



Linking modal choice to motility: A comprehensive review



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ABSTRACT

Modal choice is determined by a whole range of factors that are interrelated to a larger or smaller extent. It is often the result of a very compound choice process that can take place consciously or unconsciously and that includes objective as well as subjective determinants. Despite its significance in our daily life, there is no uniform way to define and analyze the concept of modal choice. The aim of this review is to fill this gap by elaborating a common modal choice definition and by providing a comprehensive review on the concept of modal choice through linking it to Kaufmann's motility concept. By doing so, this review will not only contribute to an improved knowledge on different modal choice determinants and their interdependencies, but can also assist to the understanding and modeling of modal choice decisions. The review can therefore help increasing the effectiveness of policy measures taken by environmental, urban and transport policy makers.

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1. Introduction

The need for mobility is of growing importance in our daily lives. A typical day consists of a chain of activities, often located at different places. This has created a rising demand for mobility. In most cases, the car is the indisputable dominant transport mode used to fulfill this need, which leads to negative side-effects (not only for the environment, but also for the economy and society) that cannot be ignored in mobility policies and planning. A growing awareness of the rising mobility needs and its accompanying effects has opened the debate on how to manage our current and future mobility in a more sustainable way (Banister, 2008; Schwanen et al., 2011). In order to take adequate policy measures to guide our mobility towards a more sustainable one, a deeper understanding of the actual travel behavior of people and their modal choices is necessary (Bhat, 1998). Although there have been many studies which focus on modal choice, there is no uniformity in the definitions and the methodologies used to study this concept. Modal choice is a very complex decision process, determined by a wide range of factors stemming from different disciplines (economy, sociology, geography and psychology). Usually, the epistemological basis of modal choice research highly depends on the practices and objectives of the research teams investigating it. This allows for alternative theoretical reflections, but also complicates things, as the research approach will have an impact on the research outcomes.

The aim of this review is to gain a deeper understanding of the notion of modal choice with emphasis on how modal choice can be defined and on the determinants that can play a role in the modal choice decision process. In order to do so, we adopt a multi-disciplinary point of view where we link modal choice to Kaufmann's motility concept (Kaufmann,

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2002), as this allows incorporating the cross-fertilization between different research fields. This results in elaborating a multi-disciplinary definition on modal choice, which is then used as a basis for building a comprehensive framework for structuring and discussing the modal choice determinants analyzed in the context of this review. The discussion of determinants is based on a descriptive analysis of the determinants studied and found significant in the modal choice papers we reviewed. A statistical analysis is not envisaged in this review paper but will be performed at a later stage, when the framework will be used to guide a more in-depth modal choice analysis of the National Household Travel Survey of Belgium. This review provides a multi-disciplinary structured insight into the influence of modal choice determinants and can therefore assist in improving the knowledge on modal choice decisions and its modeling, which in turn will help increasing the effectiveness of measures taken by environmental, urban and transport policy makers.

The outline of this review is as follows: first, the search strategy for the literature review will be explained and the key research questions will be lined out. After that, attention will be paid to different approaches that can be used to study modal choice, which will lead to the formulation of a multi-disciplinary definition of modal choice. Based on this definition, we then elaborate a multi-disciplinary framework that will be used as a frame to structure and discuss the determinants of modal choice. After that, the most important trends and interdependencies between these determinants will be discussed. Finally, we will draw conclusions and make recommendations for future modal choice research.

2. Search strategy

For this review, we take into consideration all types of research (modeling, empirical, surveys, etc.) concerning passenger travel behavior with emphasis on modal choice. With this review we seek to address the following questions:

- How is modal choice defined?
- Which factors determine modal choice?
- How do these factors determine modal choice?

Our data collection strategy is mostly based on a computerized search. Articles were mainly retrieved by tracking cited references and by tracking e-catalogues. The review mainly covers the last two decades. Several sources were used to search for literature; these included the web-based search tools (V-spaces and Article database, e-sources) and the VUBIS library e-catalogue from the university library of VUB (Vrije Universiteit Brussel). In addition, also ordinary web-search robots (e.g. Google Scholar) were used to track cited references and to find publication titles for further lookup at the university library. The search was conducted in 2010 from March until August, using the search term 'modal choice' on the search robots. From the resulting output, the relevant hits were filtered out for further analysis. Articles were then screened on their relevance with regard to modal choice definition and determinants. Finally, this resulted in 76 articles retained for further analysis and processed for this review. It is important to mention that the review focuses on modal choice for daily and regular trips made at local or regional level and that the processed articles mainly cover developed, rich countries, which is determining for the focus of the findings and discussion. Table 1 summarizes the main features of the studies examined, based on region, journey type and transport modes considered.

As far as the region is concerned, a large part of the studies are related to Europe (40 out of 76) and a smaller part to the USA (9 out of 76). In 21 of the reviewed papers the modal choice studies were performed in other regions, mainly Canada, Australia, New Zealand and Japan. In the remaining 6 papers, the study region was not specified. Regarding journey type, 14 of the 76 modal choice papers deal with home-work commute trips and 5 study other journey types (e.g. business trips, leisure trips, etc.). In many of the papers (40 out of 76,) several journey types are studied at the same time. In 17 out of 76 cases, the journey type considered was not specified. Finally, with regard to the transport modes investigated almost half of the papers (35 out of 76) include car, public transport as well as active modes. 29 papers only confront car use against public transport use, 5 articles consider other combinations and in 7 studies the transport modes examined were not specified.

3. Modal choice definition

Although no common definition on modal choice was found while reviewing the selected articles, in many studies, a definition can be derived from the nature of the determinants studied. As such, the approach used to study modal choice

Table 1

Summary table of the main features of the studies examined based on region, journey type and transport modes considered (PT = public transport).

Region	#	Journey type	#	Transport modes	#
USA	9	Home-work commute	14	Car/PT	29
Europe	40	Other (business, leisure, etc.)	5	Car/PT/Active modes	35
Other	21	Combination of types	40	Other	5
Not specified	6	Not specified	17	Not specified	7
Total	76	Total	76	Total	76

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