Time is money - The valuation of travel time savings in Switzerland

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Abstract

A main objective of most transport infrastructure projects is the reduction of user travel times. Neglecting external costs faster travel times lead to benefits for system users. A common tool to account for these benefits is their conversion into a monetary amount using a suitable value of travel time savings (short, value of time – VoT). Similarly, one can value the reductions in travel time variability, i.e. increased system reliability.

There are numerous European and US studies, which have estimated the willingness to pay for the reduction of travel times in a national context. The transport planning group of the IVT (ETH Zürich) has performed recently a number of studies measuring travel behaviour while accounting for travel times and trip costs. This paper will present initial results of a national study to estimate VoTs by trip purpose and user group. It is based on customised stated preference experiments built upon user reported trips.

This paper gives an overview of the recent studies. The second part discusses the construction and the design of the survey. It outlines some specific features which have to be considered when designing such a survey. The research is in progress, so that results presented in the third part have to be taken as preliminary.

Keywords

Value of travel time savings (VoT), Switzerland , Discrete Choice Modelling , Swiss Transport Research Conference, STRC 2003, IVT, ETH Zürich

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1. Estimating the values of travel time savings

1.1 Approach and recent studies

The transport planning group of the IVT (ETH Zurich) has performed recently a number of studies measuring travel behaviour which accounted for travel times, trip costs and travel time variability; see Vrtic, Axhausen, Maggi and F. Rossera (2003) and König and Axhausen (2003). In line with these is the study presented here: a national study of the value of travel time savings (VoT) funded by the Bundesamt für Strassen under auspices of the SVI[1]. The task of this study is the estimation of VoTs by mode, trip purpose and type of person. These values will be part of a new national cost-benefit guideline currently under development within the framework of the VSS.

The general approach of this national study is based on user customised stated choice experiments which are analysed using a random utility discrete choice framework; see Ben-Akiva and Lerman (1985), Axhausen, Bogner, Herry, Verron, Volkmar, Wichmann and Zumkeller (1996) and Bierlaire (2003). The context of the choices varies between route, mode and destination choice. While all three should reveal the same valuations, their joint use allows us to verify the results of each and to balance the inherent difficulties implied in each (ease of understanding, complexity of choice, naturalness of the situation). The experiments are based on a trip, which the respondent reported as part of the Kontinuierliche Erhebung Personenverkehr (KEP) of the Schweizerische Bundesbahnen (SBB). This national continuous telephone survey of passenger travel captures retrospectively all trips over three kilometre and beyond a municipal boundary of a respondent for a week.

In recent years a wide range of national VoT studies have been conducted which are summarised in Table 1 by country, mode and trip purpose. These means hide an even wider range of valuations by socio demographic characteristics and measurement method. In addition, the table presents values derived from recent Swiss studies, which while not concentrating on the estimation of VoTs allow their derivation. Finally, a number of values recently employed, i.e. assumed, in a range of planning studies are listed.

[1] SVI 2001/534, Zeitkostenansätze im Personenverkehr

Table 1 Overview of recent VoT Studies [CHF/h travel time savings]

Study	Year	Car				Rail			
		Comm.	Business	Other	All	Comm.	Business	Other	All
Dutch VoT study[2]	1990	14.00		7.50		10.00	12.50	5.50	
Danish VoT Study[3]	1992	10.00	21.00			6.00	20.00		
Finnish VoT Studies[4]	1995	5.00			2.50	5.00			2.50
Portuguese railway authority[5]	1995				109.80				58.40
VoT on UK Roads[6]	1996		24.00	3.60	9.00				
Californian drivers' will.-to-pay-study[7]	2003				44.00				
Korean VoT Study[8]	2003	9.50				8.50			
Quantifikation von Zeitgewinnen[9]	1980				12.00				
NUP	1981	20.00		16.00					
Swissmetro[10]	2001				51.00				
Verifizierung Prognosemethoden Einführung ICN [11]	2002				28.00	11.90	52.40		19.00
BVWP (D)[12]	1998						30.00	8.00	
Österr. Schienen-infrastruktur [13]	2000						80.00	20.00	
Avanti Initiative[14]	2000	25.00	100.00	10.00					

Values are not corrected for inflation; converted at the exchange rates of the year of publication

[2] Hague Consulting Group (1990)
[3] Jovicic and Hansen (2003)
[4] Karasmaa (2001)
[5] Bierlaire (1995)
[6] Hague Consulting Group (1999)
[7] Brownstone, Ghosh, Golob, Kazimi and Van Amelsfort (2003)
[8] Joong and Sunduck (2003)
[9] Lüthi (1980)
[10] Bierlaire, Axhausen and Abay (2001)
[11] Vrtic and Axahausen (2002)
[12] Chaumet and Eritmann (1995)
[13] Chaumet, Cerwenka, Bruns, Erismann, Kern and Stern (2000)
[14] Chaumet and Eritmann (1995)

1.2 Discrete choice models

The use of discrete choice models is established in all aspects of transport planning since their initial development (Domencich and McFadden, 1975 and for an early synthesis Ben-Akiva and Lerman, 1985). The root of these econometric models is the idea of utility maximisation, i.e. the assumption that a decider (traveller) will select the alternative with the highest subjective utility. The modelling task is to identify those aspects of the alternative, of the choice situation and of the person, which influence this utility. It is clear, that these measurable elements will not capture the utility fully, so that there is a need for a stochastic element which varies from person to person. These stochastic – error - terms will correlate between alternatives capturing their similarity in the eyes of the traveller. It is equally clear that the evaluation of the objective elements will also vary from person to person. A complete model would therefore allow for taste differences between persons and complex patterns of correlation between alternative specific error terms.

Adding the assumption of perfect information of the traveller about the objective characteristics of the alternatives one arrives at the following two part model (see Ortuzar and Willumsen, 1994 or Maier and Weiss, 1990):

- The measurable, systematic part V_{jq}, representing the value of the objective utility of an alternative j for a person q
- The stochastic part respectively error ε_{jq}, of V_{jq} considering unobserved evaluation by each user

The total utility U_{jq} is then:

$$U_{jq} = V_{jq} + \varepsilon_{jq}$$

With V_{jq} considering the attributes of the alternatives, the specific choice situation of the user and the characteristics of the user.

Travel time, or its component parts access time, waiting time, in-vehicle-time, transfer time etc., and travel costs are central elements of the description of the choice alternatives. It can be shown that the ratio of the parameters of cost and time in the utility function specifies the marginal value of one unit of time (saved; expended additionally) (Abay and Axhausen, 2000; Bates, 1987 or Jara-Diaz, 2000). For non-linear utility functions the values of travel time savings are a function of the travel time differences.

2. Survey design and data preparation

The recruiting of participants for this study was part of the KEP-telephone-interviews of the SBB, as mentioned above. We obtained the address of those willing to participate. The socio-demographic characteristics and trip descriptions were available for all respondents. The core of this study are a set of stated – choice experiments which – with one exception during the pre-tests - were constructed on the basis of a reported trip. The chosen choice contexts are mode, route and destination choice (pre-test only; not customised).

While a number of recent national VoT studies made only use of the route choice context, it was felt, that this is inappropriate for Switzerland, which has no current tolls for passenger travel; indeed, tolls have been constitutionally forbidden since 1850. Also, the railroads do not make use of surcharges for different types of trains or different services. The experiment had therefore to appeal to the experiences of the respondents with tolls or surcharges outside Switzerland. The route choice experiments were offered to both local public transport, rail and road users for the mode they had used in the trip on which the stated-choice experiment was constructed, as well as for the non-chosen mode. The results of the experiments with the non-chosen modes allow the checking of a potential selectivity bias in the valuations.

The mode choice context is obviously familiar to the Swiss respondents, but is the results are more complicated to interpret due to mode-specific valuations.

The destination choice experiment was a new approach to the elicitation of the VoT. The intention was to provide a further cross-check by offering the same shopping basket at different locations.

Table 2 shows the combinations of experiments offered to the respondents. The respondents were allocated randomly to one of the two sets depending on their chosen mode.

Table 2: Combinations of stated-choice experiments used

Mode of reported trip		Car		Public transport	
Combination		1	2	3	4
Mode choice		+	+	+	+
Route choice with chosen mode	Car	+			
	PT			+	
Route choice with non-chosen mode	Car				+
	PT		+		
Destination choice (Pre-tests only)		+	+	+	+
Share (main study)		39.0%	20.3%	40.7%	-
Number of respondents (main study)		455	227	509	-

In the original design the questionnaire consisted of four parts. The parts 1, 2 and 3 are stated-choice experiments with six or nine choice situations each. The attribute levels of the different attributes in the different experimental situations vary in each following an experimental design. The orthogonal designs were generated by the statistical software SPSS 10.2 and then revised to remove dominant choice situations, as they do not add information about the preferences. The base level (100%) of each attribute was the value reported in the KEP telephone interview. The design specified relative changes to that base level.

Part 1 is the mode choice experiment (car and bus or rail), which was presented to those participants, who have a car available.

Part 2 is the route choice experiment. Participants received either an experiment for the chosen or the non-chosen mode. The results of two pre-tests showed that the route choice with the non-chosen mode only worked with car drivers. For PT-user (with driving licence) no plausible results could be estimated. This experiment was therefore dropped for the main study.

Part 3 was the destination choice experiment. The participants were asked to choose between two shopping centres. One was cheaper but further away then other centre. Unfortunately this new idea gave no plausible estimation results. The lack of reported values in the literature made it impossible to judge the reasonableness of the vary high values obtained. In the main study it had to be dropped.

In Part 4 of the survey additional questions were asked concerning the reported trip, the person and the household and if a business trip was reported questions concerning working time on business trips. Table 3 shows the final presentation of mode and route choice experiments and of the dropped destination choice experiments.

The presentation of the attributes is a recurring difficulty in stated-response surveys, which requires experimention. Table 4 shows the three different types of presenting car travel times and the resulting estimates which were tested during the pre-tests and used in the main study. The difficulty arose because the study wanted to establish different VoTs for free flow and congested conditions in road traffic. The first pretest presented these two elements as travel time and a percentage of this time in congestion. The result was a very high valuation of the congested part of the trip and a low ratio of the values for uncongested and congested travel times. These values and the ratio are unusually high when compared with the international experiences, e.g. it its only 2/3 in the recent UK study.

It was felt, that the respondents had been unable to convert the percentage properly into minutes, given the speed at which they normally answer. In the second pre-test, this percentage was therefore presented in minutes. The estimation results gave lower absolute values but a ratio between uncongested and congested travel times which was even lower than in pre-test 1. It seems as if the respondents interpreted the congested time as additional to the total travel time. This potential misunderstanding was avoided in the main study, where total travel time as well as congested and uncongested travel time were shown. This clarity comes at the expense of a further line (attribute) which the respondent has to process. It had been this additional effort, which the study had wanted to avoid in the pre-test versions. The results are now credible.

Table 3: Design of the stated-choice experiments

Mode choice car – rail (main study version)

CAR		RAIL	
Travel costs:	18 Fr.	Travel costs:	23 Fr.
Total travel time:	40 minutes	Travel time:	30 minutes
... congested:	10 minutes	Headway:	30 minutes
... uncongested:	30 minutes	No. Of changes:	0 times
☐	← Your choice →	☐	

Route choice rail (main study version)

RAIL		RAIL	
Travel costs:	20 Fr.	Travel costs:	23 Fr.
Travel time:	40 minutes	Travel time:	30 minutes
Headway:	15 minutes	Headway:	30 minutes
No. of changes:	1 times	No. of changes:	0 times
☐	← Your choice →	☐	

Destination choice (pretest only)

SHOPPING CENTER A		SHOPPING CENTER B	
Travel time:	9 minutes	Travel time:	30 minutes
Travel costs:	22 Fr.	Travel costs:	20 Fr.
Price basket of goods:	120 Fr.	Price basket of goods:	100 Fr.
☐	← Your choice →	☐	

Table 4 Comparison of different types of presentation and estimation results (car route choice experiments)

Pretest 1

ROUTE A	
Travel time:	40 minutes
Travel costs:	18 Fr.
Share of congestion:	25%

Estimated VoT for car travel [CHF/h]

...in uncongested traffic:	38.87
...in congested traffic:	122.51
Ratio:	1 / 3.15

Pretest 2

ROUTE A	
Travel costs:	18 Fr.
Travel time:	40 minutes
...congested:	10 minutes

Estimated VoT for car travel [CHF/h]

...in uncongested traffic	27.74
...in congested traffic	99.86
Ratio:	1 / 3.59

Main study

ROUTE A	
Travel costs:	18 Fr.
Total travel time:	40 minutes
... congested:	10 minutes
... uncongested:	30 minutes

Estimated VoT for car travel [CHF/h]

...in uncongested traffic	32.79
...in congested traffic	40.40
Ratio:	1 / 1.23

Another sensitive point in the design of VoT studies is the range of trade-offs offered and their distribution. For the measurement of monetary values of travel time savings with stated-response experiments at least one variable each for time and costs must be presented for each alternative. The differences in time and money specify a trade-off, which the respondent can either accept or reject. These trade-offs must be therefore be constructed very carefully, because there is a risk of manipulating the results by offering misleading or skewed trade-offs.

Two issues must be considered: First ideally the distribution of these trade-offs across the choice situations of an experiment should be uniform in the best case, but must at least offer a

sufficient range of trade-offs, ideally in each set of choice situations. Secondly, the range of the distribution must be plausible covering small as well as not unrealistically high values. For the route choice car experiments Table 5 shows the changes in trade-offs over the two pre-tests and the main study in the questionnaires returned by the respondents. The pre-tests offered fewer small trade-offs. That was corrected in the main study. The range of values was limited from 5 to 100 CHF/h for the benefit of smaller values, but the distribution of the trade-offs covers all VoTs reported by others studies. A comparison of the choices of the cheaper alternative per experiment by the presented trade-offs shows for the main study the expected distribution see Table 6 as an example for the experiments route choice car.

Table 5 Presented trade-offs and estimated VoTs (route choice car experiments)

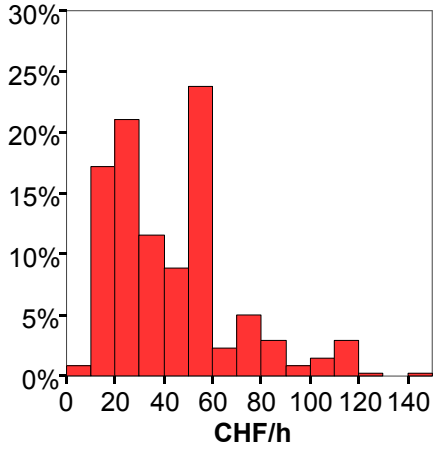
Pretest 1:

Trade-offs presented in survey returned:

Mean [CHF/h]:	58.9
Std. Dev. [CHF/h]:	32.1
Sample size [ ]:	336

Estimation:

VoT [CHF/h]:	47.7



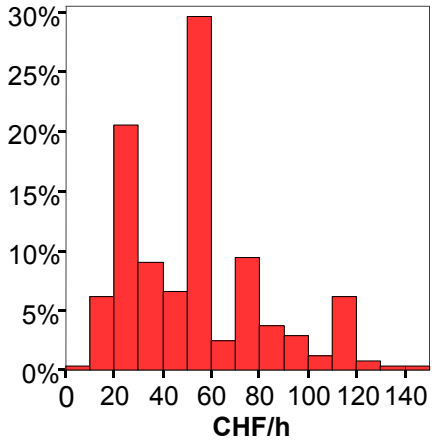
Pretest 2:

Trade-offs presented in survey returned:

Mean [CHF/h]:	46.5
Std. Dev. [CHF/h]:	25.9
Sample size [ ]:	246

Estimation:

VoT [CHF/h]:	35.4



Main study:

Trade-offs presented in survey returned:

Mean [CHF/h]:	34.9
Std. Dev. [CHF/h]:	19.2
Sample size [ ]:	2674

Estimation:

VoT [CHF/h]:	31.2

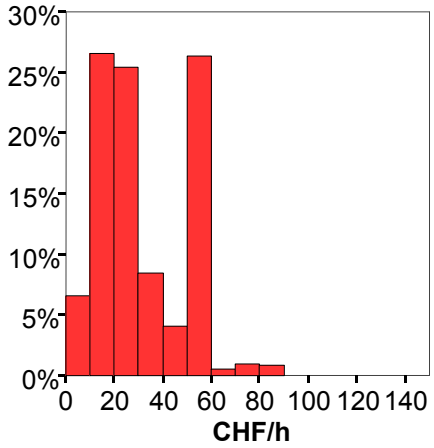
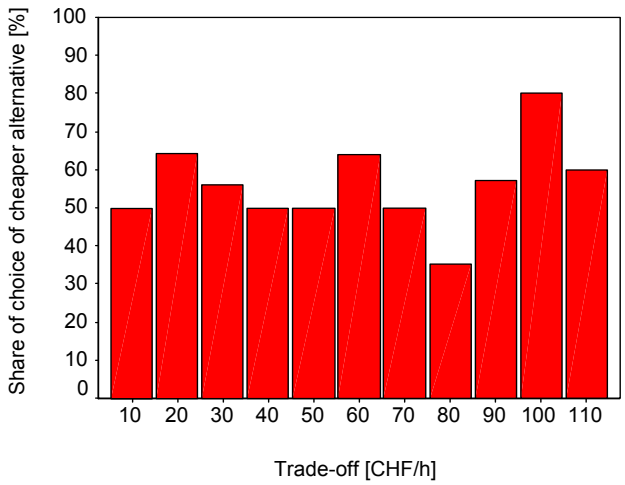
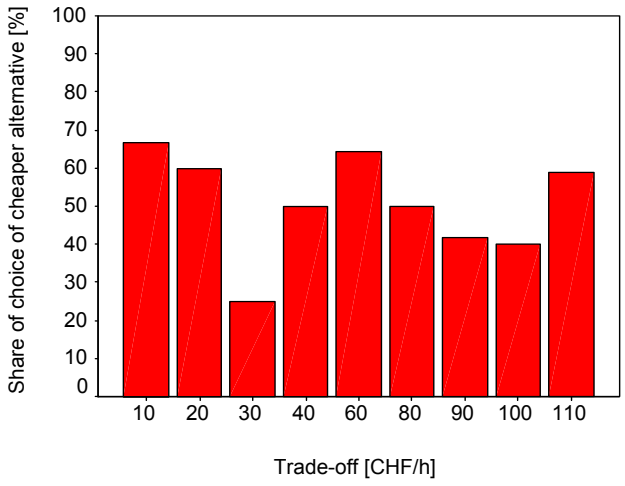


Table 6 Share of the choice of the cheaper alternative per experiment by the presented trade-off (route choice car experiments)

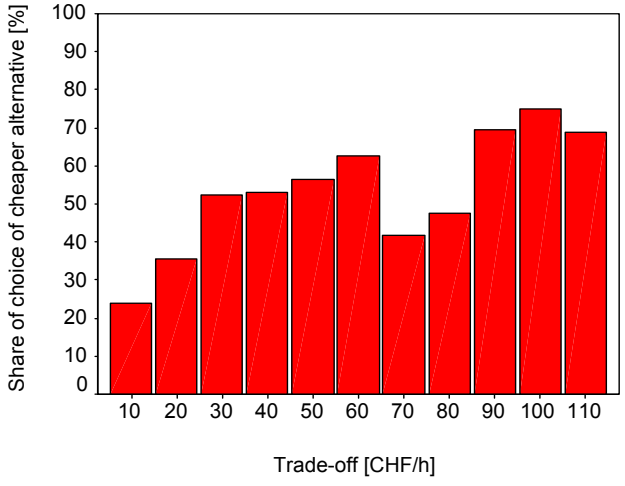
Pretest 1:



Pretest 2:

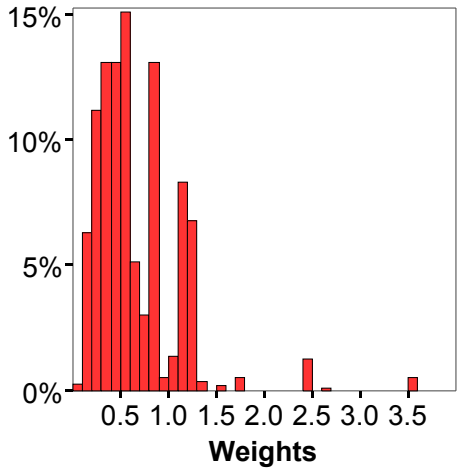


Main study:



The sample of responses obtained in the pre-tests and the main study is the results of a multiple selection process: As mentioned above the recruiting of participants for this study was done as part of the KEP-telephone-interviews of the SBB. At the end of that telephone interview the responds were asked for their willingness to participate in this survey. The fact that the people are asked on behalf of a railway company makes it likely that respondents have an above average interest in the status and future of that mode. A comparison of the socio-demographic structure of the recruited respondents with the total sample of the KEP telephone interview and with the Swiss national travel survey (Mikrozensus 2000 - MZ'00) marks this effect, see Bundesamt für Raumentwicklung and Bundesamt für Statistik (2001). The share of discount card owners increases from the MZ'00 to 13% for the respondents of this study. The share of GA-owners in this study is nearly twice share of the Swiss average. Changes of similar magnitude can be found in terms of education and working status and especially in the house hold income (see Table 7). To correct initially for these selection biases the data is weighted by the MZ'00 shares of age, gender, discount and GA ownership, education, working status and household income. Figure 1 shows the distribution of the weights, which includes a small share of not very serious outliers.

Figure 1 Distribution of the MZ'00 derived person weights



Mean weight:	1.01
Std. dev. of the weights:	0.96
Sample size:	1225

Table 7 Socio-demographic characteristics of the different samples [%]

	KEP	Pretest 1	Pretest 1	Main study	MZ'00
Railway discount and season tickets:					
Halbtax-ownership	36.3	43.1	52.3	47.4	34.8
GA-ownership	6.9	13.9	10.7	11.8	6.0
Car availability					
Always	61.3	59.2	73.1	66.7	77.3
Sometimes	14.7	23.8	13.9	18.4	13.9
Never	24.0	17.0	14.0	14.9	7.1
Education					
Primary + lower secondary	21.3	11.0	9.9	10.4	34.0
Vocational training	51.5	48.3	46.2	50.6	40.7
A-Level, tertiary	26.2	40.7	43.9	39.0	25.3
Working Status					
None	41.2	30.7	28.3	31.8	47.4
Part-time	14.8	18.6	15.7	16.3	13.8
Fulltime	37.3	42.7	49.2	45.3	33.0
Self-employed	6.7	9.0	6.8	6.6	5.8
Household income [CHF/Year]					
Less than 20 000				5.8	3.1
20 000 – 40 000				8.3	14.8
40 000 – 60 000				12.9	22.5
60 000 – 80 000				16.3	16.2
80 000 – 100 000				16.7	9.7
100 000 – 125 000				10.8	5.2
125 000 – 150 000				5.3	2.6
More than 150 000				7.0	4.0
No response				16.9	21.9

3. Initial results

The following results were estimated using the a simple multinomial logit approach (MNL) not allowing for taste differences between respondents nor pooling the various experiments. They are estimated with the software BIOGEME[15] vers. 0.5 and 0.6, developed and distributed by Dr. M. Bierlaire. This research work is in progress. The results are therefore not final and should not be cited or used in application.

Having in mind that Table 8 and Table 9 show the first models steps without the inclusion socio-demographic data and without interaction terms between variables the models give very good results. Most coefficients are highly significant. The results are reasonably consistent across experiments. An exception is the route choice by car drivers for the non chosen mode reported in the KEP-interview. Persons who drive mainly car evaluate variables like headway and the number of changes very differently. One reason could be a minor amount of experience with the less known mode. The same phenomenon can be observed in the mode choice results. The valuation of the variables differs in those situations symbolising negative characteristics of the (in reality) non chosen mode. PT-users value travel time in congested traffic conditions three times higher than car drivers.

The goodness of fit, especially of the mode choice models, is promisingly high. A detailed analysed of the route choice car data showed, that the underlying of the respondents is reasonable and that the equation as a whole is highly significant, even while the goodness-of-fit is low, reflecting an substantial currently unexplained variance.

The estimated values of travel time are slightly higher than those in the comparable studies mentioned in Section 1. Regarding the international studies this results underline one main goal of this research project: Measuring separate values for the Swiss market and its planning processes. The difference is plausible and can be explained by higher incomes and costs of living. Comparing the data with recent national studies, it is important to note that design and methodology of this study are concentrating exclusively on the topic values of travel time whereas other studies concentrated on other topics and estimated VoTs only as by-products.

Table 8: Route choice experiments: Estimation results, linear models, weighted by MZ00

		car by car drivers		rail by car drivers		rail by rail users	
Variables	Unit	Coeff.	t-Test	Coeff.	t-Test	Coeff.	t-Test
Costs	[CHF]	-0.208	-8.639	-0.183	-9.909	-0.129	-8.352
Uncongested travel time	[min]	-0.103	-8.805				
Congested travel time	[min]	-0.133	-8.714				
Travel time (PT)	[min]			-0.075	-10.413	-0.044	-9.067
Headway	[min]			-0.028	-11.772	-0.031	-15.200
No. of changes	[ ]			-0.974	-17.257	-1.002	-2.423
VoT Car uncongested	[CHF/h]	29.82					
VoT Car congested	[CHF/h]	38.44					
Ratio of congested to uncongested VoT	[ ]	1.29					
VoT PT	[CHF/h]			24.33		20.41	
Headway	[%in veh. time]			0.37		0.71	
Transfer	[%in veh. time]			13.1		22.5	
N		2838		2061		3501	
L (0)		-1692		-1192		-1470	
L (β)		-1633		-878		-1059	
LR test		117		627		820	
adj ρ^2		0.034		0.263		0.279	

T-statistics are not corrected for the panel nature of the data.

[15] http://roso.epfl.ch/biogeme

Table 9: Mode choice experiments: Estimation results weighted by MZ00

		by all respondents		by car drivers		by PT users	
Variables	Unit	Coeff.	t-Test	Coeff.	t-Test	Coeff.	t-Test
Constant		0.761	9.647	0.259	2.418	-2.158	-15.176
Costs	[CHF]	0.103	-26.468	-0.077	-16.896	-0.064	-9.350
Uncong. travel time	[min]	-0.048	-14.870	-0.041	-4.674	-0.040	-6.761
Congested travel time	[min]	0.060	-6.786	-0.044	-10.659	-0.097	-4.867
Travel time (PT)	[min]	-0.047	-19.477	-0.034	-11.824	-0.041	-8.600
Headway	[min]	-0.028	-14.656	-0.023	-8.630	-0.028	-8.995
No. of changes	[ ]	-0.598	-14.311	-0.566	-9.546	-0.831	-11.936
VoT Car uncongested	[CHF/h]	28.01		31.97		37.51	
VoT Car congested	[CHF/h]	35.09		34.16		89.91	
Ratio of congested to uncongested VoT	[ ]	1.25		1.07		2.40	
VoT PT	[CHF/h]	27.72		26.55		38.38	
Headway	[%in veh. time]	0.59		0.68		0.69	
Transfer	[%in veh. time]	12.5		16.5		20.1	
N		6108		4092		2016	
L (0)		-4233		-2836		-1397	
L (β)		-2733		-1526		-924	
LR test		3000		2620		946	
adj ρ^2		0.354		0.462		0.338	

T-statistics are not corrected for the panel nature of the data.

4. Further work

The data set now available requires substantial further work before it is possible to suggest values of travel times savings by mode, purpose and type of person.

The replies of this study include only 75 business trips. This amount is potentially too small to be analysed. The lack of trips with these purposes has to be filled with trips from other data

sets available at the IVT, both RP and stated response. The estimation software allows to combine different datasets while accounting for their differences, in particular the differences in standard deviations of the error terms.

There is a range of further issues which need to be addressed in the further work:

- Difference in VoT by trip purpose
- Difference in VoT due to the different socio-demographic characteristics of the travellers, especially by income and working status
- The impact of prior commitments and inertia on the answers to the stated-response experiments, in particular car and season ticket ownership, but also home and work location.
- Elasticity of the VoT with respect to between income and distance travelled

$$\left[\beta_{cost} \left(\frac{inc}{inc_0} \right)^{n_{inc}} + \beta_{dist} \left(\frac{dist}{dist_0} \right)^{n_{dist}} \right] * X \text{ , e.g. time}$$

- Valuation of small time savings
- Combination of RP and the stated-choice data sets, respectively of the various stated choice datasets with the aim to obtain more robust estimates.

The utility functions estimated so far can only be the start of the exploration of the data. Two directions are of importance: accounting for taste differences in the estimated parameters and accounting for non-linear effects of changes in time and cost.

A full model of taste differences would employ the random parameter approach of the mixed logit model. In an initial step it is possible to expand the time and cost parameters using interaction terms in the following way:

$$U = (a_0 + a_i * Soc_i) * Time + b * Costs + ... + e$$

where Soc is one or more socio-demographic variables.

To test for non-linearities, especially of small time savings, one can formulate the utility function using differences, their squared values and interactions (see Table 10 for first results):

$$a_1 * \Delta Time + a_2 * \Delta Time^2 + b_1 * \Delta Cost + b_2 * \Delta Cost^2 + c_1 * \Delta Time * \Delta Cost$$

Table 10: Route choice experiments: Estimation results, models with squared terms, weighted by MZ00

		car by car drivers		rail by car drivers		rail by rail users	
Variables	Unit	Coeff.	t-Test	Coeff.	t-Test	Coeff.	t-Test
Costs	[CHF]	-0.288	-8.132	-0.313	-9.839	-0.262	-8.213
Costs^2	[CHF]	1.319	2.317	2.498	4.658	2.771	4.440
Uncong. travel time	[min]	-0.141	-8.062				
Uncong. travel time^2	[min/60^2]	0.397	1.597				
Congested travel time	[min]	-0.206	-9.804				
Congested travel time^2	[min/60^2]	3.572	5.836				
Travel time (PT)	[min]			-0.126	-10.041	-0.007	-7.492
Travel time (PT)^2	[min/60^2]			0.543	4.863	0.271	+2.447
Headway	[min]			-0.028	-11.671	-0.031	-15.312
No. of changes	[ ]			-0.986	-17.163	-1.002	-2.561
VoT Car uncongested*	[CHF]	29.68					
VoT Car congested*	[CHF]	51.88					
Ratio of congested to uncongested VoT	[ ]	1.74					
VoT PT*	[CHF]			24.77			17.23
Headway	[%in veh. time]			0.22			0.43
Transfer	[%in veh. time]			7.8			13.5
N		2838		2061		3501	
L (0)		-1692		-1192		-1470	
L (β)		-1613		-862		-1045	
LR test		158		661		849	
adj ρ^2		0.046		0.277		0.289	

T-statistics are not corrected for the panel nature of the data.

*calculated for a time period of 60 min travel time reduction

Blayac and Causse (2001) show that this formulation should be embedded in a utility function which also includes the time and money budget of the respondent to be consistent with an economic model of time use(see Table 11 for first results):

$$U = a_0 - a_1 \text{ money budget} * \text{costs} - a_2 \text{ time budget} * \text{time} + ... + e$$

Table 11: Route choice experiments: Estimation results, linear models with time and money budget, weighted by MZ00

		car by car drivers		rail by car drivers		rail by rail users	
Variables	Unit	Coeff.	t-Test	Coeff.	t-Test	Coeff.	t-Test
Costs	[CHF]	-0.014	-4.143	-0.011	-4.305	-0.008	-2.996
Travel time	[min]	-0.004	-6.386	-0.002	-4.431	-0.001	-3.083
HH-income	[CHF/mon]	0.006	1.523	0.001	2.263	0.004	2.136
Time budget	[h/day]	0.001	1.769	+0	2.561	0.001	1.634
Headway	[min]			-0.026	-11.565	-0.030	-15.207
No. of changes	[ ]			-0.910	-17.257	-1.002	-2.423
VoT	[CHF/h]	21.12		24.33	8.4	20.41	6.2
Headway	[% in veh. time]			0.37		0.71	
Transfer	[% in veh. time]			13.1		22.5	
N		2838		2061		3501	
L (0)		-1692		-1192		-1470	
L (β)		-1669		-944		-1101	
LR test		47		496		738	
adj ρ^2		0.013		0.208		0.251	

T-statistics are not corrected for the panel nature of the data.

In summary, the paper has presented the stated-choice experiments conducted for the currrent Swiss value of travel time saving study. The initial and preliminary results indicate a data set of high quality from which the desired results can be obtained: VoTs by trip purpose, mode and type of traveller.

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