
The German value of time and value of reliability study

Ehreke, Ilka
Axhausen, Kay W.

**hEART 2014 – 3rd Symposium of the European Association for Research in
Transportation**

 *Institut für Verkehrsplanung und Transportsysteme*
Institute for Transport Planning and Systems

ETH

Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

hEART 2014 – 3rd Symposium of the European Association for Research in Transportation

The German value of time and value of reliability study

Ilka Ehreke
IVT, ETH Zurich
CH-8093 Zurich

Kay W. Axhausen
IVT, ETH Zurich
CH-8093 Zurich

phone: +41 44 633 30 92
fax: +41 44 633 10 57
ilka.ehreke@ivt.baug.ethz.ch

phone: +41 44 633 39 43
fax: +41 44 633 10 57
axhausen@ivt.baug.ethz.ch

Abstract short

In the framework of the medium and long-term investment strategy of the Federal Ministry for Transport and Digital Infrastructures the presented project focusses on the estimation of values of time (VOT) and of reliability (VOR) and a proposal for recommended values for both private and personal business travel. In line with international practice RP data was collected and systematically varied to serve as a basis for SC experiments. The study includes experiments with a short-term time horizon (route, mode, route and departure time), as well as long-term choices (work place and residential location). This paper will present the results of the first German value of time and reliability study.

Keywords

value of time, VOT, value of reliability, VOR, German Federal Transport Infrastructure Plan, discrete choice modelling

Preferred citation style

Ehreke, I., Axhausen, K.W. (2014) The German value of time and value of reliability study, paper presented at *hEART 2014 – 3rd Symposium of the European Association for Research in Transportation*, Leeds, September 2014.

1 Introduction

Currently the Federal Ministry for Transport and Digital Infrastructures (BMVI) is preparing its medium and long-term investment strategy in form of the new Bundesverkehrswegeplan 2015 (BVWP 2015). In this context the presented project focusses on the estimation of values of time (VOT) and reliability (VOR) and a proposal for recommended values for both private travel and personal business travel. The proposed values will be used in the evaluation of the different investment proposals, which will form the BVWP and replace the old values which were based on the ones of the BVWP 1992 and had not been verified independently since then.

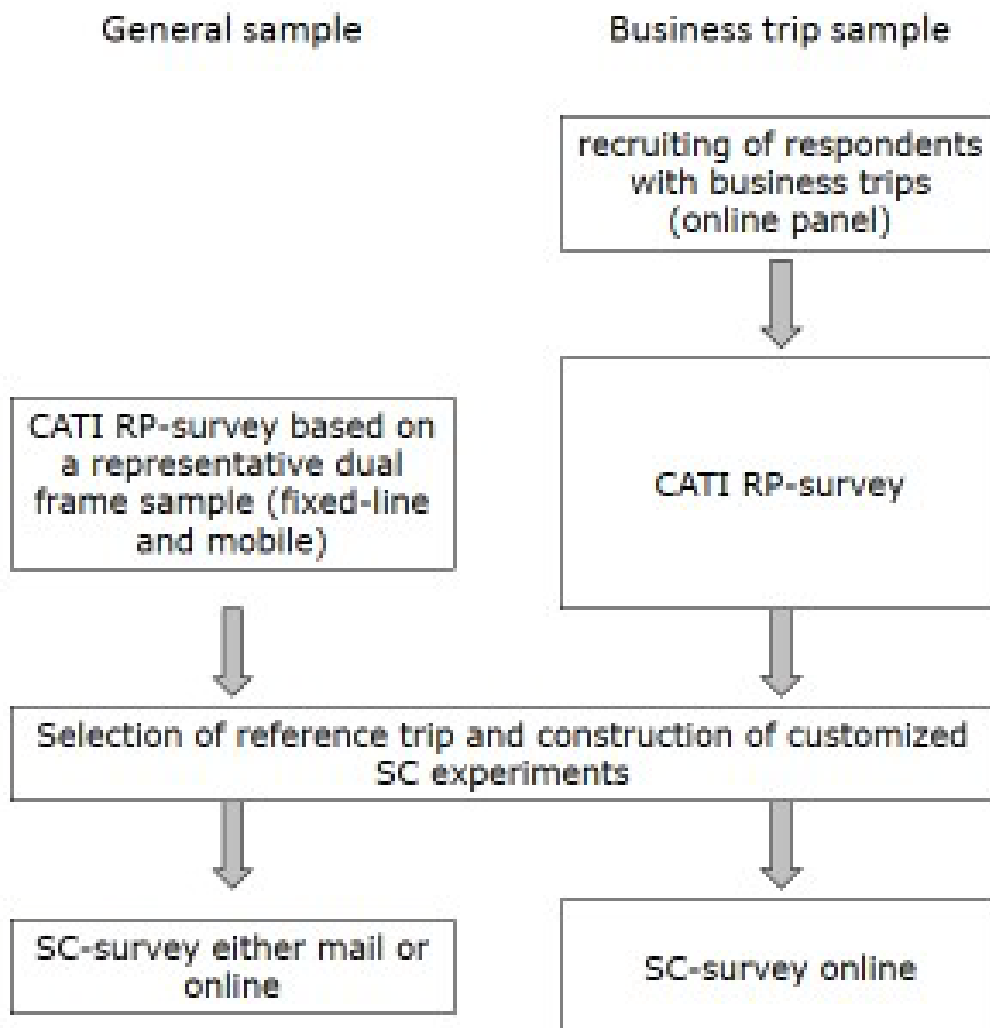
The individual business and commercial travel has higher priority in the future BVWP. Given that some firms have travel policies a qualitative study with business decision makers was conducted to examine how tightly controlled route and mode choice is. The interviews showed that the policies do not bind the travelers in route choice, and in the vast majority of cases of mode choice either, so that the SC approach is valid. To compare the SC results values with two additional approaches were tested (Hensher (1977) and a cost saving approach).

2 Study design

The project was carried out between 2012 and 2014 and adopted in line with international practice (for example Wardman, 1998; Abrantes and Wardman, 2011) a two stage approach: first the respondents reported current trips (RP, revealed preference), which were then systematically varied to be the basis for experiments in the hypothetical choice situations (SC, stated choice). The design of the study builds on the experience of studies in Switzerland (Axhausen et al., 2004 and 2008; Weis et al., 2012; Fröhlich et al., 2012), which had further developed international practice by employing more complex stated choice experiments including multiple modes and multiple elements of the generalized costs of travel in a series of overlapping choice contexts. The study includes experiments with a short-term time horizon (route, mode, reliability experiments), as well as long-term choices (work place and residential location games). The experiments were linked through a set of common variables. This allowed to estimate one joint model including all the short-term experiments.

In a CATI interview three RP trips to the workplace and most important shopping and leisure destinations and the last long-distance trip over 100 km distance were reported. This information was complemented with the usual socio-demographic information and information about mobility tools. The business trip sample was recruited via a web-based survey system. Both samples received the SC experiments within one or two weeks. Respondents received three different SC experiments in general and two if the reference trip was a business trip. In total, they were offered between 8 and 24 choice situations. The modes offered were walking, cycling, car, local public transport (PT) and the various long distance public transport modes (train and air). The reliability experiment was formulated as route-departure time choice with an expressed indication of travel time variability. Three formats of different complexity were tested each allowing to estimate a mean-variance model of scheduling. Figure 1 shows the protocol of the study.

Figure 1 Protocol of the study



A recruitment rate of over 30% for the CATI interview and about 75% completion rate for the first phases (general and the business trip sample) could be achieved. The response rates of the second which are 73% for the general sample and 93% for the business sample show in spite of the complexity of the instruments the interest in the topic (see Table 2).

Table 1 Response behavior of the samples in the main study

	General sample		Business travel sample	
RP Sample			Recruited on-line	1,112
	(CATI)		(On-line)	
	Contacts	9,491	Contacts	1,112
	Completed	3,151	Completed	848
SC experiments written	Indicated willingness to participate	2,965		
	Completed	2,187		
SC experiments on-line	Indicated willingness to participate	186	Indicated willingness to participate	848
	Completed	98	Completed	786

3 Results

Individual models for each experiment were estimated as well as a joint estimation of the complete data. Differences across experiments were accounted by experiment specific scale parameters. The well-known effect of longer distance travel times on the valuations was studied with a series of different model formulations involving interaction terms and non-linear transformations of the variables. The continuous interaction terms varied across attributes.

After weighting for the sample bias and the selectivity in the distance distribution VOT values by mode and different purpose combinations were calculated. Distance dependent values were calculated for the reported trips and aggregated into distance bands. To smooth the sample values were regressed against distance and the resulting values were corrected linearly, logarithmically or log-linearly to match the mean values. We also tested if the size of the travel time differences offered to the respondents in the SC experiments had an impact on the valuations. After accounting for the other non-linearities, our models could not identify such size-effects.

The business travel values were validated against both Hensher's (1977) and a cost-saving's approach. As the relevant variables to estimate the full Hensher approach have not been collected, the recent UK values and simplifications (Wardman et. al., 2013) were used. These estimates were close to the ones from the SC survey. For the cost saving approach the income questions in the survey have not been detailed enough so that the estimates can only show an approximation to the values.

For reliability different specifications were tested, where the final specification uses the standard deviation of travel times for private transport and the mean expected unscheduled delay for public transport and flight. The values of reliability were derived in the same manner as the VOT.

As a final result, the mean demand own- and cross elasticities from the RP data (but using the pooled RP-SP parameter estimates) by mode by aggregating trip and individual specific values were calculated.

4 References

- Abrantes, P.A.L. and M.R. Wardman (2011) Meta-analysis of UK values of travel time: An update, *Transportation Research A*, **45** (1) 1-17.
- Axhausen, K.W., A. König, G. Abay, J.J. Bates and M. Bierlaire (2004) Swiss value of travel time savings, paper presented at the *2004 European Transport Conference*, Strasbourg, October 2004.
- Axhausen, K.W., S. Hess, A. König, G. Abay, J.J. Bates and M. Bierlaire (2008) Income and distance elasticities of values of travel time savings: New Swiss results, *Transport Policy*, **15** (3) 173–185.
- Fröhlich, P., K.W. Axhausen, M. Vrtic, C. Weis and A. Erath (2012) SP-Befragung 2010 zum Verkehrsverhalten im Personenverkehr, final report for the Bundesamt für Raumentwicklung, IG Modus, Zürich and IVT, ETH Zürich. Bern.
- Hensher, D.A. (1977) *Value of Business Travel Time*, Pergamon Press. Oxford.
- Weis, C., M. Vrtic, P. Widmer and K.W. Axhausen (2012) Influence of parking on location and mode choice: A stated choice survey, paper presented at the *91st Annual Meeting of the Transportation Research Board*, Washington, D.C., January 2012.
- Wardman, M., R. Batley, J. Laird, P. Mackie, T. Fowkes, T., G. Lyons, J.J. Bates and E., Eliasson, El (2013) Valuation of travel times savings for business travelers, final report prepared for the Department for Transport, ITS, Leeds.