

Modeling recreation demand in urban forests in Prague using random utility framework

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Motivation

- the grant of the Czech Ministry of Agriculture \Rightarrow research on valuation of **recreation functions of forests** in CR
- to derive **recreation demand functions** for forest recreation (short trips, one-day and more-day trips) by TCM
 - travel costs models based on discrete choice random utility framework
- to infer **determinants** of recreation demand and to estimate **welfare change** associated with the change of forests attributes
 - i. injury on forest quality
 - ii. tree composition
 - iii. age structure of forests
 - iv. etc.
- Valuation of recreation functions of **urban woodland areas** and **parks** in Prague
 - short trips up to 4 hours



The value of recreation losses associated with

1. a **closure** of each urban forest sites in Prague
2. a **50 % decrease** in extent of urban forest sites, number of benches and length of trails



Random utility model foundation and applications

- **Discrete choice demand** \Rightarrow modeling choice of site
- **McFadden's** work (McFadden, 1974, 1978 and 2001)
- first applied by **Hanemann** (1978) in order to derive recreation demand
- later developed by Bockstael et al. (1986)
- **swimming, fishing, hunting or hiking**
- Feenberg and Mills (1980) on water pollution, Morey (1985) on the choice of ski areas, or Adamowicz et al. (1997) on moose hunting



Random utility model, basic model

Utility function

$$v_i = \beta_{tc} tc_i + \beta_q q_i + e_i$$



Choice

$$\beta_{tc} tc_k + \beta_q q_k + e_k \geq \beta_{tc} tc_i + \beta_q q_i + e_i, i \in S$$

Utility maximization
from trips

$$u = \max(v_1, v_2, \dots, v_s)$$



No-participation

$$v_0 = \alpha_0 + \alpha_1 z + e_i$$



Specification of probability model

Probability of visiting site k

$$pr(\beta_{tc}tc_k + \beta_qq_k + e_k \geq \beta_{tc}tc_i + \beta_qq_i + e_i, i \in S \\ a \geq \alpha_0 + \alpha_1z + e_0).$$



Multinomial logit model

$$pr(k) = \frac{\exp(\beta_{tc}tc_k + \beta_qq_k)}{\exp(\alpha_0 + \alpha_1z) + \sum_{i=1}^S \exp(\beta_{tc}tc_i + \beta_qq_i)}$$



Access and quality change value

Welfare loss due to closure of recreation site # 1

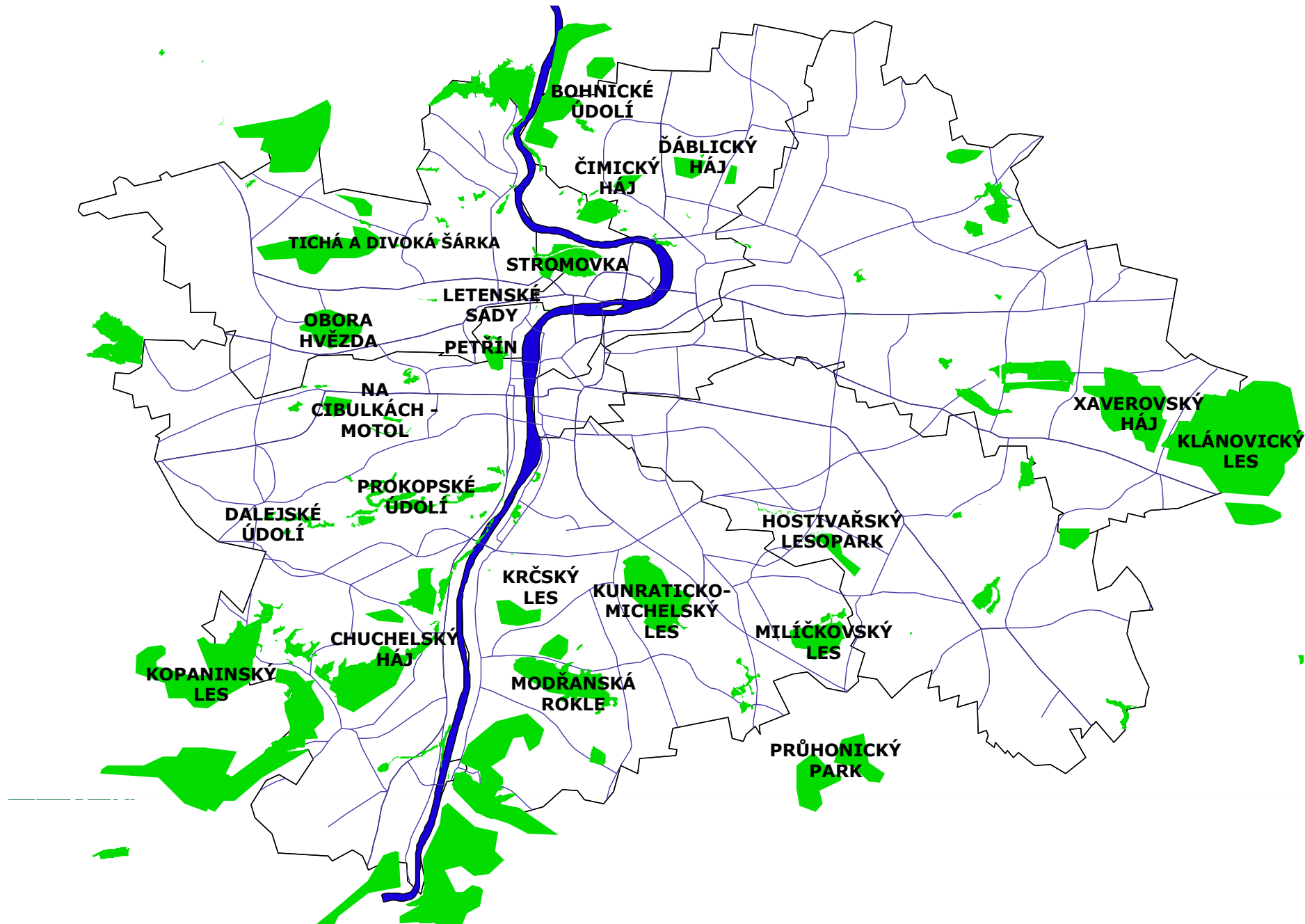

$$W^{close} = \{U^{close} - U^{base}\} / -\beta_{tc}$$

Welfare change due to quality change q^*


$$W^{change} = \{U^{change} - U^{base}\} / -\beta_{tc}$$



Study area – Urban forests in Prague

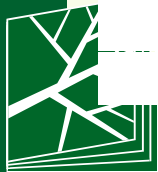
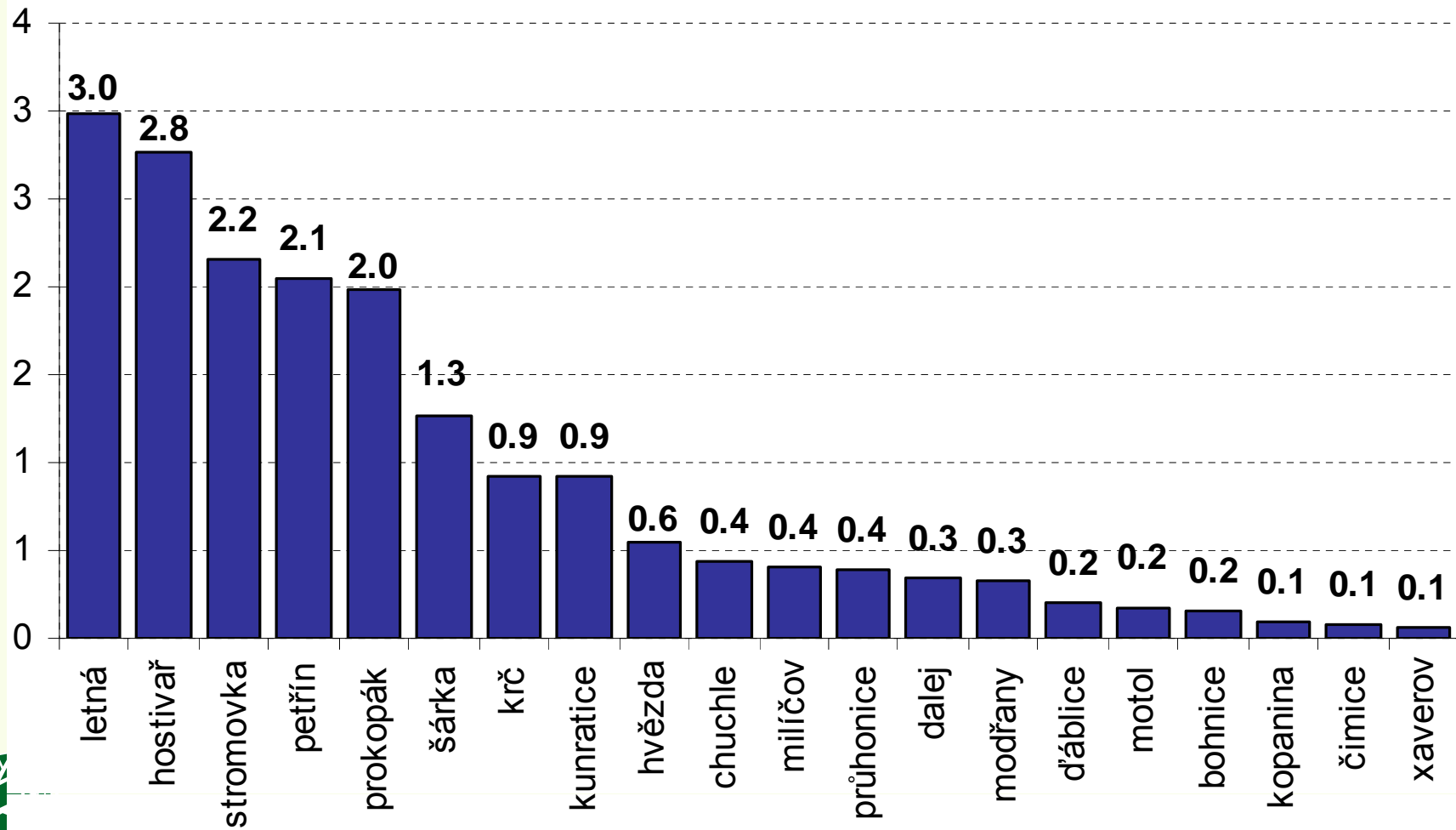


Survey implementation

- **off-site** sampling
- pretest in 11 - 12/2006, pilot in 1/2007 (50 respondents)
- main survey **3 - 4/2007**
- by SC&C spol. s. r. o.
- **quota sampling** (sex, age, education)
- **pen-and-paper** questionnaire (35 minutes)
- **303** completed questionnaires for Prague
- recreation object: **short term trips** (up to 4 h) carried out to **urban forests in Prague**
- recreation season: **4 – 10 /2006**



Seasonal average number of short trips according to each urban forest

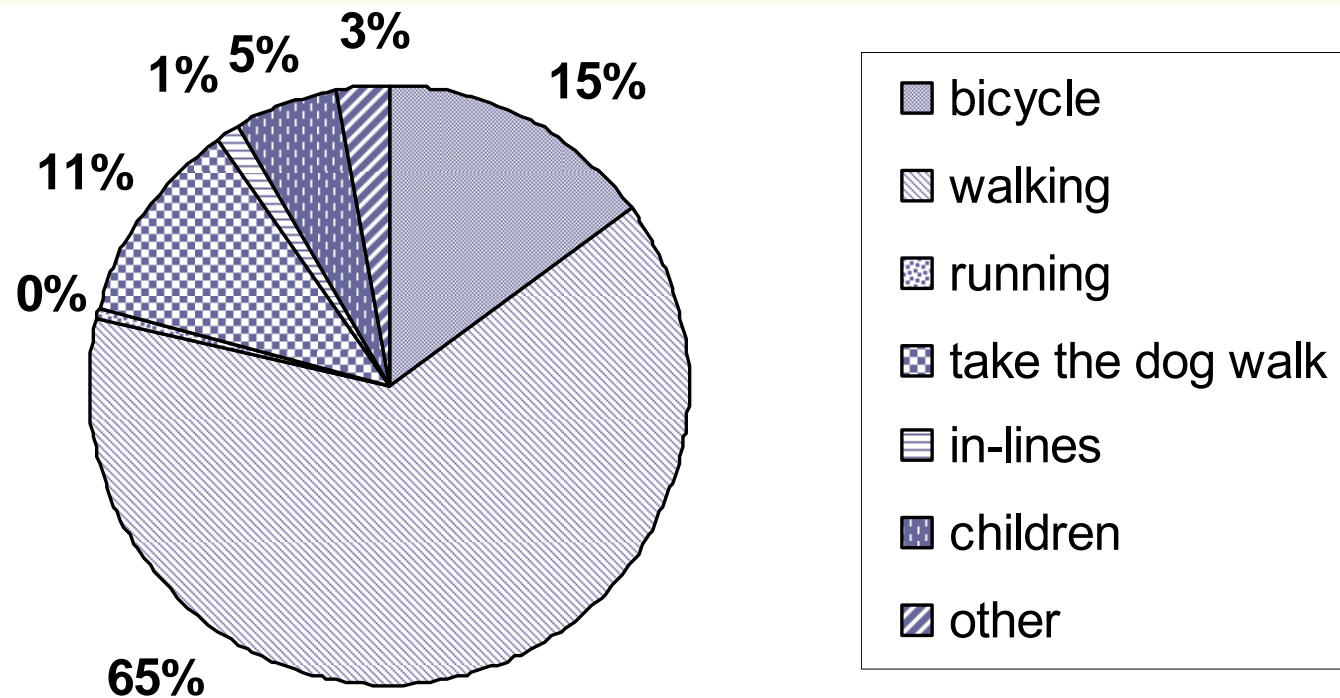


Descriptive characteristics of sample

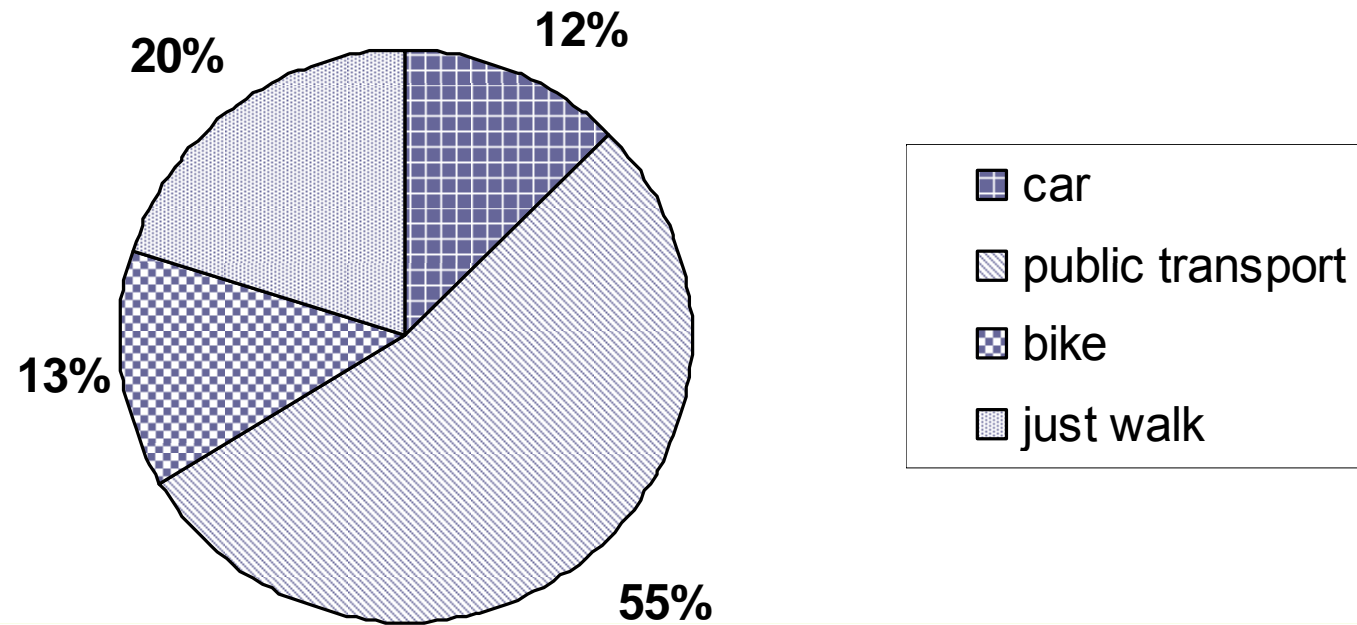
- Length of trip 3,73 hours
- Age (in average 44 years)
- Secondary education (39 %), university degree (14 %)
- Net month income 12 710 CZK



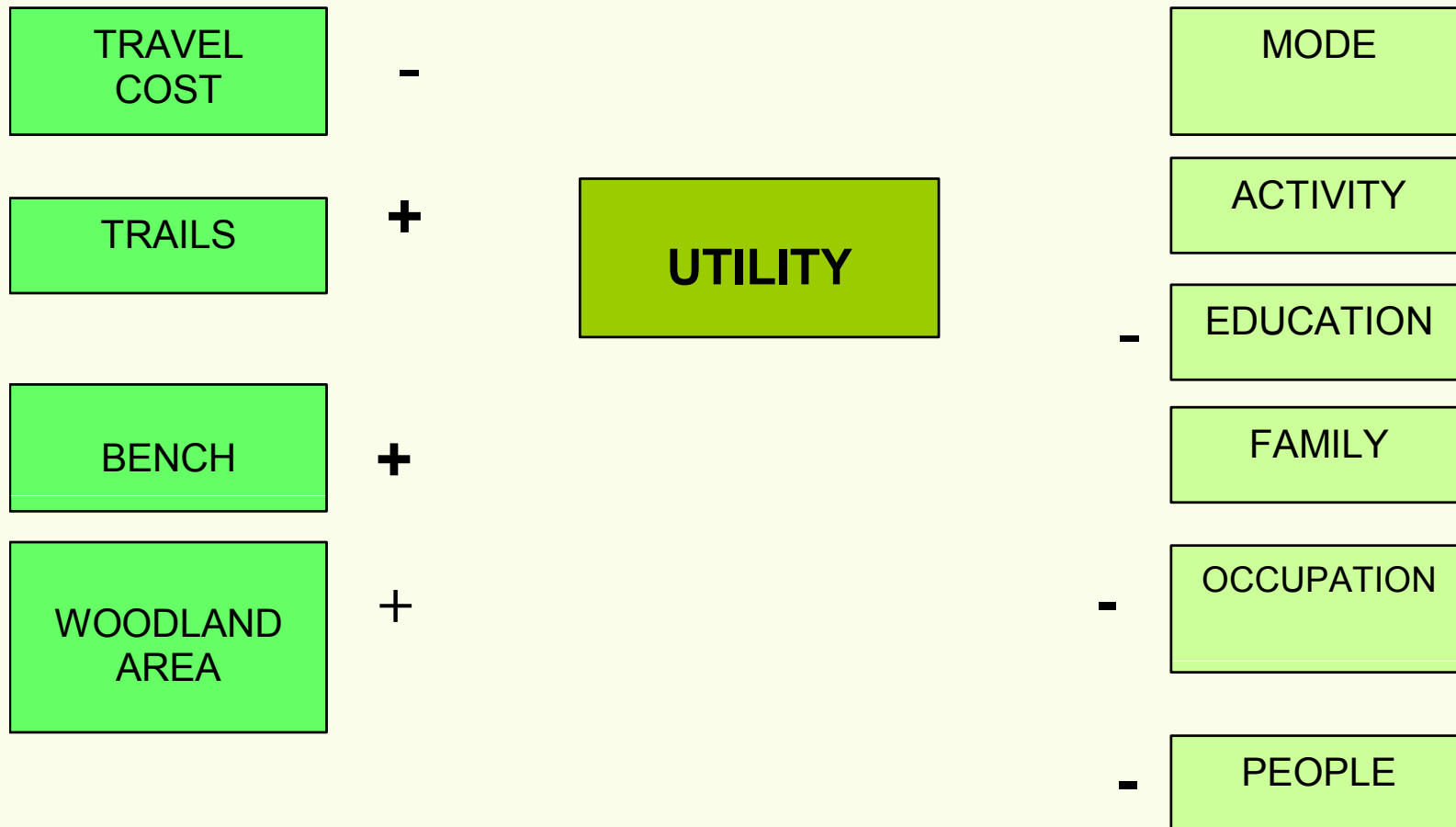
Type of recreation activity on trip



Mode of transport on trip



Specification of empirical model



Multinomial model – final model

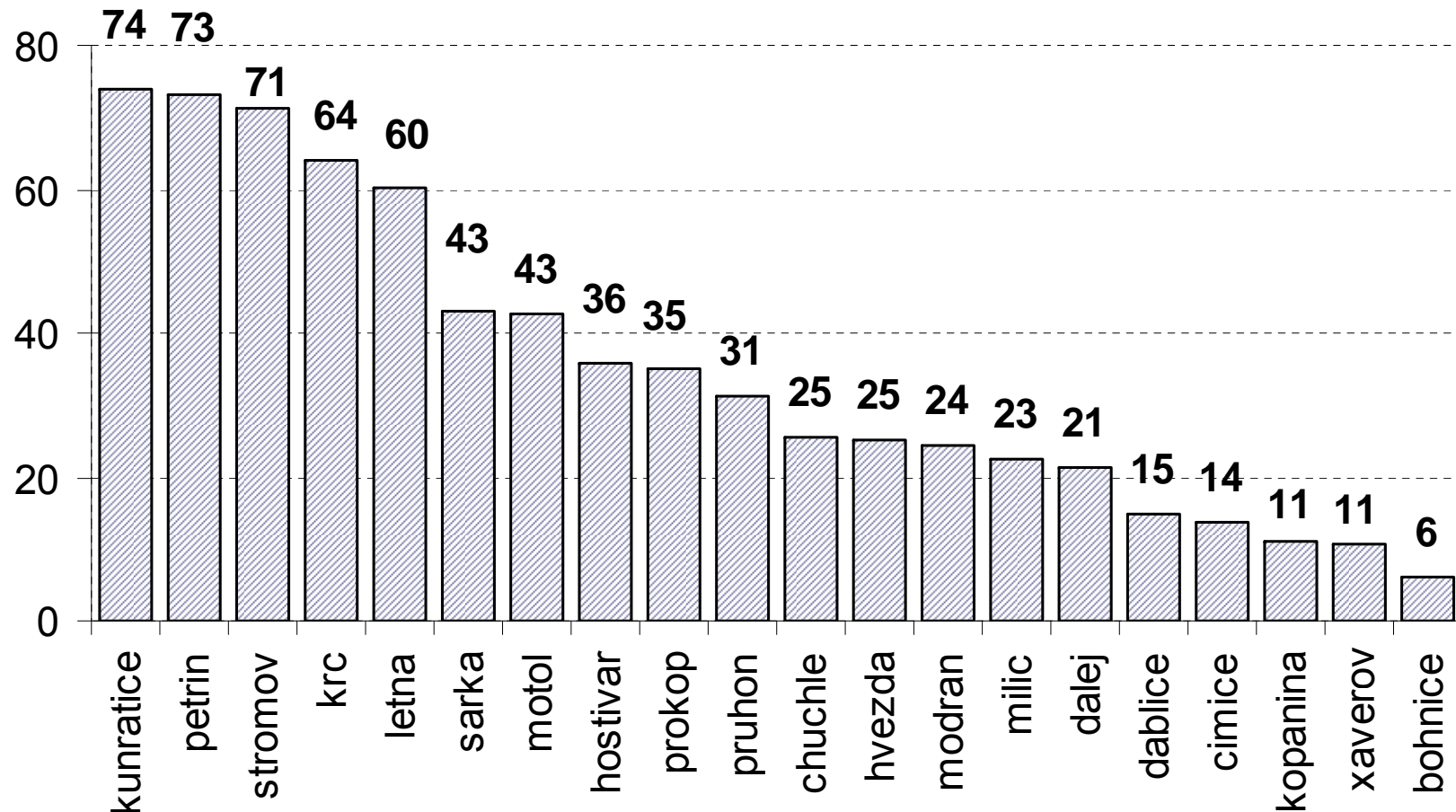
Parameters	Estimates	Standard error	Estimate/s.e.	Probability
tc	-0.0180	0.0005	-36.66	0.00
area	0.0016	0.0002	8.69	0.00
trails	0.0092	0.0026	3.55	0.00
bench	0.0012	0.0001	8.77	0.00
car	0.1164	0.0796	1.46	0.14
walking	0.5757	0.0445	12.93	0.00
second	-0.2433	0.0595	-4.09	0.00
married	-0.0261	0.0520	-0.50	0.62
fulltime	-0.3678	0.0482	-7.62	0.00
<2people	0.2860	0.0566	5.05	0.00
const.	4.3498	0.0892	48.77	0.00

Mean log-likelihood = -81.2959

Number of cases = 179

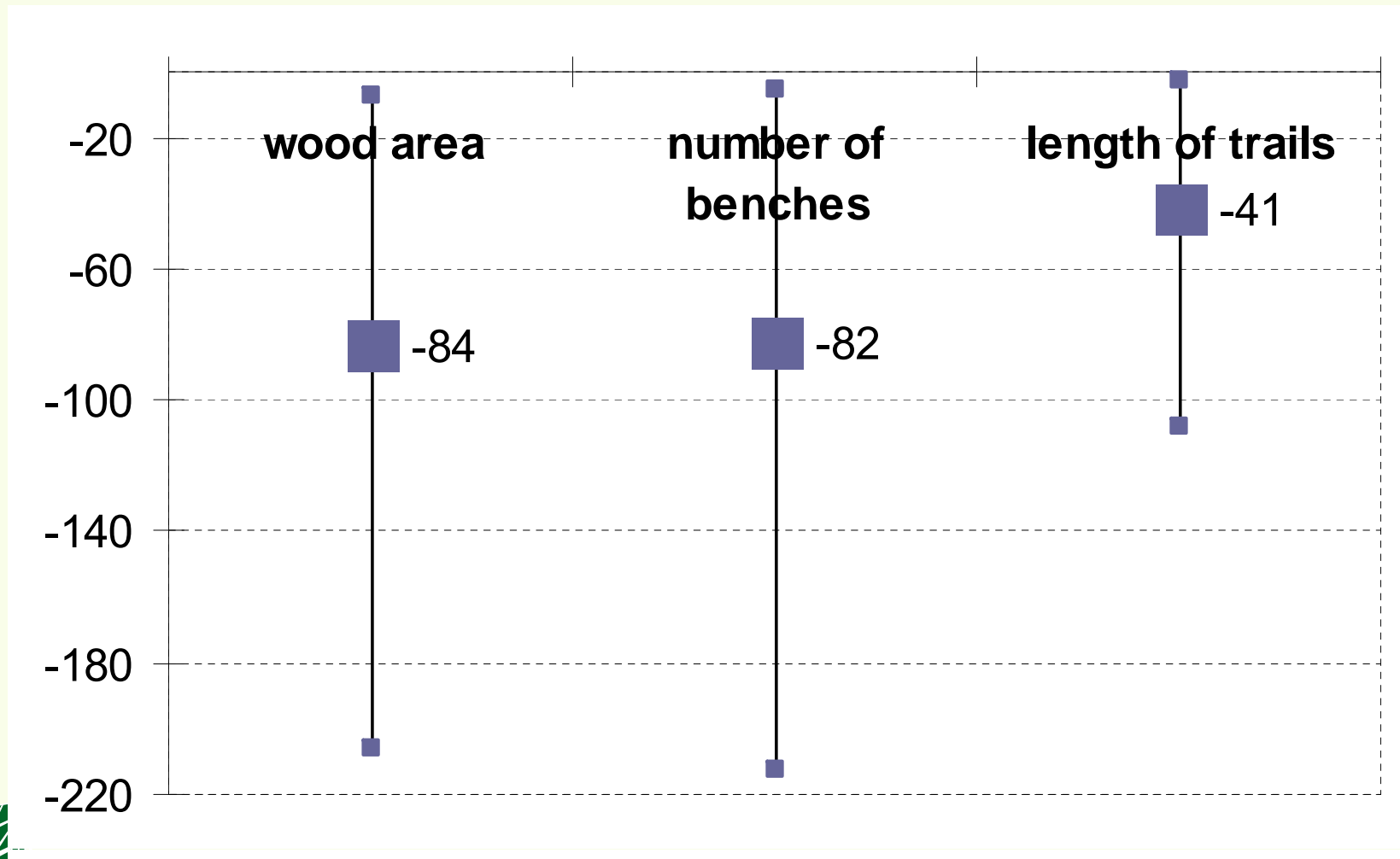


Mean seasonal per person recreational values in CZK 2006



1 USD = 22 CZK

Welfare loss due to 50 % decrease of (in CZK 2006)



Conclusions

- **Negative significant relationship** between **trips** demanded and **travel costs** as theory assumes
- significant positive impact of **recreational components** in urban forests and **forest area** on recreation demand
- **no-recreation option** explained
 - in positive manner by secondary education and fulltime job
 - in negative manner by size of family and walking in forests
- **Attention:** estimates and significance of parameters could be restrictive due to **sample size**
- future work: multinominal model on **one-day trips** and **more-day** trips in CR



Thank you for your attention

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