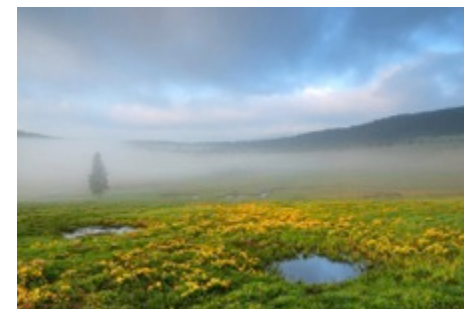
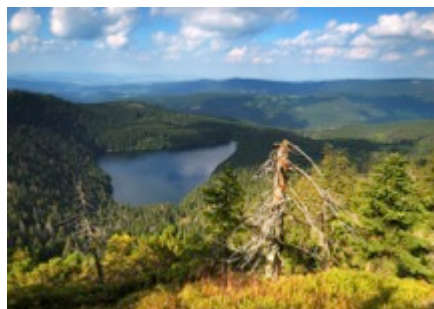




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Precision of travel cost measures in estimation the recreation demand: the case of Šumava national park

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Ulvön

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Objective

- Recreation demand model for Šumava NP
 - Welfare associated with 1 trip to Šumava NP
 - Sensitivity analysis to definition of travel cost
- Implications for further Czech recreation studies
 - Is it „worth“ to go for a time-consuming precise measurement of travel and time using GIS/route planners? / Does the noise introduced by simplifications significantly affect the results?
 - Are the statements on travel costs made by respondents reliable?
- Šumava NP
 - Large-sized recreational area to which many visitors come from a long distance from large municipalities
 - Excellent pilot site to answer these questions for Czech setting



Data

- On-site survey in the central part of Šumava NP
 - May to October 2014
 - Face-to-face interviews + not assisted data collection
 - 505 questionnaires completed
 - 238 have full data to conduct the study



Methods & models

- Single-site individual travel cost model (*Parsons, 2003*)
 - Q_d : no. of trips within last year
 - P: travel costs (5 specifications)

Cost variable	Direct cost of transport		Opportunity cost of travelling time	
	Length	Per km rate	Travel time	Opportunity cost
<i>Cost_perceived</i>	Stated	Calculated using stated total direct cost	Stated	
<i>Cost_obj1</i>	Mapy.cz fastest route, using center of the part of municipality	2.51 (survey mean)	Mapy.cz, fastest route	33% wage rate
<i>Cost_obj2</i>	Mapy.cz fastest route, using municipality center			
<i>Cost_obj3</i>	GIS - euclidean distance using municipality center			
<i>Cost_obj4</i>	GIS - euclidean distance using Šumava NP polygon			

- Truncated stratified negative binomial model, ML (*Hilbe and Martinez-Espineira, 2005*)

Descriptives

$$Visits = f(tc, x \downarrow trip, x \downarrow resp)$$



x↓*trip*

x↓*resp*

Variable	Mean	Std. dev.	Min	Max
<i>Visits</i>	2.02	2.51	1	20
<i>Cost_perceived</i>	656.6	348.6	86.0	1 865.7
<i>Cost_obj1</i>	643.7	335.8	78.1	1 891.1
<i>Cost_obj2</i>	641.1	335.9	74.2	1 891.1
<i>Cost_obj3</i>	483.9	255.7	58.3	1 455.5
<i>Cost_obj4</i>	446.7	250.4	44.6	1 399.1
<i>Hiking</i>	0.67	0.47	0	1
<i>Nights</i>	5.39	2.99	1	15
<i>Group_no</i>	3.87	3.61	1	31
<i>Hotel</i>	0.55	0.50	0	1
<i>Relatives</i>	0.07	0.26	0	1
<i>Room</i>	0.18	0.39	0	1
<i>Camp</i>	0.11	0.31	0	1
<i>Sex</i>	0.46	0.50	0	1
<i>Income</i>	19.07	7.01	6.46	30.55
<i>Age</i>	41.63	12.78	15	76
<i>Outdoor</i>	0.58	0.49	0	1

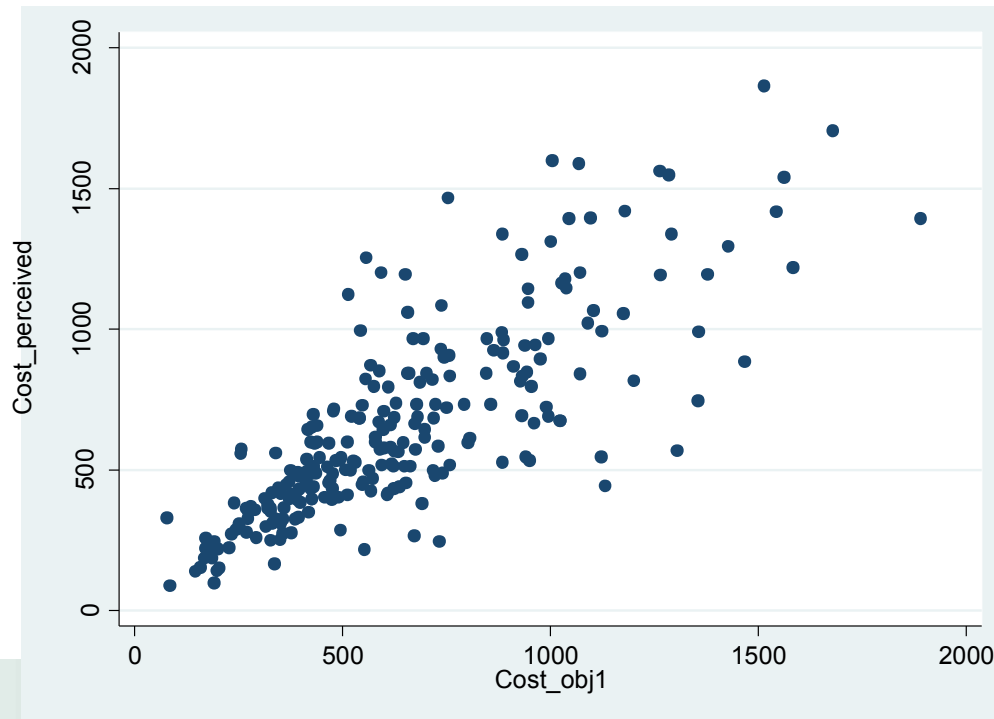
Results

Variable /Model	Model 1		Model 2		Model 3		Model 4		Model 5	
	Cost_perceived		Cost_obj1		Cost_obj2		Cost_obj3		Cost_obj4	
	Parameter	Std. Err.	Parameter	Std. Err.	Parameter	Std. Err.	Parameter	Std. Err.	Parameter	Std. Err.
<i>Cost</i>	-0.002***	0.000	-0.003***	0.000	-0.003***	0.000	-0.003***	0.001	-0.003***	0.001
<i>Hiking</i>	-0.620***	0.227	-0.488**	0.222	-0.474**	0.222	-0.570**	0.223	-0.522**	0.224
<i>Nights</i>	0.056*	0.034	0.050	0.033	0.050	0.033	0.045	0.034	0.048	0.034
<i>Group_no</i>	-0.032	0.029	-0.032	0.029	-0.032	0.029	-0.032	0.029	-0.028	0.029
<i>Hotel</i>	-1.923***	0.301	-2.174***	0.297	-2.154***	0.295	-2.011***	0.294	-2.051***	0.297
<i>Relatives</i>	-1.108**	0.435	-1.152***	0.426	-1.154***	0.424	-1.010**	0.427	-0.919**	0.433
<i>Room</i>	-2.276***	0.382	-2.575***	0.382	-2.571***	0.380	-2.440***	0.379	-2.484***	0.383
<i>Camp</i>	-1.036***	0.372	-1.247***	0.367	-1.215***	0.365	-1.163***	0.367	-1.189***	0.370
<i>Sex</i>	-0.464**	0.226	-0.436**	0.222	-0.439**	0.221	-0.464**	0.222	-0.470**	0.224
<i>Income</i>	-0.001	0.017	0.011	0.017	0.010	0.017	0.004	0.017	0.000	0.017
<i>Age</i>	-0.002	0.009	0.001	0.008	0.001	0.008	0.000	0.009	0.001	0.009
<i>Outdoor</i>	-0.263	0.241	-0.328	0.238	-0.335	0.237	-0.343	0.238	-0.330	0.239
<i>Constant</i>	1.719	1.751	2.220**	1.079	2.243**	1.052	2.252*	1.155	2.097*	1.217
<i>Alpha</i>	6.20***		3.10***		2.93***		3.40***		3.81***	
<i>N</i>	238		238		238		238		238	
<i>Log-likelihood</i>	-263.09		-258.15		-258.02		-259.39		-258.96	
<i>Wald chi2</i>	106.3***		115.9***		116.8***		115.5***		115.1***	
<i>Pseudo R2</i>	0.211		0.226		0.226		0.222		0.223	
<i>AIC</i>	2.32		2.28		2.28		2.29		2.29	
<i>BIC</i>	-1 231.3		-1 231.3		-1 231.3		-1 231.3		-1 231.3	

Are the stated travel costs reliable?

Variable	Mean	Std. dev.	Min	Max
<i>Cost_perceived</i>	656.6	348.6	86.0	1 865.7
<i>Cost_obj1</i>	643.7	335.8	78.1	1 891.1

- Pearson correlation coefficient: 0.80 (p-value: 0.000)



Are the stated travel costs reliable?

- What is the cause?
 - Length + time?

Statistics	Length (km)		Time (h)		Cost per km (CZK)	
	Stated	Computed	Stated	Computed	Stated	Computed
Mean	209.2	204.1	3.3	2.8	384.1	511.4
Std. dev.	94.5	94.1	1.7	1.1	245.0	235.8
Pearson corr.	0.94		0.81		0.55	
p-value	0.000		0.000		0.000	
Sign-rank test	3.50		7.90		-8.50	
p-value	0.00		0.00		0.00	

- Absolute error of respondents: $Diff_dist = |Dist_obj1 - Dist_stated| / Dist_obj1$
- $\chi = 10.8\%$ for distance, 18.4% for time ($\chi = 8\%$; 15.7%)
- does not change with:
 - Length of the journey
 - Familiarity of the site
 - Socio-demographics...



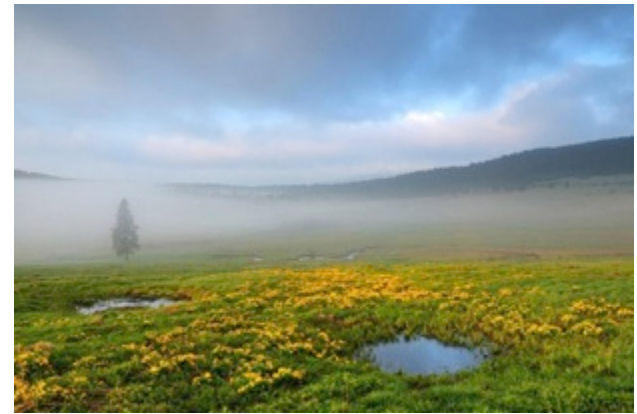
The effects on welfare estimates

Welfare measure/ Cost specification		Model 1	Model 2	Model 3	Model 4	Model 5
		Cost_perceived	Cost_obj1	Cost_obj2	Cost_obj3	Cost_obj4
CS/visit		439.4	387.8	386.4	301.0	294.1
95% Lower bound		322.9	294.3	293.3	226.3	221.8
Conf. Int. Upper bound		687.1	568.4	566.2	449.4	436.2



Conclusion

- The recreation welfare associated with an average trip to Šumava NP is estimated at 439.4 CZK = 24.4 EUR (387.8 CZK = 21.5 EUR)
- Perceptions of recreationists concerning the travel distance & time relatively close to the reality → may be considered reliable
- Use of simplified travel cost calculation approach (euclidean distance, polygons):
 - underestimates the true distance to the recreation site by 145 CZK (8.1 EUR) per visit
 - BUT does not affect the fit of the model and the stability of other determinants of demand
 - when the simplification cannot be avoided, report the distribution of CS
 - decision-making, CBAs: if the „simplified“ approach of the pilot study is employed, we should account for the possible bias; i. e. using 95% upper bound



**THANK YOU FOR YOUR
ATTENTION!**

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Image sources

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- <http://www.ceskatelevize.cz/ct24/regiony/225834-sef-np-sumava-vnima-zakon-o-parku-jako-setrny-ne-tak-ekologove/>
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