THE VALUE OF A RECREATIONAL BEACH VISIT: AN APPLICATION TO MOOLOOLABA BEACH AND COMPARISONS WITH OTHER OUTDOOR RECREATION SITES*

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Beaches and foreshores worldwide offer a broad range of goods and services to coastal communities and economies. One service, beach recreation, provides considerable benefits to most Australians. This paper represents the first Australian attempt to value a recreational visit to surf beaches within the local urban setting of Mooloolaba beach, Sunshine Coast, Queensland using a truncated negative binomial individual travel cost model. Income, on-site and off-site travel expenditure and time, party size, and employment status helped to explain visits. The consumer surplus estimates provided in this paper are within the bounds of the international literature. The passive-use values of beaches are higher than those of national parks or forests. Assessing beach non-use values is an area for future research.

INTRODUCTION

This paper estimates, for the first time in Australia, the monetary value of a recreational beach visit using the individual travel cost method via a truncated negative binomial regression model. Such estimates may be useful to coastal managers, councillors and other interested parties who deliberate over the allocation of resources to maintain or improve the services and biophysical infrastructure of beaches and coastal foreshores. Given the recent sea-change phenomenon and the increasing urbanisation of coastal Australia, outdoor recreation resources such as beaches are likely to succumb to considerable health pressures and trade-offs in the allocation of scarce funding at the local government level. The contextual comparison of beach recreation values may highlight the potential oversight that beaches in Australia currently receive. Most beaches in Australia are managed and maintained by local government councils, unlike

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their sister beaches in the United States (US), which are managed by local, state and federal governments. The US arrangement reflects the broader spheres of benefits that beaches provide to the people of other communities and states as discussed by Blackwell (2003). The estimates and regression results presented in this paper may also be useful in the day-to-day management of beaches because they indicate that tourists and local residents have different demands for beach recreation and different socio-economic characteristics. For example, a single user fee for residents and tourists may not be appropriate because of income differences.

SITE LOCATIONS

The urban beaches included in this application of the individual travel cost method include Kawana, Mooloolaba, Alex and Maroochydore on the Sunshine Coast in South East Queensland, with a small sub-sample from Cottesloe beach in Western Australia. Mooloolaba beach includes the largest single beach sample with 140 observations. The Sunshine Coast beaches are about 100 kilometres north of Brisbane with Mooloolaba beach at their centre. Cottesloe beach is a highly frequented beach in Western Australia and lies to the south-west of Perth.

THE FIELD WORK AND SURVEY

The data collected in this study formed part of a larger study into the economics of beaches and coastal foreshores (Blackwell, 2003). On-site interviews of beach users were undertaken across a number of Australian and United States beaches. The results presented in this paper are from 250 groups of Australian beach users and the sample sizes for various sites are provided in Table 1.[1] A single survey instrument was used to gain data to find both the value of a recreational beach visit (using the travel cost method) and the marginal value of a lifeguard and lifesaver (using the contingent valuation method). Blackwell and Tunny (2000) report on the marginal value of lifesavers and lifeguards. Environmental information and visitor counts were recorded on an hourly basis. Pilot and pre-test samples were conducted.

One individual from every third group of beach users encountered while moving from one end of the beach to the other was selected for questioning. This sampling method is known as systematic sample selection and combines the benefits of both simple random and stratified sampling. The method provides efficiency gains for samples estimates as compared with stratified sampling or simple random sampling, yet the process is still random and independent. However, the resulting sample is expected to be geographically more representative of the population of beach users than are samples by other methods.

From visual comparison of observations there was no evidence of interviewer bias. The non-response or rejection rate was 1.9 per cent. With a 95 per cent confidence level, the population mean for travel costs falls within $3 either side of the sample

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1 Both the survey instrument and the visitation and environmental data form are available from the author upon request.

TABLE 1

SAMPLE SIZES, DAY AND DATES OF SITE SURVEYS

State	Beach	Day and date	n
Western Australia	Cottesloe	Sat 6/11/1999	7
Queensland	Kawana	Sun 16/4 & Thur 20/4/2000	31
	Mooloolaba	Sun 16/1; Thur 20/1; Fri 21/1; Sat 22/1; Wed 26/1; Sun 30/1; Sat 15/4 & Wed 19/4/2000	140
	Alex	Sat 22/4 & Thur 4/5/2000	36
	Maroochydore	Sat 29/4 & Fri 5/5/2000	36
Total			**250**

mean of $14. Similarly, the population mean number of visits per person per year falls within 9 visits either side of the sample mean of 48 visits. Other potential bias issues are covered throughout the paper.

METHODOLOGY

This study uses the individual travel cost method (ITCM) to estimate consumer surplus measures of the benefits of a beach visit, in preference to the zonal travel cost method (ZTCM). Bateman (1993) provides a discussion of the appropriate use of the travel cost method. In the last two decades, ITCM has become more popular, given the advances in information technology and the added advantage of being able to include a number of socio-economic characteristics such as age, income, and education to help explain individual as opposed to zonal visitation.

The descriptions of variables used in the regression analysis for this study are provided in Table 2. The TTSC in front of the variables signifies that

- the nature of both side and main trips[2] has been considered in calculating travel costs; and
- an adjustment downward of travel costs has been made to gain only those costs attributable to the beach visit itself, as separate from the whole experience.

2 A *side* trip is where an individual travels from the local area of the beach to the beach; the *main* trip is where people travel from outside the local area to the beach, where the beach is the main purpose of their visit.

TABLE 2
REGRESSION VARIABLE DESCRIPTION AND MEASUREMENT

Variable name	Description	Measurement for subsequent component
VISITSPY	Respondent's annual quantity of day visits to the site	Whole, positive number
TTSCMIN	Per person fuel costs of travel to the site including return (distance * $/km/party size * 2 (return trip)[a]	A$ per person per trip
TTSCONLY [1]	Per person money expenditure of travel only (distance * $/km/party size * 2 (return trip)[b]	A$ per person per trip
TTSCTIM [2]	[1] + travel time cost (travel time * 0.4 of individual's wage rate)	A$ per person per trip
TTSCALL [3]	[2] + on-site money expenditure (on-beach and coastal strip expenditure which related to person's beach visit, for entire party per person per day)	A$ per person per trip
TTSCOFF [4]	[3] – on-site money expenditure + off-site money expenditure N.B.: [3] – on-site money expenditure = [2].	A$ per person per trip
TTSCEV [5]	[3] + on-site time cost + off-site money expenditures	A$ per person per trip
ONCOST	Time costs and expenditure while on-site per individual	Time valued at 40% of individual's wage rate, estimated from household income by dividing by average household size in Australia and assuming a 40-hr week. A$.
INC	Annual before tax household income for current financial year	A$, midpoint of various income brackets
PARTSIZE	Size of respondent's party visiting the beach	Whole, positive number
EMPDUM*	Whether respondent is a full time employee or not	1 = yes 0 = no
SUBVIS	Respondent's annual quantity of day visits to next favourite beach site	Whole, positive number
VISITOR	Whether respondent is a visitor to the site or not	1 = yes (visitor) 0 = no (resident)

Notes and Sources: [a] Fuel costs based on medium-sized car, 2.2L at $0.0647/km from RACQ (1999); [b]. Running costs based on ordinary cars, up to 1600 cc, $0.457/km (smallest amount), as allowed by the Australian Taxation Office 1998/99 financial year (RACQ, 1999).

Travel costs were calculated on a per person per visit or beach day basis. In order to allow for some sensitivity to the assumptions of travel cost (TC), a number of different measures of TC were calculated. Running costs for the TTSCONLY variable were based on ordinary cars, up to 1600 cc, at $0.457/km, the smallest amount allowed by the Australian Taxation Office in the 1998/99 financial year (RACQ, 1999).[3] The TTSCMIN variable measured fuel costs only as 6.47 cents/km as provided by the RACQ (1999) for a medium-sized car (2.2 litres). Both measures are expected to be conservative because the average cost[4] of running a private vehicle was 47.31 cents/km, assuming 15,000 km/year (RACQ, 1999).

The measurement of time costs is a much-discussed area in the travel cost literature and most studies consider it appropriate that people's time includes some measure of opportunity forgone. Time in this paper is valued at 40 per cent of individual's wage rate,[5] which is the preferred allocation for similar studies in the literature (Xue *et al.*, 2000; Ward and Beale, 2000; Cerda Urrutia *et al.*, 1997). Background analysis undertaken by Blackwell (2003) found that travel time was as significant in determining beach visits as travel distance. In addition, an analysis of respondents' employment statuses indicated that the majority of beach visitors were not full time employees, but were self employed, part-time employees, students, homemakers, retired, travelling or unemployed. These employment status groups are more likely to have the time to visit a beach. Free access to a beach may also better suit their income status.

The side trip from the local area to the beach was included for all beach users whether they were visitors from outside the local area or residents of the local area, because this represented the minimum costs of travel to the beach. In addition to the side trip is the cost of extra travel undertaken by visitors from outside the local area. This extra travel is referred to as the visitor's *main trip* and was included if the central purpose of their trip was to visit the beach. Only the local side trip was included for international visitors.

For those users who provided their home postcode, a more accurate measure of average travel time and distance was gained from the website <www.travelmate.com.au>. If the postcode was not provided then the respondent's own assessment of travel distance and time was included. A schematic of the various scenarios, including the main and/or side trips, is provided in Figure 1.

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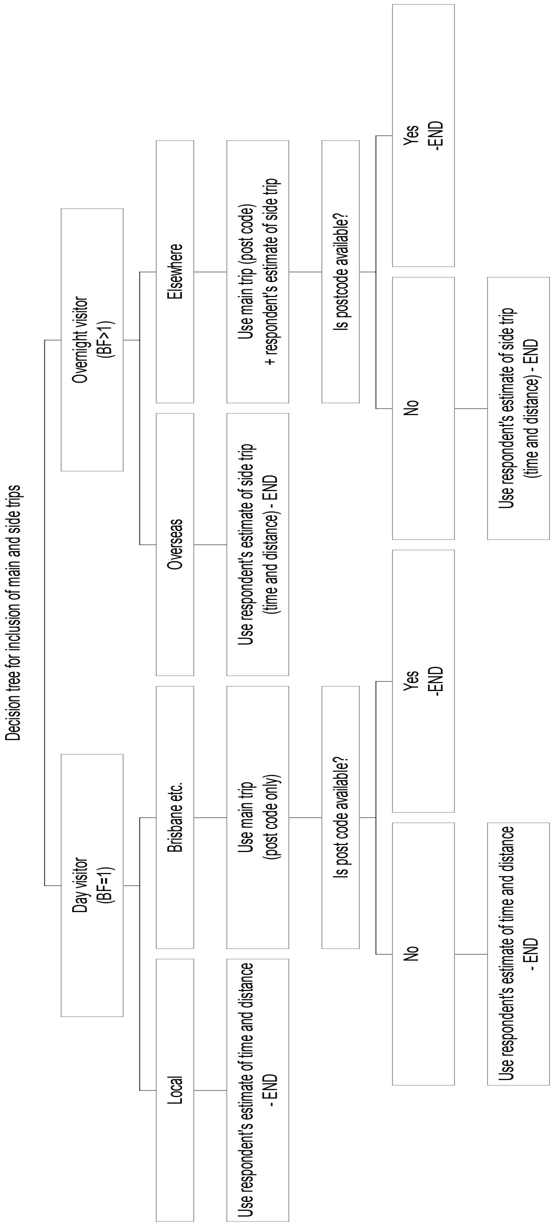
3 The 1600 cc costs allowed by the Taxation Office were used as they are expected to be a conservative estimate of actual running costs and appear to be a little below what the weighted average light-vehicle motorist used in Queensland as at May 2001. The size of vehicles used for recreation in Queensland was bimodal, equally spread between four and six cylinders for the same period (Christine Nielson, 2001, pers. comm., Queensland Transport, Brisbane).

4 Average cost includes standing costs (depreciation, interest, registration and insurance) and running costs (fuel, tyres, and service and repairs).

5 For this study, wage rates were determined from respondents' household incomes, so they are essentially *shadow* wage rates.

FIGURE 1
DECISION SCHEMATIC FOR CALCULATION OF TRAVEL COSTS



For the purpose of explaining variations in individual demand for annual beach visits across the entire sample, the following regression was used:

$$VISITSPY = \beta_0 + \beta_1 TC + \beta_2 ONCOST + \beta_3 INC + \beta_4 PARTSIE + \beta_5 EMPDUM + \beta_6 SUBSVIS + \beta_7 VISITOR$$

When the sample is broken into two sub-samples according to whether users are residents or visitors to the beach, the VISITOR dummy is dropped from both equations.

The visitor and resident regressions take the form:

$$VISITSPY = \beta_0 + \beta_1 TC + \beta_2 ONCOST + \beta_3 INC + \beta_4 PARTSIE + \beta_5 EMPDUM + \beta_6 SUBSVIS$$

These two equations represent the linear form of the individual travel cost model. In the truncated negative binomial and truncated Poisson models the natural log of the dependent variable is taken, so the equation for visitors or residents becomes:

$$\ln(VISITSPY) = \beta_0 + \beta_1 TC + \beta_2 ONCOST + \beta_3 INC + \beta_4 PARTSIE + \beta_5 EMPDUM + \beta_6 SUBSVIS$$

A number of important observations can be made from the descriptive statistics[6] of the variables used in the regression analyses.[9] These descriptive statistics are presented in Table 3:

1. Residents' incomes on average are lower than those of visitors to the local area beach.
2. Residents take a larger number of annual visits than visitors but visitors spend more money on average per visit across all types of travel-cost measures.
3. Residents have a larger number of visits to other beach sites than do visitors, which may suggest that visitors are visiting their favourite site: Parsons *et al.* (2000) discuss favourite sites and beach demand; Blackwell (1999) discusses site selection.
4. Visitors share higher costs over a larger party size on average.
    - Observations 1 to 4 reinforce the need to split the sample into *two sub-samples: one model representing demand for beach visits by visitors and one representing such demand by residents*. The highly significant explanatory power of the visitor dummy variable in the entire sample models presented in Tables 4 and 5 provides further evidence of this need.

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6 While these observations are not tested statistically to establish their significance, they prove useful for exploratory purposes.

7 The survey data were analysed using LIMDEP 7.0 (Econometric Software, 1997).

TABLE 3

DESCRIPTIVE STATISTICS OF REGRESSION VARIABLES

	Entire Sample (n=250)			Resident (n=88)			Visitor (n=162)		
Variable	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.
VISITSPY	48.00	14.00	77.41	108.65	52.00	102.47	15.06	8.50	22.15
TTSCEV	37.52	20.90	49.41	12.85	8.48	17.01	50.93	35.40	55.72
TTSCOFF	18.85	7.73	29.66	4.44	3.03	4.64	26.68	15.29	34.26
TTSCALL	25.75	9.40	45.28	7.22	3.66	14.97	35.81	18.84	52.54
TTSCTIM	13.68	4.70	26.14	3.37	1.91	3.97	19.28	7.58	30.96
TTSCONLY	10.91	3.14	22.74	2.66	1.31	3.60	15.39	5.51	27.12
TTSCMIN	1.61	0.44	3.28	0.38	0.19	0.51	2.28	0.82	3.90
ONCOST	24.71	11.65	45.30	9.71	6.51	12.29	32.86	16.28	53.87
INC	47,380	45,000	29,258	38,636	35,000	23,753	52,129	45,000	30,896
PARTSIZE	3.00	2.00	1.75	2.63	2.00	1.79	3.20	3.00	1.70
EMPDUM*	0.34	0.00	0.47	0.31	0.00	0.46	0.35	0.00	0.48
SUBVIS	22.00	5.00	46.99	33.99	9.00	61.40	15.50	5.00	35.44
VISITOR	0.65	1.00	0.48	0.00	0.00	0.00	1.00	1.00	0.00

Note: * EMPDUM had one observation missing and represented n = 249 for entire sample and n = 161 for visitors.

5. For both visitors and residents there is a tendency for those categorised as not full-time employed to be visiting the beach more frequently than those full-time employed. Not full-time employed groups are more likely to have the time to visit a beach, and free access to a beach may also better suit their income status.

RESULTS OF REGRESSION ANALYSIS AND ESTIMATES OF CONSUMER SURPLUS

Table 4 presents the results of the travel cost model (TTSCMIN) in which only fuel costs are considered, while Table 5 presents the results with total costs of running a vehicle plus travel time costs included (TTSCTIM). These models were chosen from an array of possible measures of travel costs because both provide lower bound values for consumer surpluses and because TTSCTIM includes a component for travel time costs as discussed above.

The results from the linear (OLS), truncated Poisson (TP) and truncated negative binomial (TNB) regressions are presented in each table to provide some sensitivity analysis of the results to the functional form chosen. In the case of count data, such as the number of visits to a recreation site, where over-dispersion is significant, the truncated negative binomial model is the preferred model (for example, Dobbs, 1993a and 1993b; Offenbach and Goodwin, 1994; Englin and Shonkwiler, 1995). As can be seen from the results, the dispersion co-efficient (α) is both positive and significant. As well as dealing with the problem of over-dispersion, the truncated negative binomial model accounts for truncation and sample selection bias.

With regard to Table 4, the following interpretation of the results can be made:

- The truncated negative binomial (TNB) regressions for both visitors and residents have the highest log likelihood and, as expected, are therefore the preferred models.
- The most important coefficients in this study for the purpose of gaining consumer surplus measures are those for travel costs. In all models except for the OLS entire sample model, the travel cost coefficients have a negative sign, which is to be expected, and are significant at the 10 per cent level at least. The negative sign is expected because as the costs of travel to the site increase, one is expected to take fewer trips per annum, *ceteris paribus* (given a fixed level of income).
- Respondents who are full-time employed tend to take fewer visits, no matter whether they are resident or visitor. This inference is significant and reliable in the TNB visitor model.
- The larger a respondent's party size, the less likely the respondent is to take a beach visit. Under the TNB model this result is significant for visitors but not for residents. The transaction costs and logistical problems of coordinating larger group sizes may explain this. Also the larger total TC for visitors may need to be shared across a larger group size to make a trip worthwhile.

TABLE 4

TTSCMIN MODEL REGRESSION RESULTS

	Entire sample			Resident			Visitor		
Variable	Ordinary Least Squares (OLS)	Truncated Poisson (TP)	Truncated Negative Binomial (TNB)	OLS	TP	TNB	OLS	TP	TNB
Constant	135.2016*	5.3484*	5.3139*	186.7158*	5.440*	5.2078*	33.5131*	3.9691*	3.7121*
	(12.606)	(237.109)	(26.514)	(6.396)	(201.898)	(15.219)	(7.149)	(73.005)	(16.109)
TTSCMIN	-0.9726	-0.1729*	-0.07698**	-52.9741**	-0.5872*	-0.4178***	-1.0273**	-0.1050*	-0.08431**
	(-0.719)	(-16.629)	(-2.511)	(-2.419)	(-22.202)	(-1.881)	(-2.102)	(-11.350)	(-2.549)
ONCOST	-0.01099	-0.0006169	-0.0006383	0.1223	0.002717*	0.0026648	-0.008852	-0.00124**	-0.0006199
	(-0.114)	(-1.513)	(-0.002197)	(0.125)	(2.796)	(0.176)	(-0.265)	(-2.475)	(-0.271)
INC	-0.0001265	-0.03443a*	-0.04853a***	-0.0003474	-0.000003*	-0.04322a	-0.0001***	-0.000006*	-0.0000035
	(-0.815)	(-8.399)	(-1.820)	(-0.665)	(-5.924)	(-0.686)	(-1.679)	(-6.975)	(-1.047)
PARTSIZE	-4.9175**	-0.1259*	-0.1190*	-11.232***	-0.1201*	-0.04895	-2.8639*	-0.2372*	-0.2200*
	(-2.025)	(-19.208)	(-3.035)	(-1.790)	(-16.807)	(-0.784)	(-2.696)	(-14.657)	(-3.191)
EMPDUM	-9.1785	-0.2232*	-0.2764	-18.4589	-0.2159*	-0.0927	-4.5340	-0.3608*	-0.4131***
	(-1.030)	(-10.075)	(-1.555)	(-0.770)	(-8.815)	(-0.303)	(-1.206)	(-6.819)	(-1.857)
SUBVIS	-0.1609***	-0.003127*	-0.0007168	-0.3156***	-0.003831*	-0.003553	0.02196	0.002197*	0.0004634
	(-1.813)	(-14.600)	(-0.414)	(-1.751)	(-16.506)	(-1.496)	(0.430)	(2.959)	(0.112)
VISITOR	-89.4940*	-1.6690*	-1.8773*	-	-	-	-	-	-
	(-9.571)	(-63.840)	(-10.610)						
α	-	-	1.1040*	-	-	0.9613*	-	-	1.1379*
			(8.257)			(5.914)			(5.408)
Chi squared	-	11244.70*	8563.77*	-	1177.725*	6271.98*	-	690.61*	1769.21*
Log likelihood	-1379.34	-5354.100	-1072.215	-525.94	-3631.87	-495.88	-716.94	-1455.05	-570.45
Adj. R^2	0.3477	-	-	0.0590	-	-	0.0845	-	-
F	19.88*	-	-	1.91***	-	-	3.46*	-	-
N	249	249	249	88	88	88	161	161	161

Notes: t-value or equivalent in brackets; significance level:* = 1%, ** = 5%, *** = 10%; a = income scaled by dividing by 10,000 to overcome non-convergence.

TABLE 5

TTSCTIM MODEL REGRESSION RESULTS

Variable	Entire sample: Ordinary Least Squares (OLS)	Entire sample: Truncated Poisson (TP)	Entire sample: Truncated Negative Binomial (TNB)	Resident: OLS	Resident: TP	Resident: TNB	Visitor: OLS	Visitor: TP	Visitor: TNB
Constant	134.9439*	5.3237*	5.2954*	185.9424*	5.4320*	5.1991*	32.7432*	3.8994*	3.6753*
	(10.700)	(238.917)	(26.302)	(6.552)	(205.86)	(16.027)	(7.050)	(73.048)	(15.771)
TTSCTIM	-0.1127	-0.02039*	-0.008836**	-7.2658**	-0.08205*	-0.05745**	-0.1098***	-0.01080*	-0.0093**
	(-0.669)	(-16.126)	(-2.107)	(-2.627)	(-24.010)	(-2.061)	(-1.825)	(-9.894)	(-1.993)
ONCOST	-0.01017	-0.0004828	-0.0007371	0.1793	0.003565*	0.003109	-0.008459	-0.01122**	-0.0008037
	(-0.105)	(-1.198)	(-0.327)	(0.184)	(3.757)	(0.189)	(-0.251)	(-2.268)	(-0.343)
INC	-0.0001237	-0.000003*	-0.000004***	-0.0002196	-0.000002*	-0.000003	-0.0001004	-0.000005*	-0.0000031
	(0.797)	(-7.480)	(-1.671)	(-0.425)	(-3.520)	(-0.551)	(-1.630)[a]	(-6.942)	(-0.913)
PARTSIZE	-4.8148**	-0.1199*	-0.1144*	-0.9805***	-0.1159*	-0.04636	-2.6739**	-0.2189*	-0.2123*
	(-2.002)	(-18.472)	(-2.901)	(-1.776)	(-16.375)	(-0.749)	(-2.545)	(-13.758)	(-3.039)
EMPDUM	-9.2939	-0.2281*	-0.2840	-20.2707	-0.2372*	-0.1032	-4.7574	-0.3746*	-0.4292***
	(-1.044)	(-10.302)	(-1.596)	(-0.851)	(-9.647)	(-0.335)	(-1.263)	(-7.100)	(-1.911)
SUBVIS	-0.1632***	-0.003153*	-0.0009072	-0.3239***	-0.003941*	-0.003641	0.01332	0.001589**	-0.0000783
	(-1.848)	(-14.702)	(0.517)	(-1.806)	(-16.899)	(-1.538)	(0.264)	(2.196)	(-0.019)
VISITOR	-89.7095	-1.6819*	-1.8837*	-	-	-	-	-	-
	(-9.626)*	(-64.628)	(-10.509)						
α	-	-	1.1119*	-	-	0.9527*	-	-	1.1649*
			(8.276)			(5.901)			(5.446)
Chi squared	-	11218.34*	8588.68*	-	1283.36*	6167.15*	-	645.87*	1811.97*
Log likelihood	-	-5367.28	-5367.28	-525.42	-3579.05	-495.47	-717.50	-1477.42	-571.44
Adj. R^2	0.3475	-	-	0.0722	-	-	0.07817	-	-
F	19.87*	-	-	2.10***	-	-	3.26*	-	-
N	249	249	249	88	88	88	161	161	161

Notes: t-values or equivalent in brackets; significance level:* = 1%, ** = 5%; *** = 10%; a = almost significant; p = 0.1050

When individual variables were regressed separately against beach visits, the p-values for the coefficients of off-site expenditure and time indicated that they help to explain the number of beach visits for visitors and residents. In contrast, the coefficients of onsite time and expenditure and income were found to have a higher level of significance in determining days at the beach for visitors than for residents. All mean values of travel costs and income are larger for visitors than for residents .

In Table 6 the consumer surplus measures per person per visit (*CS/q*) in 1999–2000 Australian dollars are provided as calculated from the travel-cost coefficients (β^{s}) of the various models. These estimates were gained by calculating the absolute value of the inverse of the beta coefficients of truncated Poisson and truncated negative binomial models:

$$CS/q = \left|\frac{1}{\beta}\right|$$

The linear estimates were gained by taking the inverse of two times the beta coefficient and multiplying by the median number of visits per annum, following Cerda Urrutia *et al*. (1997). The median was chosen due to the right skewed nature of VISITPY. This calculation is equivalent to taking the total consumer surplus per annum per person and dividing by the median number of visits to gain an equivalent measure per visit; that is:

$$CS/q = \left|\frac{q^2}{2\beta}\right| \Big/ q = \left|\frac{q}{2\beta}\right|$$

An array of travel cost variables is presented in Table 6 to provide some sensitivity analysis for the consumer surplus measures. As can be seen, the magnitude of the measures is sensitive to the components of travel cost: the more costs included, the larger the consumer surplus measures.

The most reasonable measure is the TTSCTIM, which includes the total cost of running a car plus travel time costs. For the theoretically preferred TNB model this provides an estimate of consumer surplus per person for a recreation day visit to the beach of $119.95 for the entire sample. The visitor equivalent is $107.75 while the resident's is $17.41. This highlights the need to consider the differences between resident and visitor willingness to pay for beach visits when considering user pays. Note also that the TP and OLS measures, where the travel cost coefficients are significant, are smaller than those attained from the TNB model. This is consistent with the findings in the international literature (for example, Cerda Urrutia *et al*., 1997).

As a lower bound measure, TTSCMIN is chosen because it includes only the fuel costs of running a medium-sized car, as discussed previously in the paper. Here, the consumer surplus measures per person per visit are $12.99 for the entire sample, $11.86 for a visitor, and $2.39 for a resident.

TABLE 6

CONSUMER SURPLUS FOR BEACH RECREATION PER PERSON PER VISIT, A$, 1999–2000

	Entire sample			Resident			Visitor		
Variable	Ordinary Least Squares (OLS)	Truncated Poisson (TP)	Truncated Negative Binomial (TNB)	OLS	TP	TNB	OLS	TP	TNB
TTSCEV	113.93[a]	200.52[a]	250.19[a]	65.96*[a]	190.44[a]	529.10*[a]	48.50[a]	179.89[a]	221.04[a]
TTSCOFF	54.26*	57.01	126.92	3.97	12.48	16.93	24.36	97.09	116.31
TTSCTIM	62.11*	49.04	119.95	3.58	12.19	17.41	25.09	92.59	107.75
TTSCMIN	7.20*	5.78	12.99	0.49	1.70	2.39	2.68	9.52	11.86

Notes: * = travel cost co-efficient insignificant at least at 10% level, therefore estimates are not reliable; a = oncost dropped, otherwise there would be double counting.

Annual benefits and perpetuity values of beach recreation

The aggregate benefits per annum for recreation day visits at Mooloolaba beach were obtained by multiplying the TNB TTSCTIM consumer surplus per person per visit by the Maroochy Shire Lifeguard Service estimate of annual visitation.[10] The proportion of visitors and residents in the sample (67 per cent and 33 per cent respectively) were multiplied by the total annual number of visits to gain the breakdown of total annual visits for residents and for tourists. These respective visit numbers were then multiplied by the consumer surplus measures per person per visit to obtain the respective annual values. The annual estimates are $862 million for the entire sample, $153 million for residents and $205 million for visitors. Table 7 presents a sensitivity analysis for these annual measures of benefits, taking into account different visitation levels per annum. If patterns for coastal migration and holiday visitation continue, the upper end estimates become more relevant.

TABLE 7

RECREATION BENEFITS PER ANNUM USING TRUNCATED NEGATIVE BINOMIAL RESULTS, TTSCTIM MODEL, MOOLOOLABA BEACH, A$, 1999–2000

Visits per annum	Overall sample	Residents	Visitors
250,000	419,815,281	74,350,367	99,654,440
512,995	861,452,561	152,565,466	204,488,918
1,000,000	1,679,261,125	297,401,467	398,617,760

Using the Lifeguard Service estimate for annual visitation, the perpetuity value of these estimates using a discount rate of eight per cent provides estimates for the entire sample, the residents and the visitors respectively of $10.8 billion, $1.9 billion and $2.6 billion. A sensitivity analysis is provided for these results in Table 8 using additional interest rates of six and 10 per cent.

TABLE 8

RECREATION PERPETUITY VALUE USING TRUNCATED NEGATIVE BINOMIAL RESULTS, TTSCTIM MODEL, MOOLOOLABA BEACH, A$, 1999–2000

Interest rate	*Overall sample*	*Residents*	*Visitors*
10%	8,614,525,609	1,525,654,656	2,044,889,177
8%	10,768,157,011	1,907,068,320	2,556,111,471
6%	14,357,542,681	2,542,757,760	3,408,148,628

10 512,995 visits per annum (Heath Collier, 2002, pers. comm., Maroochy Lifeguard Services Manager, 21 August).

THE VALUE OF A BEACH VISIT: COMPARISON WITH PREVIOUS STUDIES

The values attained for a recreation beach visit can be compared with those surveyed from the broad literature,[11] other Australian literature, and Bell's (1999) digest for Florida beach recreation. These are discussed in turn. Those from the broad literature are outlined in Table 9, where values are in United States dollars. An approximation of the Australian dollar equivalents may be obtained by multiplying these values by 1.6 and taking account of the time value of money by assuming an inflation rate of six per cent.

TABLE 9

COMPARISON OF CONSUMER SURPLUS MEASURES FOR THE RECREATIONAL USE VALUE OF A BEACH VISIT

Year	Source, type	Beach day value	Annual value	Area	Visitation per annum
1984	Bell and Leeworthy (1990), CS of recreation value	Tourist (T): US$33.91	-	Florida's beaches 2708 acres	70 million beach days
1984	Bell and Leeworthy (1986)	Resident (R): US$10.23 T: US$29.32	-	As above	5.2 million residents 8 million tourists
1991	Pitt (1992)	-	T and R: A$150.85m	Lower, Mid and Far North Coast of NSW	2.08 million
≈ 1988	Silberman and Klock (1988)	US$3.60 (mean WTP of use value)	-	Northern New Jersey Beaches, 12 miles	2.2 million beach days
1996	Cerda Urrutia *et al*. (1997)	T US$19.95 per household	-	Dichato Beach, Tome-Chile	100,000 households
1998	Dharmaratne and Braithwaite (1998)	1st time:US$8.87 Repeat: US$7.33	-	West and South Coast beaches of Barbados	400,000 long-stay visitors (7-day visit)

Notes: ≈: estimate, as not stated in paper.

The tourist and resident values obtained by this study fall within the range of values found in the literature. However, the mean value obtained in this study is well above that of Silberman and Klock (1988).

[11] While cross-country comparison of beach recreation values may be invalid because both user and physical beach characteristics and survey and modelling processes may be different, it provides a context for the values obtained by this study.

The annual value obtained by Pitt (1992) in 1991, if converted to total consumer surplus and taking account of the time value of money, lies within the interval obtained for residents and below that obtained for the overall sample and for tourists. No regression analysis was conducted in Pitt's (1992) study because the zonal travel cost approach was used. This present study adds to the work of Pitt (1992) by using a negative binomial individual travel cost approach to beach recreation for the first time in Australia.

Converting the annual values obtained in this study to values per 100 metres of beach and taking account of the time value of money assuming a discount rate of six per cent produces values of 3.5 million to $5.6 million and $4.5 million to $7.6 million per 100 meters of beach for residents and tourists respectively in 1991 dollars. These values are well above those of the north coast of New South Wales and Adelaide depicted in Table 10. The values of Seacliff to Grange Rd and Grange Rd to Outer Harbour respectively equal $73,346 and $23,830 per 100 meters of beach in 1991 dollars. The reasons for the difference are twofold. These figures do not take account of increases in demand for urban beaches over time, especially given the recent sea-change phenomenon. Secondly, Mooloolaba's beach length (2 kilometres) is substantially shorter than Seacliff to Grange Rd (14.9 kilometres), reflecting a concentrated value.

TABLE 10

COMPARISON OF WILLINGNESS TO PAY FOR RECREATION AT BEACHES IN AUSTRALIA

Source	Area	Australian dollars per 100 metres of beach per annum in 1998 dollars
1983 Kinhill Stearns and Riedel and Byrne	Adelaide, South Australia,	
	-Seacliff to Grange Rd (14.9 km)	$46,130
	-Grange Rd to Outer Harbour	$14,988
1992 Pitt	North coast New South Wales	
	-Lower	$57,955
	-Mid	$248,864
	-Far	$78,409

Source: Manipulation of material from the Envalue site of the New South Wales Environment Protection Agency at <www2.epa.nsw.gov.au/envalue/>, with a subsequent referral to <http://www.environment.nsw.gov.au/education/evri.htm>, viewed on 14 December 2006.

Table 11 provides comparison with Bell's (1999) digest, prepared for the United States' National Oceanic and Atmospheric Administration. The values obtained by the Leeworthy studies (1994, 1997, 1999) are of the same order of magnitude as those from this study. The resident values appear to be higher for those beaches provided in the table. Clearwater beach has values almost double those obtained in this study, taking account of inflation and exchange rates.

TABLE 11

BELL'S DIGEST OF WILLINGNESS TO PAY/DAY/PERSON FOR FLORIDA BEACHES – TRAVEL COST METHOD ONLY

Author	Site	Kind of visitor	Willingness to pay/day/ person (1999 US dollars)
Bell and Leeworthy (1990)	All Florida	Visitor	$54.00
Bell and Leeworthy (1986)	All Florida	Resident	$16.08
		Visitor	$46.08
Leeworthy (1997)	Florida Keys	Resident/Visitor	$67.00
Leeworthy (1994)	Clearwater Beach	Resident/Visitor	$70.00
	Honeymoon Island	Resident/Visitor	$18.61
EERG (1998)	Pinellas County State Recreation Area	Resident	$22.75 (using a Random Utility Model)
Leeworthy (1999)	Daytona Beach	Resident/Visitor	$32.06
	Hugh Taylor Birch State Recreation Area, Fort Lauderdale Beach	Resident/Visitor	$34.27
	St Andrews State Recreation Area	Resident/Visitor	$47.76
	St George Island State Park	Resident/Visitor	$42.59
	Gulf Islands National Seashore	Resident/Visitor	$31.19

Source: Presentation of travel cost data only from Bell (1999).

COMPARISON OF BEACH VALUES AND VISITS WITH THOSE OF FOREST AND NATIONAL PARK RECREATION

Table 12 outlines some of the consumer surplus-use values for forest and national park recreation in Australia. The values for beach recreation by tourists and the general sample for Mooloolaba beach lie above those presented in Table 12. Those for resident beach users lie within the range of values presented in the table. These comparisons are made taking into account the time value of money.

Beach and national park daytrips

In 1999 according to the Bureau of Tourism Research (*Courier Mail*, 2001), going to the beach was the most favoured activity for Australian day trippers, representing 25 per cent of daytrips taken as depicted in Table 13. Australian day trippers undertook 170.9 million daytrips at a cost of $11.9 billion in 1999. However, overnight visitors spent three times the amount spent by day trippers.

TABLE 12

AUSTRALIAN USE VALUES FOR FOREST AND NATIONAL PARK RECREATION

Author	Year	Site	Method	Value/day visit (1998 Australian dollars)	Number of visits/year
Bennett (1995)	1995	Dorrigo NP, NSW	TCM	$35.25	158,824
		Gibraltar Range National Park (NP), New South Wales (NSW)	TCM	$19.70	42,105
Blackwell and Asafu-Adjaye (1997)	1995	Noosa NP, Qld	CVM	$5.24	1 to 1.5 million visitor days
Driml (2002)	1994	Wet Tropics World Heritage Area (Qld)	Travel Cost Method (TCM) – zonal	$55/visitor-day	1.7 to 3.4 million visitor days
Economic Associates (1983)	1983	Green Island, Great Barrier Reef, Queensland (Qld)	Contingent Valuation Method (CVM)	$38 (for natural and human-made facilities)	-
Gillespie (1997)	1995	Minnamurra Rainforest Centre, Budderoo NP, NSW	TCM	$29.02	139,285
Hundloe et al. (1990)	1986	Frazer Island, Qld	TCM	$16	190,000 visitors
Read Sturgess and Associates (1994)	1994	Grampians NP, Victoria	TCM	$19.54/visitor day[a]	3,055,556 visitor days or 725,000 people

Source: First 4 references are manipulations of material from the Envalue site of the New South Wales Environment Protection Agency at <www2.epa.nsw.gov.au/envalue/>, with a subsequent referral to <http://www.environment.nsw.gov.au/education/evri.htm>, viewed on 14 December 2006.

Note: [a]According to the National data standards set by the Australian and New Zealand Environment and Conservation Council (ANZECC) WorkingGroup on National Parks and Protected Area Management (NPS Victoria, 1996) person-visit days is one of the preferred measures of visitation to protected areas. In some cases there is little difference between a person-visit day and a day visit except where a person visits a site more than once in a single day and is counted as more than a single day visit. There can be considerable difference between a visit and a day visit as a visit can occur over a number of days.

TABLE 13

COMPARISON OF PERCENTAGE OF AUSTRALIAN DAYTRIPS TO THE BEACH AND TO NATIONAL PARKS

Activity	Percentage (%)
Going to the beach	25
Pubs, clubs and discos	21
Visiting national parks, bushwalking, rainforest walks	13

Beach versus national park visits

Even at the State level the results for Queensland are similar. According to Tourism Queensland (2000), "going to the beach" ranked highly, with 34 per cent of domestic visitors undertaking this activity. Visiting national parks did not receive a mention. For international visitors to Queensland, going to the beach again ranked well above visiting national parks, with 73 per cent versus 58 per cent of respondents participating in these activities respectively.[12] For the Sunshine Coast the disparity is the same. The most popular activities for international visitors to the Sunshine Coast were going to the beach and shopping for pleasure. Both accounted for 85 per cent of international tourists, while visiting national parks accounted for 70 per cent (Tourism Queensland, 2000).

CONCLUSION

From the evidence presented in this paper, beaches appear to have higher passive-use values than national parks or forests. Some caution should be given when using this result in all contexts. Beach and user characteristics differ from site to site and these characteristics impact on the final recreation value obtained. The values obtained in this paper were for a condensed urban beach. Also, studies from the past will not necessarily reflect current recreation values because rising demand for beach recreation resources will occur as coastal population levels increase.

While national parks may have high non-use values relative to their recreational values, this paper provides evidence that more attention and resources may be required for beaches. Even though commonwealth and state governments contribute to local government funds, the re-allocation of funds and resources towards maintaining and enhancing beach services may warrant more than just direct local government input, because the benefit spheres of beaches extend to the state and commonwealth levels. The United States has acknowledged this by having local, state and federally managed and serviced beaches.

An assessment of beach non-use values would prove useful in analysing the importance of beaches relative to national parks. Because many of the conservation

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12 Percentages add to more than 100% because respondents can participate in more than one activity.

and preservation values of beaches are unknown, future research would require the skills of an array of disciplines including economists.

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