Modelling Impacts of Beliefs and Attitudes on Mode Choices: Lessons From a Survey of Luxembourg’s Cross-border Commuters
Philippe Gerber, Marius Thériault, Christophe Enaux, Samuel Carpentier

To cite this version:
Philippe Gerber, Marius Thériault, Christophe Enaux, Samuel Carpentier. Modelling Impacts of Beliefs and Attitudes on Mode Choices: Lessons From a Survey of Luxembourg’s Cross-border Commuters. 11th International Conference on Transport Survey Methods, Sep 2017, Montréal, Canada. <halshs-01712646>

HAL Id: halshs-01712646
https://halshs.archives-ouvertes.fr/halshs-01712646
Submitted on 19 Feb 2018

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L’archive ouverte pluridisciplinaire HAL, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d’enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.
**Introduction**

This presentation shows an attempt to measure and relate environmental beliefs and concerns and attitudes about the car and the train (as latent constructs) to the self-declared satisfaction in commuting and the perceived utility of transportation modes (later) for commuting using a survey of Luxembourg’s cross-border commuters. The main objective is to illustrate the use of structural equation models (SEM) as a data-mining tool to unravel the endogenous relationships among measurements, satisfaction, and the perceived utility within the theory of planned behaviour (TPB; Ajzen 1991) conceptual framework. Shortcomings of the analytical procedure and suggestions to enhance the integration of beliefs and attitudes are discussed. It identifies ways to improve measurement of perceptual indicators and mediators that potentially condition mode choices for commuting on top of usual factors of socio-economic status, lifestyle, accessibility, parking availability/costs, public transport service levels, etc.

**The Survey (Mobility, Resources, Satisfaction, Attitudes)**

LISER (Luxembourg Institute for Socio-Economic Research) conducted a self-administered 3-page pencil-paper mobility survey among commuting cross-border workers. The first phases were about the usual features of a National Transport Survey. The second phase was concentrating on travel satisfaction, and the impact of beliefs, attitudes, information, and attitudes on mobility choice and environmental concerns. So the survey is an attempt to combine a commuting scale that measures one single parameter per day for a former border worker from Germany. The sampling frame was constructed from the administrative registers and simplified in 2007 (3,752 respondents, response rate 18%). A second wave was undertaken in 2011 to include more of the new commuting workers and to be able to capture all commuting changes. It attained 5,727 respondents among those of the first phase (62% retention rate).

The survey of environmental orientation levels results either for maximum flexibility in the possibility to change commuting patterns and attitudes about energy conservation (3-point Likert scales). It confirms the figure that for the self-declared satisfaction of perceiving suitability, satisfaction, and the perceived utility of transport modes (see the figure below), satisfaction in commuting correlates with the self-declared satisfaction of energy conservation in the figure below). Further, the transportation mode used and has the weight (n=6,085). Nevertheless, the car is perceived as the most polluting and causes the most environmental damage among border commuters despite a last decrease from 67% in 2007, between 2011 and 2014.

**Modelling the Perceived Utility**

The concept of utility is central to the transportation literature, considering the cost and duration of travel (and value of time) to compare modes. During the last decade, progress was made using multiple items, their latent psychological context within various functional specifications of logical regression and SEM. This integrative approach could benefit a great deal from the specification of attitudes assuming their role in the shaping of the utility because attitudes about transport modes are qualitative assessments of perceived utility to support travel behavior. The figure below shows a SEM model of perceived utility of PT that integrates attitudes, self-reported satisfaction, travel cost and duration with the mode choice as the outcome (mediated factor for the specific case of Luxembourg, countries and the location of the workplace are used to control for the overall bias of differences in PT service levels.

**Discussion and Conclusion**

CFA and SEM allowed us to develop latent variables to describe multiple structural relationships between beliefs, perceptions, and attitudes about the car and the train (self-reported satisfaction and perceived utility) to achieve the choice of the PT. Utility is based on a structural equation model to gain in-depth knowledge of relationships between perceived travel cost, satisfaction, and the perceived utility of PT in commuting. The figure below illustrates the final results of the data mining; an enhanced SEM (2011) that fits the data more than the initial SEM model shown above.

**Cross-sectional Decision Model and SEM for Data Mining**

Previous models provide the latency and practical attitude factors needed to implement the conceptual framework of the TPB. The figures below present an example of the integration of attitudes (CFA, TCA, TCA, and PE), the perceived utility of PT, and self-declared satisfaction in commuting based on the SEM model to explain the usefulness of PT for commuting. In a similar application, a causal relationships between the four models of the TPB. The overall adjustment to the survey data is clearly good (CFI=0.964; RMSEA=0.031; NNFI=0.952; SRMR=0.032), as well as the confidence of the estimated framework of TPB. External factors provided by the TPB are used to specify a restriction and a decision model. They are a combination of latent factors and self-reported status of PT service at the workplace and access to a dedicated firm car.