

Master's Thesis Topic

Modelling the public transport choices in long-distance (intercity) trips

Background

Providing reliable and efficient public transport (PT) services is an important challenge especially in long-distance travel, i.e. intercity or cross-country trips. Compared to short-range, urban PT trips, the intercity travel choices can involve different considerations (trade-offs) between travel time, cost or comfort, necessity to transfer, (un)reliability of PT connections. Travellers' perceptions can also differ between intercity bus (coach) and rail modes. While these aspects are a subject of growing scientific interest, a full understanding of long-distance travel behaviour is yet missing. Addressing these research gaps is an interesting, open question and forms the background of this thesis project.



sources: [wikipedia.de](https://de.wikipedia.org/wiki/FlixBus); [zeit.de](https://www.zeit.de)

Thesis objective

The aim of this master thesis can be summarised by the following research question:

“What factors influence the choices of public transport connections in long-distance (intercity) trips?”

The master thesis student shall conduct a stated-preference survey among public transport (PT) users, and use its results to estimate discrete choice models of different travel decisions made in long-distance PT journeys.

Methodology

Main points of the expected methodology are summarised below. Reasonable deviations from the project description and new ideas are welcome.

1. Design and conduct an online stated-preference passenger survey to investigate the above stated research problem. The questionnaire contents shall be verified in pilot surveys before the main data collection stage.
2. Analyse the survey data and estimate discrete choice models, describing the choice probabilities of long-distance (intercity) PT connections, accounting for different user categories (demand heterogeneity). Choice modelling shall be conducted with adequate analytical tools, e.g. BIOGEME, Apollo R (or analogous).

Expected results

Main outcome of this master thesis will be the evidence-based discrete choice models of travel behaviour in long-distance PT journeys. These models will help understand the probability of choosing the intercity bus (coach) and/or rail connections, depending on factors such as e.g. travel times, costs, on-board comfort, transfer disutility or reliability perceptions. Conclusions of this thesis shall bring new insights that address the gaps in state-of-the-art literature, and provide valuable implications for PT users, operators and policymakers.

Key skills

- Completed the “Discrete Choice Modelling” course at TUM or similar. Experience in discrete choice modelling (BIOGEME, Apollo R or similar) is **necessary** for this master’s thesis project.
- Knowledge and experience of stated-preference survey design is **recommended**.
- Fluency in English and good scientific skills will be highly **appreciated**.

References and relevant work

- Bierlaire, M. (2023). *A short introduction to Biogeme. Technical report TRANSP-OR 230620*. Transport and Mobility Laboratory, ENAC, EPFL. Available at: <https://biogeme.epfl.ch/>
- Hess, S., & Palma, D. (2019). *Apollo: A flexible, powerful and customisable freeware package for choice model estimation and application*. Journal of Choice Modelling, 32, 100170.
- Hess, S., Spitz, G., Bradley, M., & Coogan, M. (2018). *Analysis of mode choice for intercity travel: Application of a hybrid choice model to two distinct US corridors*. Transportation Research Part A: Policy and Practice, 116, 547-567.

- Román, C., Martín, J. C., Espino, R., Cherchi, E., de Dios Ortúzar, J., Rizzi, L. I., ... & Amador, F. J. (2014). *Valuation of travel time savings for intercity travel: The Madrid - Barcelona corridor*. *Transport Policy*, 36, 105-117.
- Schatzmann, T., & Axhausen, K. W. (2021). *Long-distance buses in Switzerland: An examination of their substitution effects for long-distance travel*. ETH Zurich Working paper, 1427.
- Van Acker, V., Kessels, R., Cuervo, D. P., Lannoo, S., & Witlox, F. (2020). *Preferences for long-distance coach transport: Evidence from a discrete choice experiment*. *Transportation Research Part A: Policy and Practice*, 132, 759-779.
- Witlox, F., Zwanikken, T., Jehee, L., Donners, B., & Veeneman, W. (2022). *Changing tracks: identifying and tackling bottlenecks in European rail passenger transport*. *European Transport Research Review*, 14(1), 7.

Starting date

As soon as possible from December 2024 onwards. The thesis will be registered at the Chair of Transportation Systems Engineering (Prof. Antoniou).

How to apply:

Interested applicants should contact Arkadiusz Drabicki (arkadiusz.drabicki@tum.de) by email. Please include (1) a short explanation (max. 100 words) of why you are interested in this project, (2) a recent transcript of records and (3) any work related to stated preference surveys or discrete choice modelling (e.g. report, paper).