



¹ Transport and Mobility Laboratory (TRANSP-OR)

Optima: Collaborative work between EPFL's Transportation Center (TraCe) and CarPostal, the public transport branch of the Swiss Postal Service.



Objectives

- Understanding the travel behaviour
- Integrating the latent concepts like attitudes, perceptions
- Improving the public transportation offer

Data collection

Revealed preferences (RP) survey:

• What people did

• Collected data:

- Travel diary
- Habitudes
- Psychometric indicators
- Socioeconomic information

Stated preferences (SP) survey:

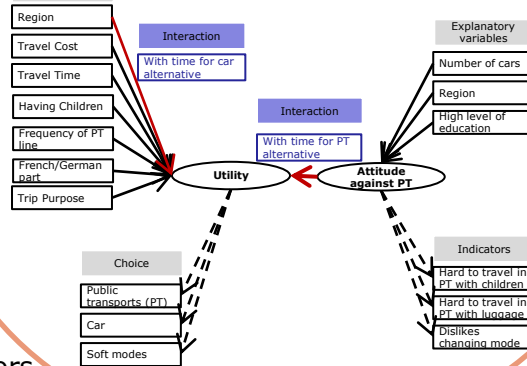
• What people would do

• Improved public transport services are proposed with more flexibility:

- Increased frequency
- On-demand availability
- Neighborhood solutions
- Electric bikes
- Information services



Integrated model & characteristics



Explaining preferences

Transport mode choice:

- Explained using **discrete choice modelling**.

An individual faces 3 types of choice:

- Car
- Public transports
- Soft modes (e.g. bike)

Each mode choice is explained & predicted using an **integrated model** involving:

- A **discrete choice model**
 - Why people choose a transport mode
- A **latent variable model**
 - How indicators of mobility explain the attitude against public transports (e.g. « It is hard to travel with children. »)

Model estimation

The integrated model is estimated maximising the following likelihood equation:

$$P(y_n | X_n; \beta, b, \phi_{AttPT}) = \int P(y_n | X_n, AttPT; \beta) \cdot f(AttPT | X_n, b, \phi_{AttPT}) dAttPT$$

Labels for the equation:

- Choice indicator** points to $P(y_n | X_n; \beta, b, \phi_{AttPT})$
- Parameters to be estimated for latent model** points to $f(AttPT | X_n, b, \phi_{AttPT})$
- Latent variable: attitude against public transports** points to $AttPT$
- Measurable data** points to X_n
- Parameters to be estimated for choice model** points to β, b, ϕ_{AttPT}
- Error term for attitude against public transports** points to $dAttPT$

Results of the estimation:

- Car preferred in the French part of Switzerland.
- Higher frequency of public transports increases their choice.
- If the trip purpose is work, public transports are preferred.
- Presence of children favors the choice of car.

A **latent variable** can have a **significant influence on the transport mode decision:**

- Attitude against public transports favors car.

Elasticities and Value of Time

Discrete choice modelling enables us to study the **demand elasticity** relative to certain parameters:

- Cost of public transport ticket – 1%
 - Public transport market share + 0.16%
- Time in public transports + 1%
 - Public transport market share – 0.28%

Interacting the latent variable of the attitude against public transports and the time spent in car makes it possible to:

- Obtain a **value of time** at an individual level.

The average values of time obtained are:

- 10 CHF/hour for public transports
- 25 CHF/hour for the car

Validation

Two steps to test the **genericity** of the integrated model:

- 1) **Estimation** of the model on 80% of the data.
- 2) **Simulation** of the model on the remaining 20%.

Most of the people's choices are well predicted as the majority of the choice probabilities are greater than 0.5.

