Title

A combined RP and SP mode, route and destination choice modeling approach to capture the heterogeneity of mode and user type effects in Austria

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Background

Mode choice models have been used extensively to evaluate policy implications and level-of-service changes, providing a powerful tool in transport planning for developing effective travel demand forecasts (Bhat, 1998). As a key valuation indicator, the value of travel time savings (VTTS) has always been subject to extensive debate in both academia and politics, because savings in travel time account for the biggest share of user benefits in most cost-benefit analyses.

The VTTS may differ according to characteristics of the trip, travel mode and the user (Mackie et al., 2001): Typically, mode effects describe differences in VTTS due to heterogeneity in time sensitivities (comfort, productive time use, etc.), while user type effects are driven by differences in socio-economic and other (unobserved) characteristics. It is difficult to disentangle mode effects and user type effects due to self-selection issues (e.g. people with high income choose more pleasant modes but still have a higher VTTS).

Differences in the VTTS across modes have important implications for policy appraisals, as modes with a higher VTTS will be prioritized ceteris paribus. The outcome of costs-benefit analyses may strongly depend on whether user type and/or mode effects are removed from the VTTS (Flügel, 2014). It has been suggested that mode effects should not be removed as otherwise resources may be allocated inefficiently, while - for equity reasons - the removal of user type effects seems advisable. It is therefore crucial that the sources of differences in the VTTS across modes are well understood. See Mackie et al. (2001), Börjesson and Eliasson (2014), and Flügel (2014) for discussions on this topic.

Research question

The focus of this paper is to disentangle mode effects and user type effects for a detailed dataset with both stated (SP) and revealed preference (RP) data from Austrian travelers. We will provide VTTS estimates capturing mode (car, walk, bike, public transport) and user type (income, season ticket ownership, working hours and residential location) effects for different trip purposes (work, leisure and shopping) and distances, applying a joint RP/SP modeling approach. In particular, we focus on differences in the VTTS associated with public transport, which tends to be significantly lower than the VTTS associated with the other modes (car, cycling, walking), especially in the RP domain.
Data

Data were collected for a representative sample of 748 respondents in Austria between 2015 and 2016, using a seven-day mobility, activity and expenditure diary (MAED) to get information about time use, expenditure allocation and travel behavior. The diaries resulted in 17.052 RP mode choice observations. In addition, respondents received personalized SP experiments with attribute reference values depending on one selected RP trip, leading to additional 12’428 choice observations. Finally, six different data sets were combined: RP mode choice, SP mode choice, SP car and SP public transport (PT) route choice, SP car and SP PT destination choice.

Methodology

We present a methodological framework how to qualitatively assess two different approaches to optimally model mode and user type heterogeneity regarding estimation efficiency, behavioral plausibility and feasibility: we compare (A1) multivariate segmentation by a-priori dividing the sample into discrete subgroups of respondents, for each of which we estimate a separate choice model (e.g. Jara-Diaz and Guevara, 2003) and (A2) an interaction approach using advanced and efficient techniques to capture the moderating effects of the segments in 1). Both approaches incorporate pooled SP and RP data, as well error components to account for the panel structure of the data (e.g. Greene and Hensher, 2007).

Expected results

In both approaches and all segments (here using univariate segmentation), estimated coefficients show significant and expected effects, with time sensitivities differing substantially by mode. Preliminary results show a VTTS (not corrected for user type effects) for car of 12 Euro, for bike of 9 Euro, and for walking of 20 Euro. The VTTS associated with PT is significantly lower, amounting to only 5 Euro.

References


