CS^{PW}) approach of incorporating multiple destination (MD) visitors in the TCM demand specification provides a comparable value to the CVM derived estimate for the same trip categories (i.e., MD or SD). We evaluate whether: CVM-CS_{SD} = TCM-CS_{SD}^{PW} and CVM-CS_{MD} = TCM-CS_{MD}^{PW}.

Count Data Travel Cost Models

The number of trips to a recreation site is a non-negative integer, and if the average number of trips taken per person is small, statistical efficiency can be improved by adopting an estimator that recognizes this (Creel and Loomis, 1990). If we assume the number of trips consumed by an individual in a year is generated by a Poisson process, then the probabilities of an individual taking y trips can be modeled as:

$$\Pr(y|X) = \exp(-\lambda)^{*}\lambda^{y}/y! \tag{1}$$

Where λ is the Poisson parameter which is the expected number of trips. Equation (1) yields a familiar semi-log demand form for trips:

$$\ln \lambda = \beta_0 - \beta_1 TC + \beta_2 X_2 + \ldots \beta n X n \quad (2)$$

where TC is travel cost and *X*'s reflect other non-price independent variables such as demographics.

However, a restriction of the Poisson count data model is that it assumes the mean and variance of trips are equal. This may not be the case, resulting in a condition known as overdispersion (Creel & Loomis, 1990). The negative binomial form of the count data model does not impose the equality of mean and variance of trips and allows one to test for overdispersion (Creel & Loomis, 1990). Thus we test for overdispersion using the negative binomial model.

Because Poisson and negative binomial count data models have a functional form equivalent to a semi-log model, the consumer surplus per trip is:

$$\text{CS per trip} = 1/\beta_1. \quad (3)$$

Following Englin and Shonkwiler (1995a), it is not necessary to use a simulation method or bootstrapping in order to estimate confidence intervals for TCM when using a negative binomial or Poisson model. Englin and Shonkwiler (1995a) provide a simple Taylor series approximation for the confidence interval around the CS per trip that involves the standard errors of the TC coefficient.

Parsons and Wilson Multi-Destination Demand Approach

Rather than dropping individuals who take multiple purpose or multiple destination trips, Parsons and Wilson (1997) developed a model that incorporates these trips into the demand specification. They defined joint consumption trips as "trips taken for dual purposes". In this circumstance the trip is viewed as a bundle of trip-related attributes (in the individual's mind) that includes visits to sites nearby the site of interest to the analyst. Parson and Wilson (1997) suggest their approach is compatible with Mendelsohn, et al.'s (1992) treatment of multiple destination trips by redefinition of the "site" into a group of sites. Some visitors may also take what Parsons and Wilson (1997) call "incidental trips", such as spur-of-the-moment stops at the recreation site of interest as part of a trip taken for other purposes. Parsons and Wilson's (1997) empirical model does not distinguish between these different types of multiple purpose trips as they use a single dummy variable indicator for both types of trips. This current analysis also does not distinguish between multiple destination trips involving incidental trips or trips taken for multiple purposes. Any non-single destination is grouped together as a multiple destination trip.

The Parsons and Wilson's (1997) TCM demand model of multiple destination trips can be used to calculate separate estimates of consumer surplus for each of these two trip types. This is an especially attractive feature, where there are small sample sizes, such that separate models for each group cannot be estimated. To make this feature more explicit, we combine a stylized version of our model in (2) with the distinguishing feature of their model, the indicator variable for multiple destination trips and its interaction with the price variable.

$$\ln \lambda = \beta_0 - \beta_1 \mathit{TravelCost} + \beta_2\, \mathit{MDDummy} + \beta_3\, \mathit{MDTravelCost} \quad (4)$$

where: *MDDummy* = 1 if the trip is multiple purpose (joint) or multiple destination (incidental) and zero if it is a primary purpose trip. *MDTravelCost* = *MDDummy* * *TravelCost.*

Parsons and Wilson (1997) indicate that inclusion of the intercept dummy variable is expected to capture the average shift of recreation demand function for multiple destination trips. Statistical significance on the differential intercept, β_2, implies that the intercepts for two trip reason groups are different, and a positive coefficient means that incidental visits serve as a complement. Statistical significance on the differential price slope coefficient, β_3, indicates that the slope for different trip reason groups are different, and therefore the consumer surplus of two sample groups are different. The consumer surplus for single destination trips is $|1/\beta_1|$, while the counterpart for multiple destination trips is $|1/(\beta_1 + \beta_3)|$. Parsons and Wilson (1997) point out that the consumer surplus from the multiple destination trips is a legitimate part of the total site consumer surplus and it would be lost if the site were closed or allowed to deteriorate.

Contingent Valuation Method (CVM)

CVM is a more direct approach to measure recreation value. The method is general enough that it can be applied to value a site regardless of the proportion of single and multiple destination visitors. In our study, the dichotomous choice contingent valuation method was employed using higher trip costs as a payment vehicle. The dichotomous choice WTP question format is a commonly employed willingness to pay question format because of its market-like price-taking format (i.e., will you buy at $\$X$ or not, rather than asking what is the maximum amount you would pay). Using higher trip costs was a neutral payment vehicle as the area currently had no entrance fees. The bid amount is varied randomly across the sample and all that is observed is a Yes or No response to the bid amount. As described by Hanemann (1984), if the utility from paying the bid amount and having access to the recreation site, minus the utility from full income but not visiting the site is distributed logistically, then mean WTP can be estimated using a logistic regression model of the simple form:

$$\log\ (\text{Yes}/1\text{-Yes}) = \gamma_0 + \gamma_1\ (\text{Bid}) \quad (5)$$

While the coefficients predict the log of the odds ratio (log(Yes/1-Yes), the coding of the raw data for the dependent variable is simply one for Yes, and zero for No.

As shown by Hanemann (1989), mean WTP is calculated as:

$$\text{Mean WTP} = \ln(1 + \exp(\gamma_0))/\gamma_1 \tag{6}$$

The confidence intervals around the mean can be calculated using a simulation approach first applied to dichotomous choice CVM by Park, Loomis and Creel (1991). Because we have adopted the simple approach of Englin and Shonkwiler (1995a) to calculate confidence interval around the CS per trip from TCM, we have confidence intervals for both TCM and CVM, but not an empirical distribution of WTP for TCM. Thus, we cannot perform the method of convolution as suggested by Poe, Severence-Lossin and Welsh (1994) to formally test for the significance levels associated with the statistical differences in the distribution of WTP between the two methods. For our purposes we believe the comparison of confidence intervals is indicative of the significance level of any statistical difference, but we acknowledge this is not a formal statistical test like the method of convolution, where an exact significance level for the test of differences can be calculated.

We estimate one logit equation to measure an overall average value of all trip types, and then separate logit equations for single destination trips and multiple destination trips. These estimates are compared to those derived from the TCM for the same three sample specifications. Since CVM benefit estimates may not be as influenced by multiple destination trip bias, the CVM benefit estimates may act as a check on how well Parsons and Wilson's correction does in differentiating the values of single and multiple destination trip values.

Data Sources

The Snake River in Jackson Hole, Wyoming was selected as the recreation site of interest for this analysis. This stretch of the Snake River south of Grand Teton National Park provides a wide spectrum of recreational activities. These activities included fishing from shore, fishing from boats, scenic raft trips, as well as hiking/fishing/jogging along the levees. Visitors to one of four areas along the Snake River were given a mail-back survey packet during weekdays and weekends during the month of August through Labor Day weekend in September of 2000. The four sampling locations included a boat put-in and take-out point used by private and commercial rafters, as well as two levee areas used for fishing, hiking, and jogging. A random sample of visitors was intercepted as they returned to their vehicles at each location. Visitor names and addresses were recorded so that a reminder postcard and second mailing of the survey to non-respondents could be made. Only individuals over 18 years of age were requested to fill out a survey. We only had 19 refusals, for a refusal rate of just 3%. There were 657 surveys successfully handed out and the response rate of surveys handed out was 65%, but 62% of all attempts to distribute surveys.

The standard questions necessary to implement a TCM demand model as specified above were asked. This included gasoline costs, travel time, annual number of trips, time available for recreation, income, etc.

The dichotomous choice CVM recreation WTP question was asked immediately following the questions asking the respondent to record their trip expenses. The exact wording of the question was: "As you know, some of the costs of travel, such as gasoline, have been increasing. If the cost of this most recent visit to this section of the Snake River had been $\$X$ higher, would you have still made this visit? Yes No". The $\$X$ was replaced with one of 15 bid amounts ($1, 2, 4, 6, 8, 10, 15, 20, 30, 40, 50, 60, 70, 90, 150). The surveys were spread evenly among the 15 different dollar amounts.

As part of the survey, individuals were asked to check one of four reasons they had for making their trip to Snake River. These trip reasons were: (a) trip was sole destination from home; (b) the trip was the primary purpose but not sole purpose of the trip from home; (c) the visit to the Snake River was one of many equally important reasons or destinations of the trip; (d) the visit to the Snake River was just an incidental stop on a trip taken for other purposes or to other destinations. Following the logic of Parsons and Wilson (1997), we treated trip purposes (a) and (b) as meeting the assumptions of the Travel Cost Method, while trip purposes (c) and (d) are considered multiple destination trips for this analyses. As such, trip purposes (c) and (d) are retained in the TCM model, but are coded as multiple destination, i.e., MD = 1. In future research, a more defensible way to separate out single and multiple destination trips might be to ask visitors if they would have still made this trip, if the specific study site was closed. If they say Yes, they would have made the trip then it would be a multiple destination trip, and if they say No, then it would be a single purpose trip to the site of interest.

Count Data TCM Specification

The general count data model specification was identical for the standard and Parsons-Wilson TCM model, so as to not have specification influencing the results. The price variable was gasoline costs to the Snake River so as to not include any endogenous costs (Ward, 1984). This variable is called *Travel Cost.* This variable is just the variable costs of the trip, and does not include any fishing license costs, as these are often seasonal licenses and allow fishing anywhere in the state. There were no entrance fees at the sites.

Incorporation of travel time has been an issue of much research in the travel cost method. As suggested by recent research by Feather and Shaw (1999) and Shaw and Feather (1999), since most households cannot freely vary their work hours, the wage rate is often not a good measure of the opportunity cost of time. Rather, households maximize utility subject to both income and time budgets. As suggested by Larson (1993a, 1993b) this maximization involves including a variable for travel time and their overall recreation time budget. Therefore, a question on the survey asked about both of these variables. For travel time, we asked "What was the one-way travel time of your trip from home to the location of this most recent visit to the Snake River?" This variable is called *TravelTime.* To calculate a person's recreation time budget we asked "About how many days per year do you have available for outdoor recreation?" This is called *TimeBudget* in the model.

As a measure of recreation tastes we included demographic variables such as *Age, Gender* (male = 1, female = 2) and whether they owned a boat (*OwnBoat*). *Income* was also included as a variable. Distance to what respondents considered as the next best substitute site for this stretch of the Snake River is called *Subdistance.*

The Parsons and Wilson general demand model specification is:

$$\ln\lambda = \beta_0 - \beta_1 \mathit{Travel\ Cost} - \beta_2 \mathit{TravelTime} + \beta_3 \mathit{Income} + \beta_4 \mathit{TimeBudget} + \beta_5 \mathit{SubDistance} + \beta_6 \mathit{Age} + \beta_7 \mathit{Gender} + \beta_8 \mathit{OwnBoat} + \beta_9 \mathit{MDDummy} + \beta_{10} \mathit{MDTravelCost} + \beta_{11} \mathit{MDTravelTime} \quad (7)$$

Because the sample was collected on-site there is a possibility of oversampling more avid users, a problem called endogenous stratification. The concern is that more frequent or avid users are present at the site more often, and therefore are more likely to be sampled than those that go less frequently. Englin and Shonkwiler (1995b) provide a correction for endogenous stratification for count data models that is adopted in this analysis.

Results

About 60% of visitors indicated that their visit to the Snake River was the sole or primary destination of their trip, while 40% indicated their trip had multiple destinations or purposes. As shown in Table 1, the two types of visitor profiles indicates similarity in demographic variables such as age and boat ownership, but substantial differences in terms of travel costs. Those on single destination trips lived sufficiently close that they had about one-quarter the travel costs of those on multiple destination trips. Corresponding to these differences in travel costs, single destination trip visitors took nearly seven times the number of trips per year to the Snake River as multiple destination visitors did.

The third and fifth columns of Table 1 presents the results of the count data TCM model applied to all trip types and the Parsons-Wilson model, respectively. In both models the travel cost coefficients are negative and statistically significant. The coefficient for gender is positive and significant, indicating that females take significantly more trips to the Snake River than males.

Of particular interest is that the coefficients on the multiple destination dummy variable (MDDummy) and the price interaction term (MDTravel-Cost) are both statistically significant. The coefficient on the MDDummy is negative indicating that individuals on multiple destination or incidental

TABLE 1
Comparison of All Trips TCM Count Data Regression to Parsons & Wilson TCM Model
(Dependent variable is natural log of trips)

	All Trip TCM			Parsons & Wilson TCM		
Variable	Means	Coefficient	*T*-statistic	Mean SD/MD	Coefficient	*T*-statistic
Constant		2.764**	(6.52)		2.847**	(6.73)
Travel Cost	$52.43	−.004726*	(2.34)	$19.49/NA	−.016824**	(4.141)
Travel Time (hours)	5.82	−.134**	(6.175)	2.22/NA	−.047	(1.337)
SubDistance (miles)	162.7	.000238	(.743)	95.8/294	.000253	(.771)
Time Budget (days)	155.5	.0002**	(2.80)	180/106	.0018**	(2.605)
Gender	1.36	.586**	(3.07)	1.4/1.3	.367*	(1.97)
Age	43.5	−.00187	(−.242)	42/46	.01085	(1.45)
Income (1000's)	$88	−3.90e-3**	(−2.53)	$83/$97	−5.53e-3**	(3.71)
OwnBoat	.47	.0482	(.096)	.47/.47	.1927	(1.055)
Multi-Dest (MD) Dummy				N/A/NA	−1.326**	(5.36)
MD*Travel Cost				N/A/$117	.01613**	(3.765)
MD*TravelTime				NA/12.9	−.089*	(2.178)
Alpha (Overdispersion)		.59**			.46**	
Likelihood Ratio Statistic		12055**			12046**	
Pseudo R Square		.86			.86	
Sample Size		259			259	

**indicates significant at the 1% level, * indicates significant at the 5%

trips take fewer trips to the Snake River than visitors who have this river as their sole destination. The positive sign on the MDTravel Cost coefficient will make the slope of the multiple destination trip demand more price inelastic, raising the consumer surplus for the multiple destination trips relative to single destination trips. The statistical significance of the MDDummy and MDTravel Cost is consistent with the results of the likelihood ratio test which reject coefficient equality of the single and multiple destination trip behavior at the 1% level (χ^2 = 93.72 with 9 d.o.f.).

Table 2 presents the results of the CVM binary logit models for all trips, and then for single destination trips (trip purposes (a) and (b)) and multiple destination trips (trip purposes (c) and (d)). The coefficient on the bid amount is negative and statistically significant in all three of the logit equations, indicating the higher the bid amount the respondent was asked to pay the lower the probability they would pay. The results of the likelihood ratio test rejects coefficient equality of the single and multiple destination logit coefficients at the 1% level (χ^2 = 34.96 with 2 d.o.f.).

Comparison of Mean WTP and Results of Hypothesis Tests

Before, we compare of WTP between single and multiple destination visitors we need to standardize the WTP measure into a value per person,

TABLE 2
Results of CVM Logit Equations for All Trips, Single Destination Trips and Multiple Destination Trips

Variable	All Trips	Single Destination Trips	Multiple Destination Trips
Constant (Std. errors)	1.466**(.014)	1.273**(.215)	2.172**(.343)
Bid Amount	−.014096**(.00304)	−.02366**(.0051)	−.010821**(.0048)
LR Statistic	22.44**	26.73**	4.761*
Sample Size	352	211	141

**indicates statistically significant at the 1% level, *indicates statistically significant at the 5% level.

per day to adjust for differences between group size and length of stay of these two groups. Single destination visitors had a median group size of two and a median time on site of three days. Multiple destination visitors had a median group size of three and time on site of four days. Table 3 presents the mean WTP and 90% confidence intervals for TCM and CVM derived benefits per person per day.

Several relationships are apparent in this table. First, the CVM derived value for all trip reasons (i.e., single and multiple destination) of $9.89 is about half the TCM mean for all trip reasons ($17.63). However, given the large confidence intervals around the TCM estimate, the confidence intervals overlap indicating there is likely no statistical difference between these

TABLE 3
Comparison of Net WTP Per Person Per Day for All Trips, Single Destination Trips and Multiple Destination Trips Using TCM and CVM

Valuation Method	All Data	Single Destination Trips	Multiple Destination Trips	Sum of SD & MD
CVM				
Mean WTP	$9.89	$8.03	$17.56	
Lower 90% CI	$7.80	$6.44	$11.50	
Upper 90% CI	$13.96	$11.28	$50.67	
Total Visitor Days	4224	1688	1692	3380
Total Benefits	$41,795	$13,551	$29,706	$43,257
TCM				
Mean WTP	$17.63	$7.43	$120.08	
Lower 90% CI	$10.40	$5.34	$84.14	
Upper 90% CI	$58.03	$12.20	$250.70	
Total Visitor Days	4224	1688	1692	3380
Total Benefits	$74,482	$12,542	$203,170	$215,712

two estimates of the mean. The large confidence intervals are due in part to relatively small sample sizes. This suggests the need in future studies to collect larger samples if the visitor population is relatively heterogeneous, such as ours. In addition, the overlapping confidence interval approach to testing for differences in mean WTP is imprecise (Poe, Severence-Lossin & Welsh, 1994) and may accept the null hypothesis of no difference too often.

Table 3 also indicates that there is a noticeable difference in TCM mean WTP for the single destination trips (trip reasons 1 and 2) at $7.43 per person per day as compared to all data at $17.63. The confidence interval on these two trip values overlap, suggesting they are not statistically different from one another. Thus we accept our the null hypothesis that the Parson and Wilson (1997) corrected TCM application yields the same consumer surplus as the all trip TCM consumer surplus. The separate dichotomous choice CVM logit equation for single destination trips yields an estimate of similar magnitude for these single destination trips at $8 per trip. The 90% confidence interval for the single destination TCM and CVM largely overlap each other suggesting they are not statistically different at the 90% level or higher levels. Thus CVM and Parsons and Wilson's (1997) TCM model yield equivalent values for single destination trips. Therefore we accept the second part of hypothesis #2 on equality of adjusted TCM and CVM for single destination trips. It is worth noting that in Parson's and Wilson's (1997) original results, we calculated that multiple destination trips to be worth slightly less than single destination trips ($77 for single destination and $52 for multiple destination trips). This is different than Loomis, Yorizane and Larson (2000) for whale watching and this analysis, both of which found a positive sign on the MD*TravelCost variable, and hence multiple destination trips having a higher value than single destination trips. However, this pattern is consistent with the pattern of WTP estimates from the CVM in Table 3; multiple destination trips have a higher value than single destination trips.

The average value for all trips of $10 using CVM and $17 for TCM is below the range of existing literature estimates for these activities in the intermountain west. According to Rosenberger and Loomis (2001), hiking has an average value of $32 and fishing is $41. The average of these recreation activity values is $36, much higher than our average values. This may be due to the long length of stays of these trips.

Table 3 also reveals that the multiple destination trips have a higher consumer surplus whether estimated by Parsons and Wilson's (1997) TCM model or CVM. The TCM estimate for multiple destination trips is $120 per person per day, while the CVM estimate is $17.56. The two sets of 90% confidence intervals do not overlap, suggesting these two different estimates of the value of multiple destination trips are statistically different. Therefore we reject the null hypothesis of equality of the Parsons and Wilson (1997) TCM and CVM estimates of WTP for multiple destination trips.

The consistently higher net WTP or consumer surplus for the multiple destination trips may be quite plausible. If individuals had decided it was worthwhile to incur the trip cost to visit some other site in the Jackson Hole area (e.g., Grand Teton National Park), the additional surplus from being able to float or fish the Snake River south of the Park is almost free for the taking. That is, since the incremental cost of fishing or floating the Snake River once you have made a trip to Jackson Hole is negligible, almost the entire area under the multiple destination trip demand curve would be consumer surplus (e.g., gross WTP is almost equal to net WTP for the multiple destination site).

Table 3 also indicates the error that would result from using the overall TCM average trip net WTP in column two that ignores the single destination vs multiple destination distinction. Essentially, ignoring the differences in trips is a mis-specification. Since both the count data TCM and the dichotomous choice CVM involve non-linear models, the specification bias does not net out to zero. This can be seen in Table 3, whereby the sample total site benefits estimated using the average of all trip TCM and CVM benefits range from about \$74,482 to \$41,795, respectively. The sum of the single and multiple destination benefits from CVM is in this range (\$43,257). However, the Parson and Wilson's (1997) total benefit estimates is five times the CVM and three times the all trip TCM. Thus, the greatest underestimate of benefits occurs with the TCM, whereby total benefits are underestimated by \$140,000 using the average consumer surplus from TCM across all trip types. This larger degree of error may not be unexpected since the multiple destination trip bias is more of a concern in TCM than in CVM. The potential underestimate of total site benefits from dropping the multiple destination users would be substantial as their trips represent the majority of the recreation benefits at our study site, whether estimated by TCM or CVM.

Conclusion

Ignoring the distinction between single and multiple destination trips when applying the Travel Cost Method can have a substantial effect on estimates of per trip and total site benefits. Rather than dropping the multiple destination trips, the correction procedure proposed by Parsons and Wilson to include such trips but control for the distinction via an intercept shifter and price interaction term makes a substantial difference in total site benefits.

For our sample, the net willingness to pay of the multiple destination users represents the majority of total site benefits. This is true whether estimated by the Travel Cost or Contingent Valuation methods. Thus, omitting multiple destination users from benefit estimation would result in a substantial underestimate of total site recreation benefits for the Snake River south of Grand Teton National Park. We suspect the importance of multiple destination visitors is similar at many National Parks throughout the world as there are often major destinations that are in close proximity to each other by nature (e.g., Bryce & Zion National Parks in Utah, Banff and Jasper National Parks in Canada) or by design (amusement parks in Orlando, Florida).

While our application of Parsons and Wilson's modification to the travel cost demand model only distinguished between single destination and multiple destination users, it is possible that disaggregation into finer categories might be useful with larger sample sizes. The distinct categories might distinguish multiple purpose trips that literally mix business and pleasure at the same location as well as trips to visits family and friends. These refinements may be important at recreation sites near big cities or in resort areas that cater to conferences.

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