The Optima project: inferring transport mode preferences from attitudes

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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

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

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:

\[ P(Y_i | X_i, b, \alpha_{y_i}) = \prod_{n=1}^{N} \frac{1}{\alpha_{y_i}} P(Y_i | X_i, b, \alpha_{y_i}) \]

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.

Valiation

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.