# The willingness to pay for mobility

## presentation at the 7th European Congress on Intelligent Transport Systems and Services, Geneva, June 2008

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# The Willingness to Pay for mobility

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# Questions of this study

- How acceptable is mobility pricing ?

- What is the willingness to pay for mobility pricing cost components?
- How does it differ from the already known willingness to pay with regard to fuel prices or public transport fares?

- What would be the impacts of new mobility pricing schemes on route, mode and departure time choice?

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- What would be the impacts of new mobility pricing schemes on route, mode and departure time choice?

# Surveys undertaken

I) Revealed preference telephone survey (SBB)

IIa) Paper-based stated preference survey

- Political Acceptability
- Departure time and route choice
- Departure time and mode choice
- Route and mode choice

IIb) Face-to-face stated preference survey

- Residential location choice
- Mobility tool ownership

# Route and mode choice: Questionnaire example

| | Car | Rail, Bus Tram |
|---|---|---|
| Travel time (min) | 10 min | 25 min |
| Fuel / ticket cost | 0,40 CHF | 1,60 CHF |
| Number of Transfers | | 2 |
| Access time public transport | | 10 min |
| Interval | | 10 min |
| Toll | 0,40 CHF | |
| Parking fee | 2,00 CHF | |

❑ ← Your Choice → ❑

# Modelling approach

- Joint multinomial logit model across experiments
- Non-linear weighting of cost and time

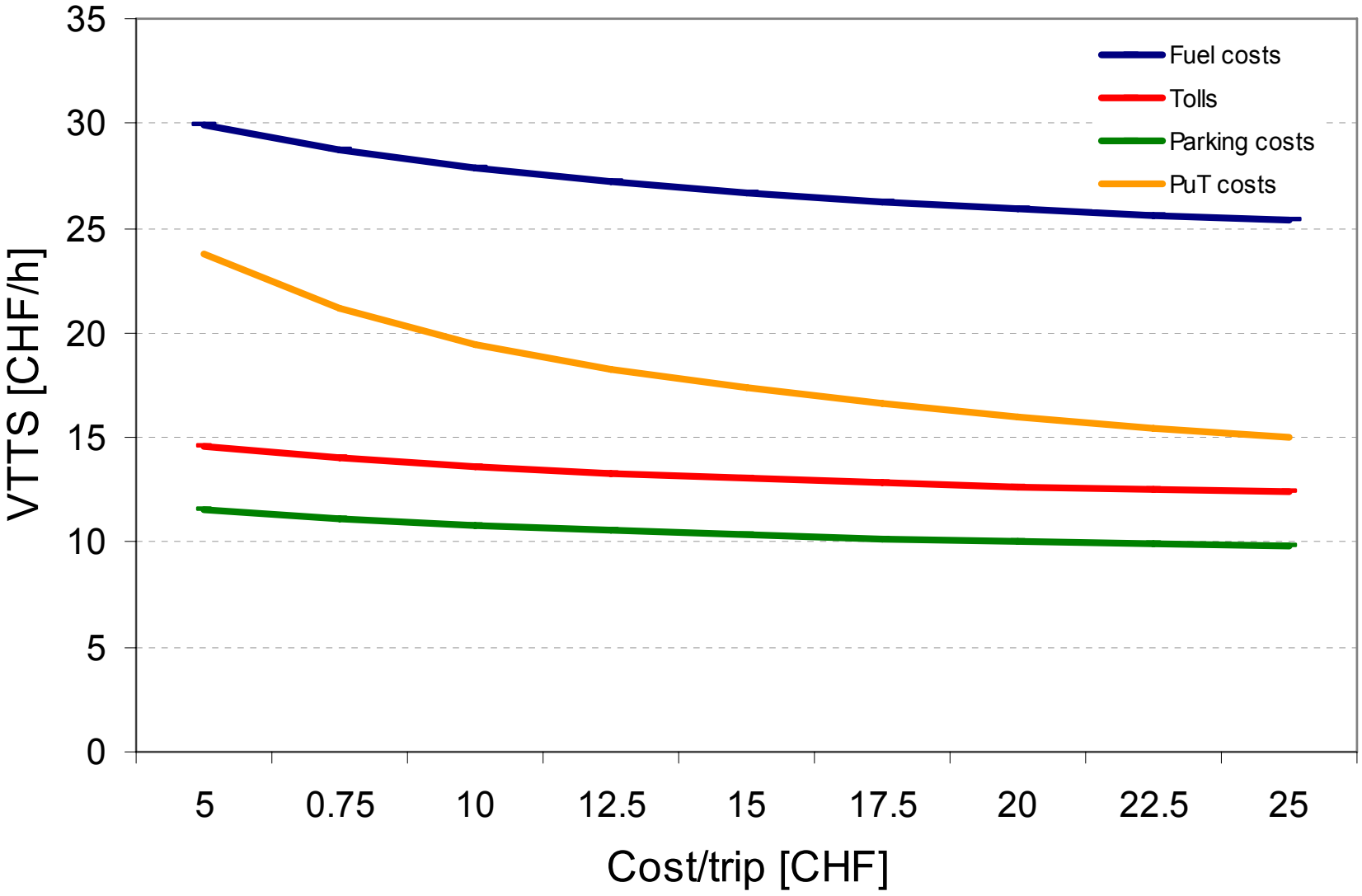
$$V = \ldots + \ldots$$

$$\beta_{\text{TravelTime}} \cdot \left( \frac{\text{Cost}}{\text{meanCost}} \right)^{\lambda_{\text{Cost}}} \cdot \text{TravelTime} +$$

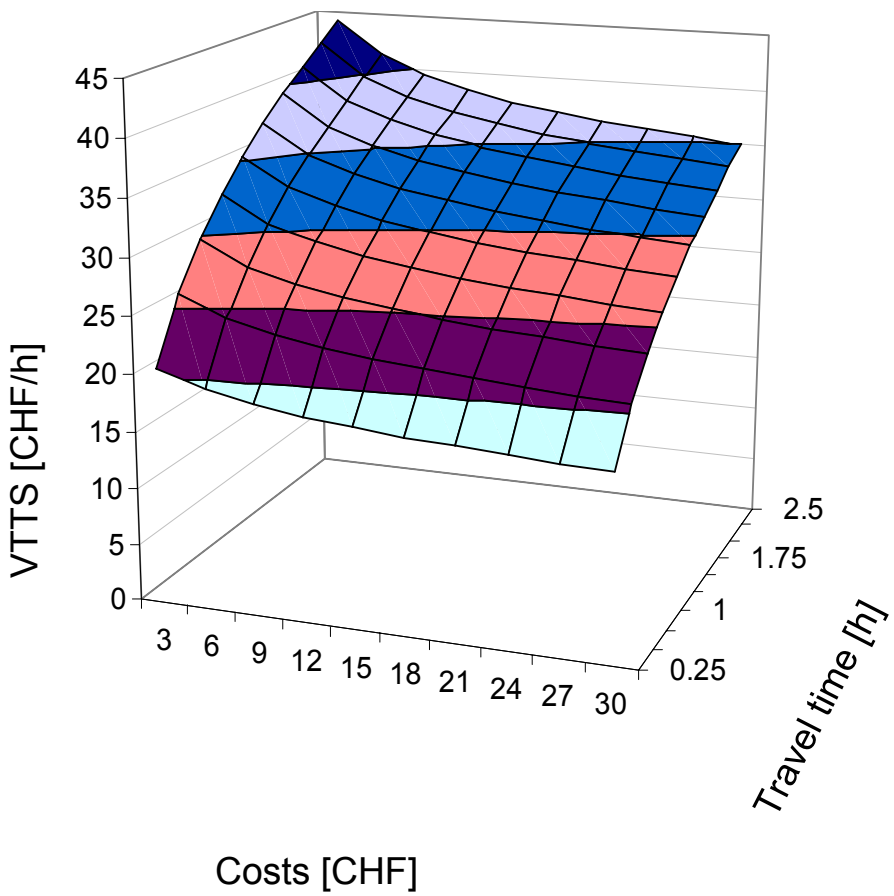
$$\beta_{\text{Cost}} \cdot \left( \frac{\text{Income}}{\text{meanIncome}} \right)^{\lambda_{\text{Income}}} \cdot \left( \frac{\text{TravelTime}}{\text{meanTravelTime}} \right)^{\lambda_{\text{Time}}} \cdot \text{Cost}$$

- Estimation with Biogeme (http://biogeme.epfl.ch/)

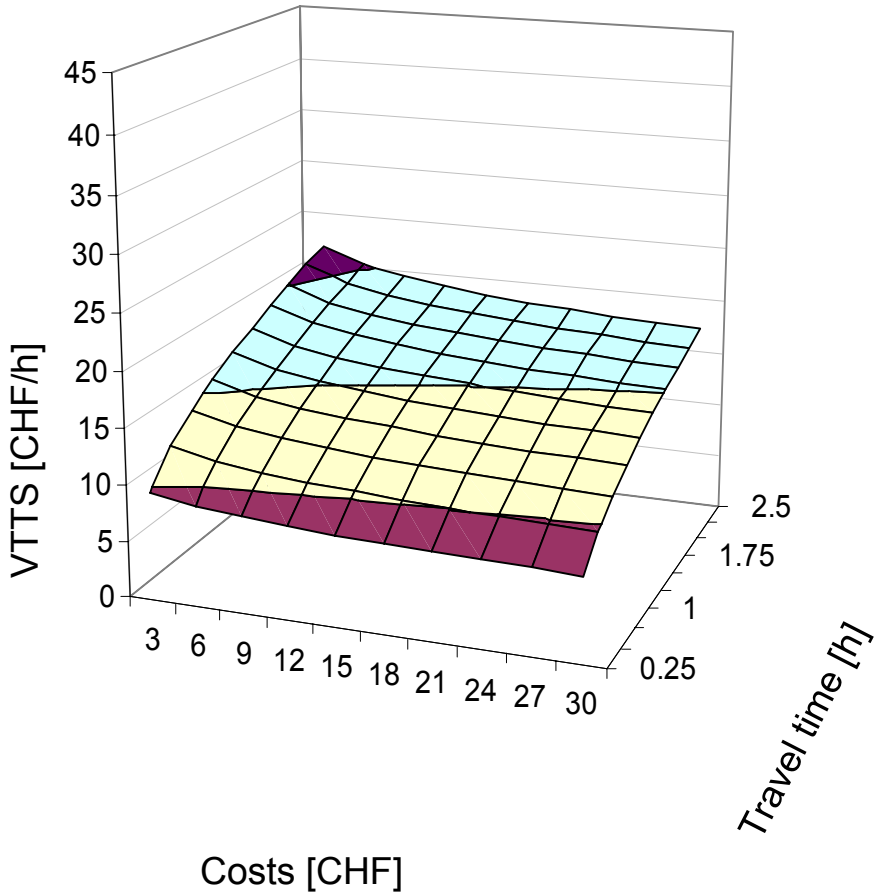
# VTTS with respect to costs



# VTTS (Car) with respect to fuel costs and tolls




Fuel costs




Tolls

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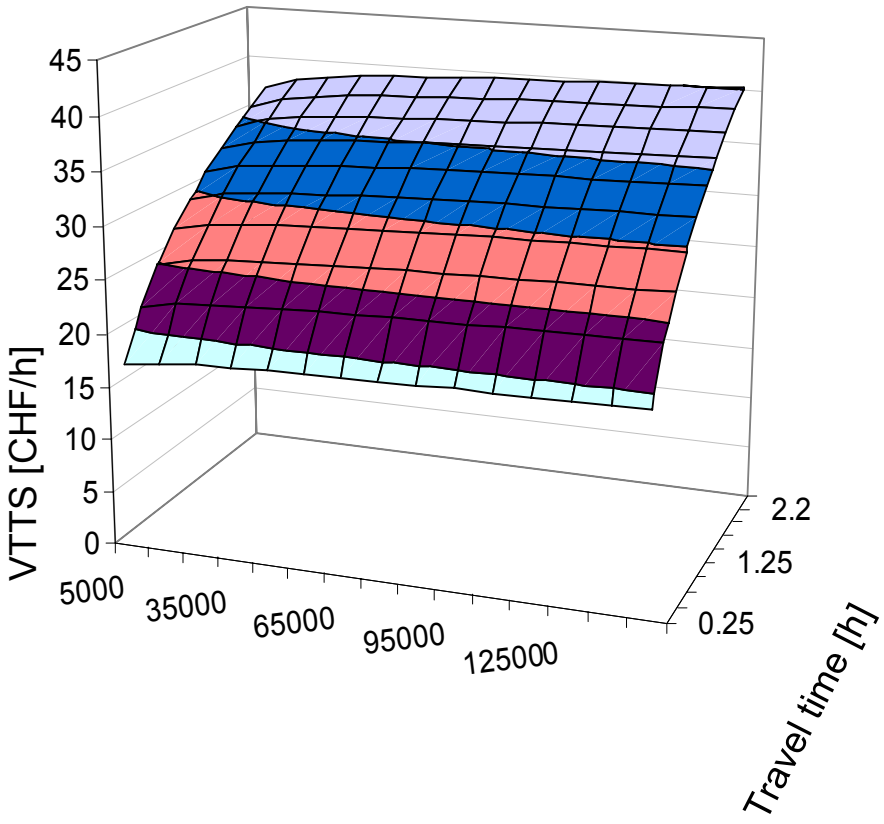


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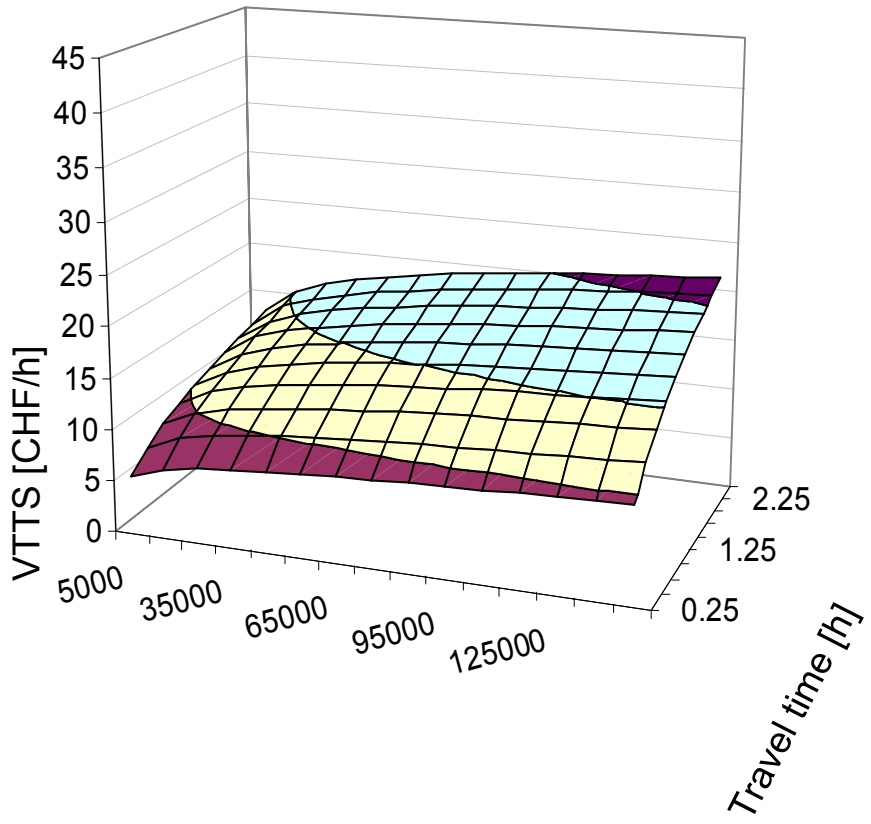
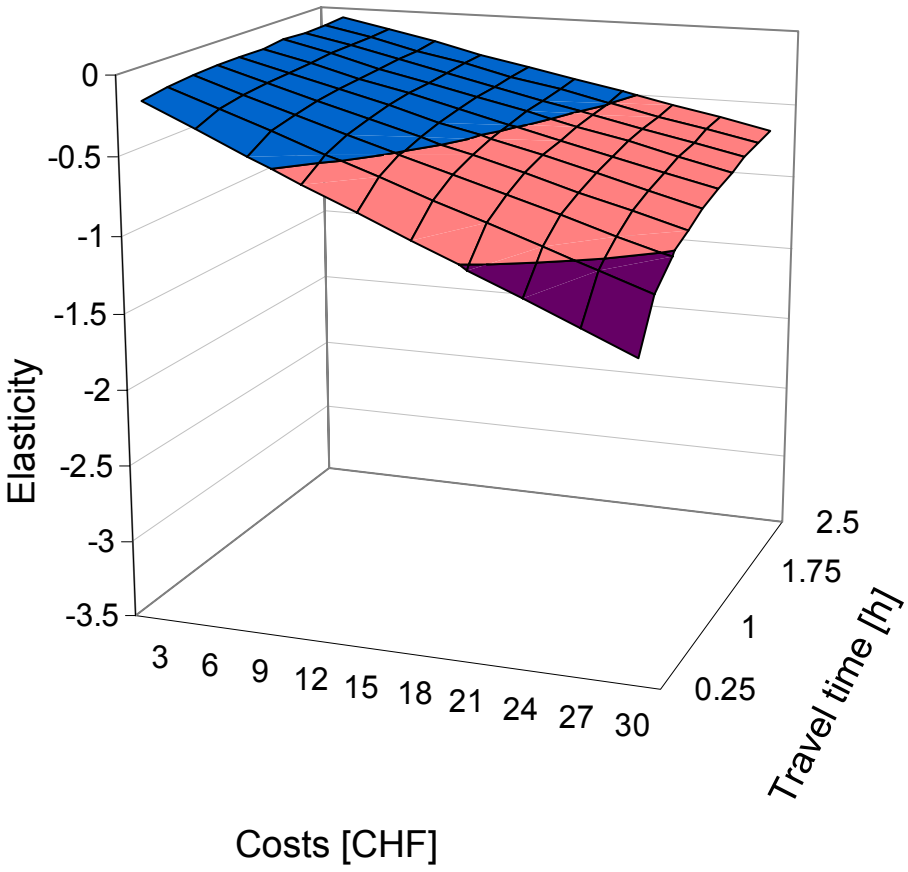
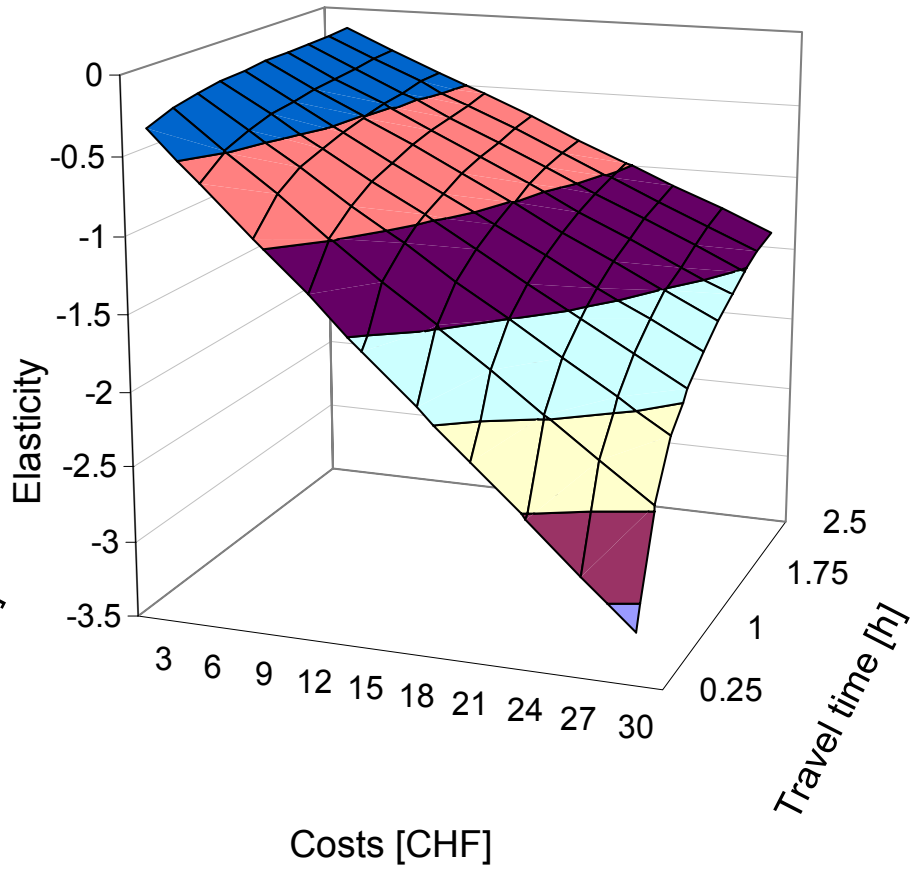



Tolls

# Direct cost elasticity with respect to cost and travel time




Fuel




Toll

# Direct elasticities for the mean observed trip

| | Travel time | Fuel costs | Tolls | Parking costs | PuT costs |
|---|---|---|---|---|---|
| MIV | -0.62 | -0.18 | -0.26 | -0.19 | |
| ÖV | -0.76 | | | | -0.35 |

| | | | |
|---|---|---|---|
| Travel time Car: | 33 min | Travel time PuT: | 43 min |
| Fuel costs: | 4.40 CHF | Tolls: | 3.08 CHF |
| Parking Costs: | 1.79 CHF | PuT costs: | 7.04 CHF |
| Modal split: | 50% each | | |

# Conclusions

The results emphasise traveller's nonlinear valuation of cost and travel time characteristics.

The values of travel time savings strongly depend on household income, overall travel cost and specific travel time.

Regarding the different cost components, the values of travel time savings have substantially different values.

There is a strong impact of the political attitude of the respondents on their choices.

# For more information

Hess, S., A. Erath, M. Vrtic and K.W. Axhausen (forthcoming) Joint valuation of travel time savings estimation on four separate Swiss data sets, *Transportation Research Record*.

Vrtic, M., N. Schüssler, A. Erath and K. W. Axhausen (2007) The impacts of mobility pricing on route and mode choice behaviour, paper presented at the *11th World Conference on Transportation Research*, Berkeley, June 2007.

Vrtic, M., N. Schüssler, A. Erath and K. W. Axhausen (2007) Design elements of road pricing schemes and their acceptability, paper presented at the *11th World Conference on Transportation Research*, Berkeley, June 2007.

See

www.ivt.ethz.ch

# Appendices

# Specification of the variables

| Variable | Specification |
|---|---|
| Departure time | 30, 15 min earlier, unchanged, 15, 30 min later |
| Travel time (Car) | 40%, 20% less, unchanged, 20%, 40% more |
| Travel time (PuT) | 20% less, 10% less, unchanged |
| Fuel costs (Car untolled) | 0.12 CHF/km |
| Fuel costs (Car tolled) | 0.048, 0.06, 0.072 CHF/km |
| Tolls | 0.045, 0.06, 0.075, 0.105, 0.15 CHF/km |
| Parking costs | 0.00, 2.00, 5.00 CHF |
| PuT costs | 0.072, 0.092, 0.104 CHF/km (GA holder)<br>0.135, 0.173, 0.195 CHF/km (HT holder)<br>0.252, 0.322, 0.364 CHF/km (no subscription) |
| Reliability* (Car untolled) | every 20th, 5th and 3rd trip |
| Reliability* (PuT) | null, every 20th and 10th trip |
| No. of transfers | 1 less, unchanged, 1 more |
| Headway** | 1 level worse, unchanged, 1 level better |
| Access time (PuT) | 15% less, 15% more, 30% more |

(*) Number of trips more than 10 minutes late

(**) Interval levels: 10 min, 20 min, 30 min, 50 min, 60 min, 120 min.

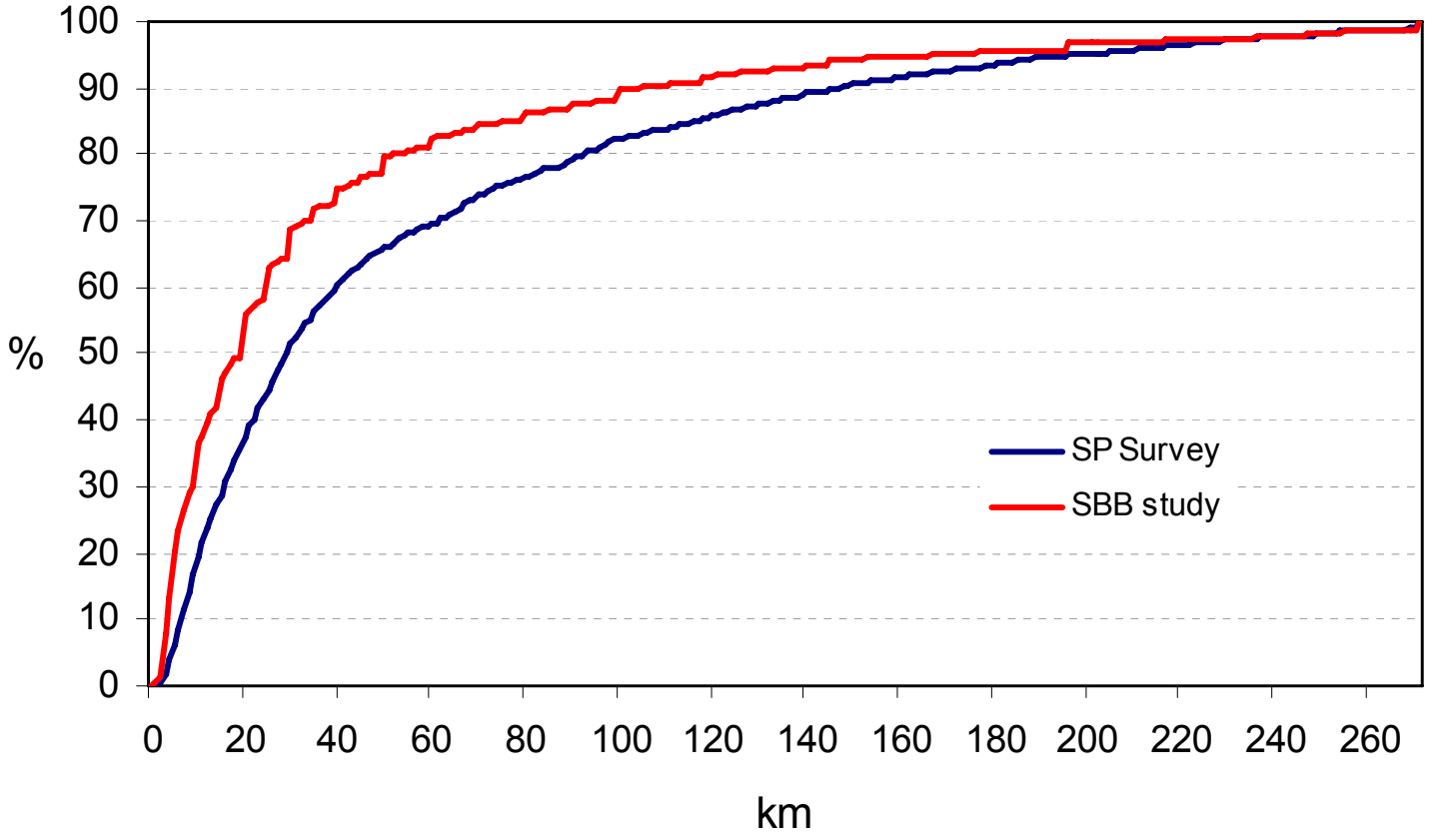
# Sociodemographic characteristics (1)

| | | SP Survey | | SBB study |
|---|---|---|---|---|
| | | total | [%] | [%] |
| Age | Younger than 25 years | 95 | 9.5 | 11.8 |
| | 25 – 45 years | 381 | 37.9 | 40.5 |
| | 45 – 65 years | 405 | 40.3 | 36.7 |
| | Older than 65 years | 124 | 12.3 | 11.1 |
| Sex | Male | 558 | 55.5 | 50.9 |
| | Femal | 447 | 44.5 | 49.1 |
| Person in household | 1 | 164 | 16.3 | 17.5 |
| | 2 | 358 | 35.6 | 34.8 |
| | 3 | 151 | 15 | 15.7 |
| | 4 and more | 332 | 33.1 | 31.8 |
| Language | German | 818 | 81.4 | 78.5 |
| | French | 141 | 14 | 17.5 |
| | Italian | 46 | 4.6 | 4.1 |

# Sociodemographic characteristics (2)

| | | SP survey | | SBB study |
|---|---|---|---|---|
| | | total | [%] | [%] |
| Houshold income | Less than 36,000 CHF/year | 37 | 3.7 | 4.4 |
| | 36,000 – 72,000 CHF/year | 202 | 20.1 | 23.8 |
| | 72,000 – 108,000 CHF/year | 327 | 32.5 | 30.1 |
| | More than 108,000 CHF/year | 291 | 29 | 24.7 |
| | No answer | 148 | 14.7 | 14.6 |
| Employment | Full time | 504 | 50.1 | 51.4 |
| | Part time (< 37h/w) | 209 | 20.9 | 20.7 |
| | not employed | 292 | 29.1 | 27.9 |
| Car availability | always | 672 | 66.9 | 64.4 |
| | occasionally | 205 | 20.4 | 20.4 |
| | never | 128 | 12.7 | 15.1 |
| Public transport subscriptions | GA | 161 | 16 | 13.1 |
| | Halbtax | 435 | 43.3 | 41.6 |
| | No subscription | 409 | 40.7 | 45.3 |

# Trip distance distribution of the SP trips



# Results of the route, mode and departure time model

| Variable | Parameter Car | Parameter PuT |
|---|---|---|
| Constant Car | *0.21* | |
| Constant route without pricing | 4.80 | |
| Travel time [h] | -2.26 | -1.90 |
| Fuel costs / PuT costs [CHF] | -0.08 | -0.10 |
| Tolls [CHF] | -0.17 | |
| Parking Costs [CHF] | -0.21 | |
| Early departure mode choice [h] | -0.35 | -0.35 |
| Early departure route choice [h] | 0.30 | |
| Late departure [h] | -0.78 | -0.78 |
| Access time [h] | | -2.61 |
| Headway [h] | | -0.56 |
| Number of transfers | | -0.26 |
| Reliability ◊ | -0.04 | -0.02 |
| λ Cost | -0.28 | -0.10 |
| λ income fuel / PuT costs | *-0.02* | -0.26 |
| λ incomce tolls | -0.15 | |
| λ income parking costs | -0.28 | |
| λ travel time fuel /PuT costs | -0.33 | -0.19 |
| λ travel time tolls | -0.35 | |
| λ travel time parking costs | -0.27 | |

(◊) Proportion of trips with a delay of at least 10 minutes

# Results of the route, mode and departure time model

| Variable | Parameter Car | Parameter PuT |
|---|---|---|
| Preference for MP in political SP | 6.5 | |
| GA Holder | | 1.33 |
| HT Holder | | 0.62 |
| Car Owner | 0.52 | |
| Annual vmt [1000 km per year] | 0.03 | |
| Language French | -0.15 | |
| Language German | -0.52 | |
| Age | | 0.01 |
| Full Time employed | | 0.03 |
| Oberservations | | 5910 |
| Final log-likelihood | | -3294 |
| Adjusted rho-square: | | 0.16 |
| Scale parameter RDC model | | 1.00 |
| Scale parameter MDC model | | 1.91 |
| Scale parameter MRC model | | 1.98 |