Value of Time

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ÉCOLE 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 :

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

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

	Case 1	Case 2
Time	2 h	1.5 h
Cost	7 €	13 €
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

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.

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

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

☐ ← Your choice → ☐

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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)
- frequency (TC)
- number of transfers (TC)
- trip length
- income
- …

Value of time in Switzerland

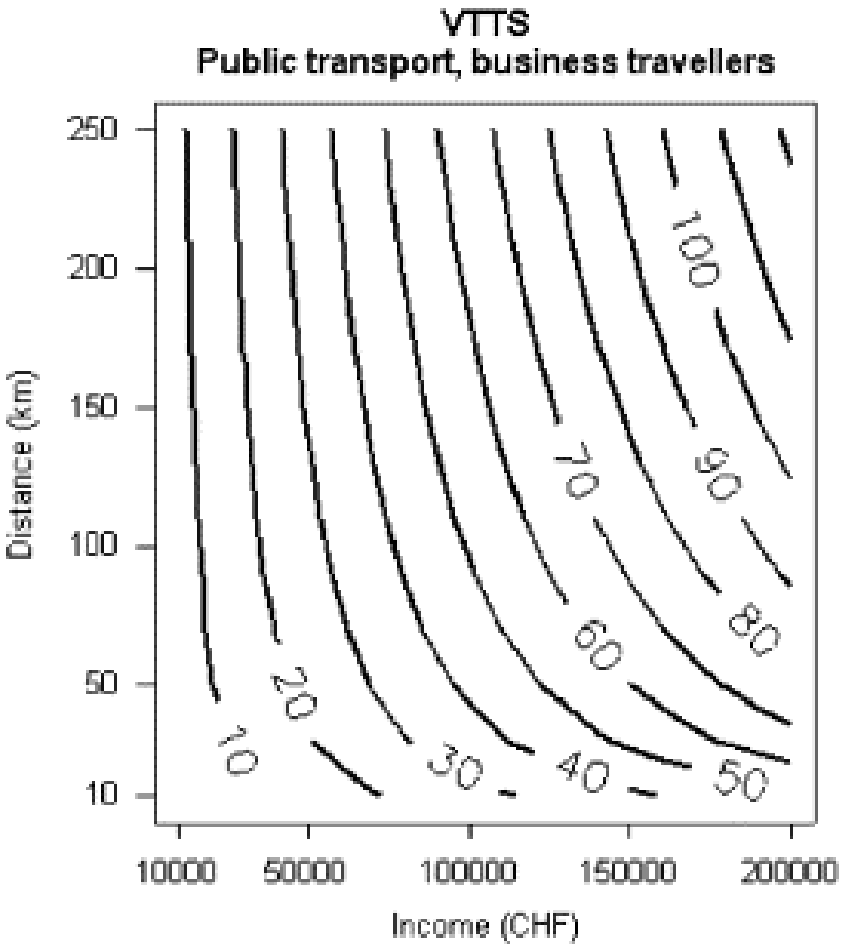
Explanatory variables:

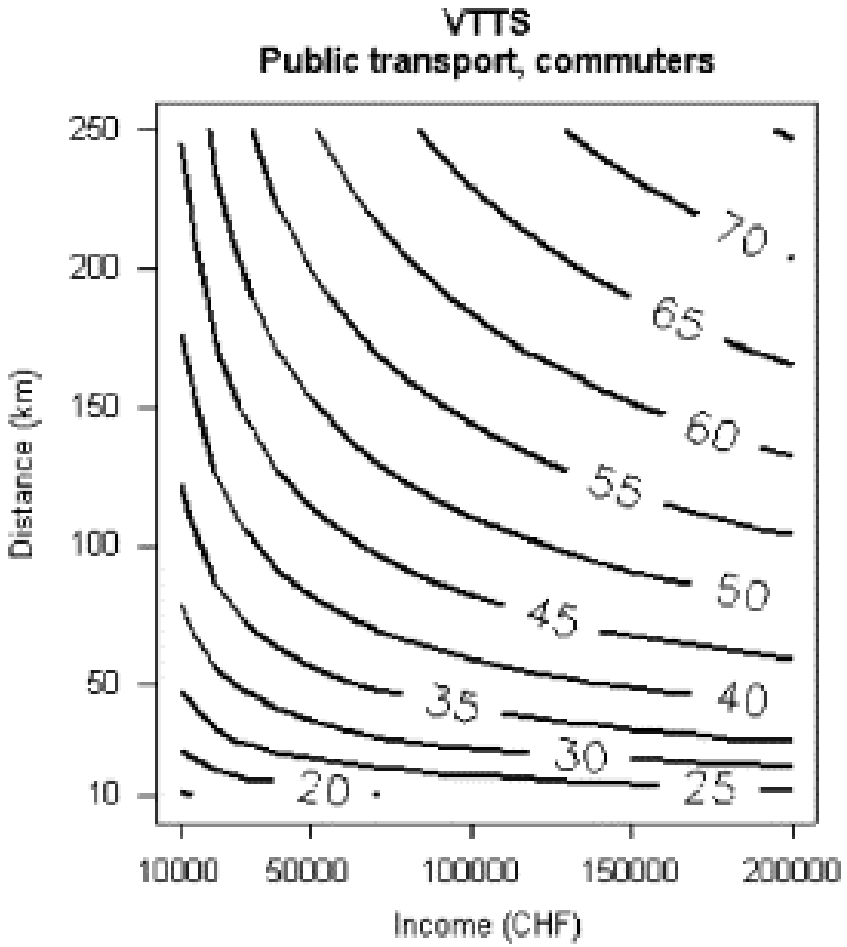
- . . .
- inertia
- car availability
- sex
- 1/2-fare CFF
- general subscription
- trip purpose

Value of time in Switzerland

	Business	Commute	Leisure	Shopping
Time TC (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.