Value of Time

Amanda Stathopoulos
amanda.stathopoulos@epfl.ch

Transport and Mobility Laboratory, School of Architecture, Civil and Environmental Engineering, Ecole Polytechnique Fédérale de Lausanne

Value of time

Value of time

- What is the monetary value of travel time?
  - Cost - benefit analysis
  - Costs : CHF
  - Benefits : travel time savings
- Definition: price that travelers are willing to pay to decrease the travel time. "Willingness-to-pay"
- Motivation: total time budget is limited, saved time can be used for other activities and, therefore, has value.

Value of time

Choice model

$$\begin{aligned} U_1 &= -\beta t_1 - \gamma c_1 \\ U_2 &= -\beta t_2 - \gamma c_2 \end{aligned}$$

with $\beta, \gamma > 0$

$$U_1 \geq U_2 \text{ if } \underbrace{c_1 - c_2}_{\text{CHF}} \leq -\underbrace{\frac{\beta}{\gamma}}_{\frac{\text{CHF}}{\text{hours}}} \underbrace{(t_1 - t_2)}_{\text{hours}}$$

Value of time

- If utility function is linear
- the value of time is the ratio between
  - the coefficient of the "time" variable, and
  - the coefficient of the "cost" variable
- Warning: utility is not always linear
- Value of time varies with
  - trip purpose
  - transportation mode
  - trip length
  - income

Value of time

Example: model choice in Nijmegen :

$$\begin{aligned} V_{\text{car}} &= -0.798 \quad -0.110 \cdot \text{cost}_{\text{car}} \quad -1.33 \cdot \text{time}_{\text{car}} \\ V_{\text{train}} &= \quad\quad\quad -0.110 \cdot \text{cost}_{\text{train}} \quad -1.33 \cdot \text{time}_{\text{train}} \end{aligned}$$

Value of time = -1.33 / -0.110 $\approx$ 12 euros / h $\approx$ 0.20 euros / min

Example: changing variables and constant utility

	Case 1	Case 2
Cost train	7 €	13 €
Time train	2 h	1.5 h
Utility of train	-3.43	-3.43

Other willingness-to-pay indicators

- Headway (i.e. time between two buses)
- Number of transfers
- Reliability
- etc.

Same methodology:

- The model must involve the corresponding variable
- Willingness-to-pay = ratio between the coefficient of the variable and the cost coefficient

$$U = -\beta t - \gamma c - \alpha n$$

Willingness-to-pay to have one less transfer: α/γ

Value of time in Switzerland

Data collection:

- Source for recruitment: survey "Kontinuierliche Erhebung zum Personenverkehr" (KEP) by SBB/CFF
- Stated preferences
- Questionnaire designed based on a real reference trip
- Three parts:
  - SP mode choice (car / bus or rail)
  - SP route choice (current mode or alternative mode)
  - Socio-demographics and information about the reference trip

Axhausen, K., Hess, S., Koenig, A., Abay, G., Bates, J., and Bierlaire, M. (2008). Income and distance elasticities of values of travel time savings: new Swiss results, Transport Policy, 15(3):173-185.

Value of time in Switzerland

Mode choice car – rail (main study version)

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)

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

Value of time in Switzerland

Number of observations (1225 individuals)

	Business	Commuters	Leisure	Shopping	Total
Mode: car/bus	6	162	186	126	480
Mode: car/rail	426	1716	2538	1104	5784
Route: bus for bus users	9	405	450	342	1206
Route: car for car users	156	846	1176	660	2838
Route: rail for car users	126	594	837	504	2061
Route: rail for rail users	324	1008	1881	288	3501
Total	1047	4731	7068	3024	15870

Value of time in Switzerland

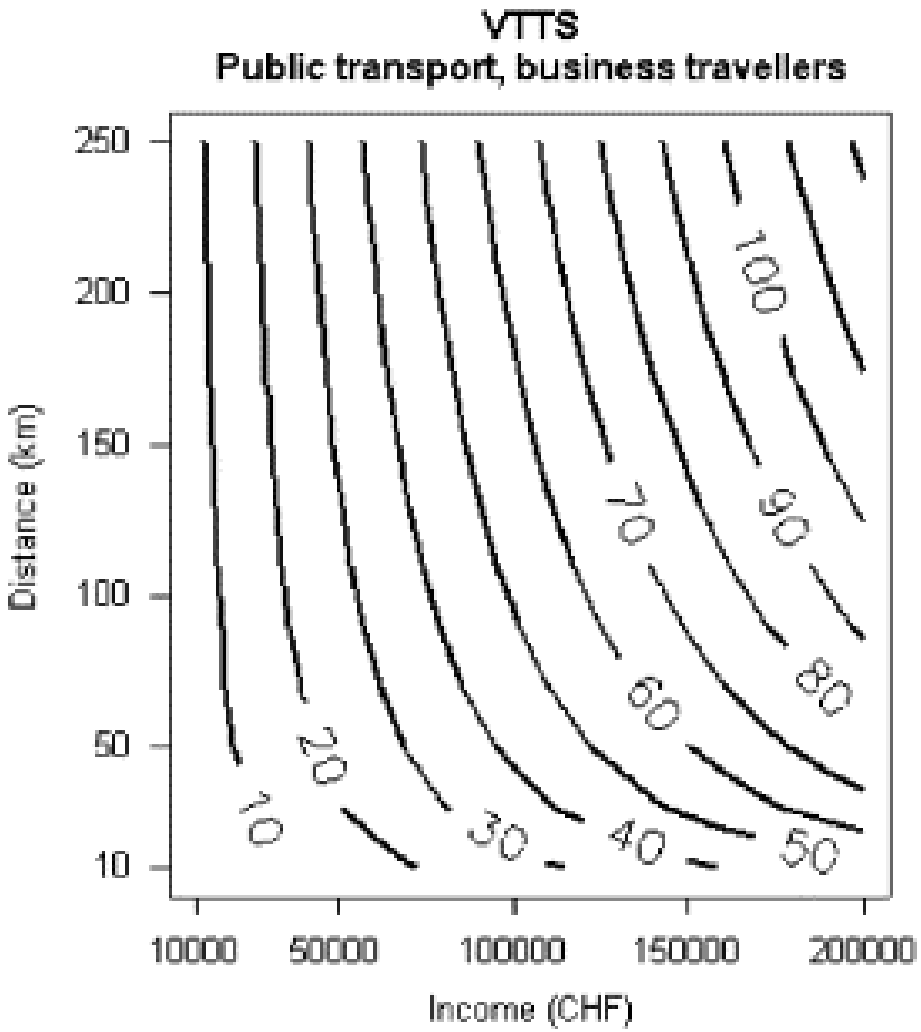
Explanatory variables:

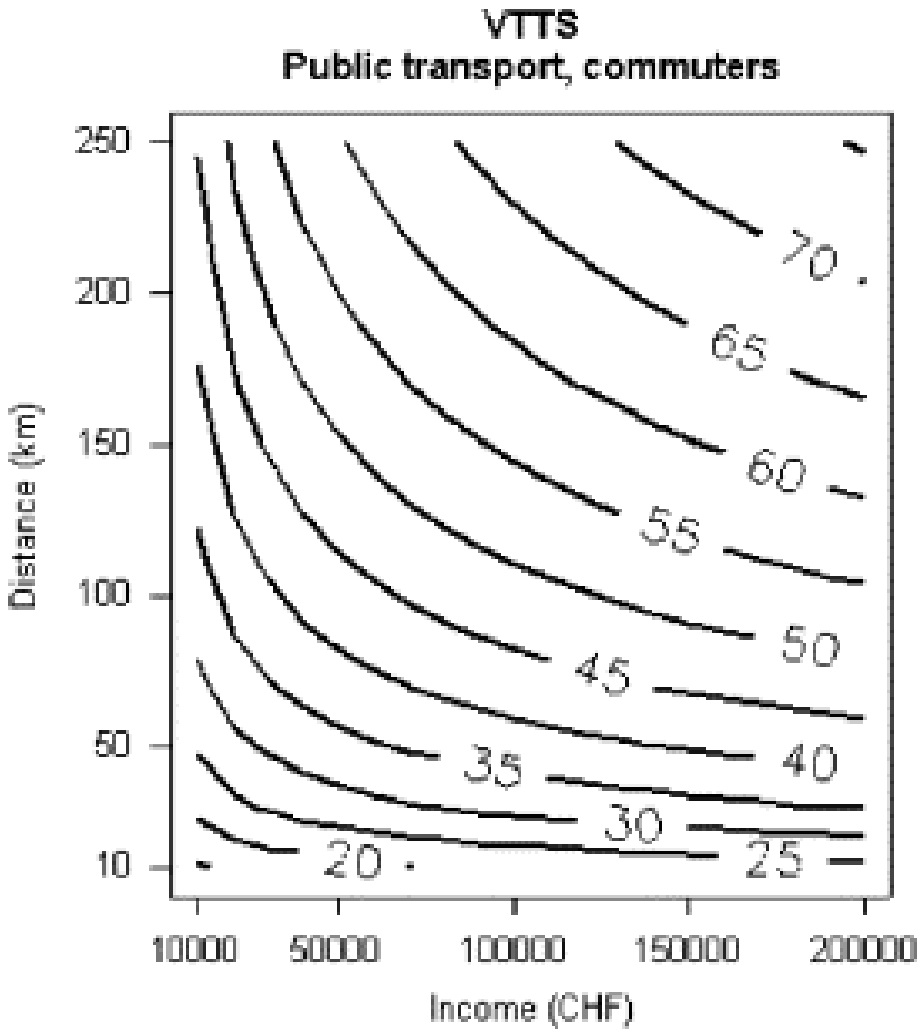
- travel time
- travel cost
- level of congestion (car)
- headway (PT)
- number of transfers (PT)
- trip length
- income
- car inertia (dummy)
- car availability (dummy)
- sex (male dummy)
- 1/2-fare CFF (dummy)
- general subscription (dummy)
- trip purpose

Value of time in Switzerland

	Business	Commute	Leisure	Shopping
Time PT (CHF/h)	49.57	27.81	21.84	17.73
Time car (CHF/h)	50.23	30.64	29.20	24.32
Headway (CHF/h)	14.88	11.18	13.38	8.48
CHF/transfer	7.85	4.89	7.32	3.52

Value of time in Switzerland





Summary

Value of time varies (namely) with

- transportation mode,
- trip purpose,
- income,
- trip length.