

18th Euro Working Group on Transportation, EWGT 2015, 14-16 July 2015,
Delft, The Netherlands

Investigation of factors that stimulate car drivers to change from car to carpooling in city center oriented work trips

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Abstract

The current study aims to get more insight into the attributes that stimulate car drivers to use carpool as an alternative for their commuting trips in which the car is still the most used travel mode. The study was set up as a stated choice experiment. In the experiment, car drivers were asked to evaluate various hypothetical carpool alternatives. The alternatives were described using eight attributes: travel time to and waiting time at start location, travel time in (carpool) vehicle, uncertainty in travel time, costs of the trip, number of persons in the vehicle, parking situation at work location, car/bike availability at work location, and flexibility of arrival and departure times. Each generated carpool alternative was included in a choice task together with the respondent's current car alternative. The choices were analyzed using a mixed multinomial logit model. The model estimation process showed that almost all attributes significantly influence the attractiveness of carpooling in an expected direction. Most influential are the time and costs related attributes. No significant effect was found for the minimum number of persons in the carpool vehicle.

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Peer-review under responsibility of Delft University of Technology

Keywords: Carpooling, Work trips, Stated choice

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1. Introduction

Many cities in the Netherlands face increasing traffic flows, especially in the morning peak at entrance roads. Most of these entrance roads are not able to manage a large amount of car traffic often resulting in congested roads. These congested roads form a problem because they produce pollution, noise, and unreliable travel times. This unpleasant situation forces municipalities to consider alternatives for the car such as public transport, bicycles, and carpooling. Because of its flexibility and more personal atmosphere, carpooling is considered as an interesting alternative for solo car use (e.g., Caulfield, 2009). Other reasons make carpooling as an interesting alternative as well. For example, Wang (2011) stated that in China, carpooling becomes more popular when gas prices rise or when local regulations (e.g., driving restrictions, restricted parking policy) are implemented. Several, mostly small scale, initiatives are set up with varying success when looking at commuters' travel mode switching behavior. It appears that there is limited insight into the attributes that might stimulate car drivers to change to carpooling (e.g., Nurul Habib et al., 2011; Wang, 2011; Wang & Chen, 2012).

The aim of this study is to contribute to the existing insights regarding the attributes that stimulate car drivers to change from solo car driving to carpooling. The focus of the study is on home originated work trips in Dutch urbanized areas (cities with more than 75,000 inhabitants) in which the car is still the main mode of travel. This focus is not only based on the increased problems regarding traffic flows but also because of the discussion regarding the use of bus lanes in urban areas by cars with a high occupancy. The remainder of the paper is organized as follows. First, a brief overview is given of previous studies on the structure of carpooling and factors that influence the use of carpools. Next, the adopted research approach is explained. This section is followed by a description of the data collection and some details of the research sample. The results of the analyses are presented in the proceeding section. The paper ends with the conclusions and suggestions for future research.

2. Literature review

In the past, several studies have been published regarding carpooling as alternative travel mode for solo car driving. Some studies focus on the factors that stimulate car drivers to switch mode from single occupancy vehicle (SOV) use to high occupancy vehicle (HOV) use (e.g., Correia & Viegas, 2011). Other studies focus on solutions to overcome one or more problems that are related to carpooling such as guaranteed ride home service (e.g., Menczer, 2007), carpool matching programs (e.g., Galland et al., 2014), and special infrastructure such as HOT-lanes (Burriss et al., 2014). In the studies, different definitions of carpooling are presented. The content of most definitions is more or less similar. One example of a definition that is close to the objective of the current study is presented by Arbour-Nicitopoulos et al. (2012): 'the sharing of transportation to work or school in a private vehicle with other workers or students that result in the prevention of a vehicle trip'. The subject of carpooling is investigated for different target groups such as workers in home-work trips (e.g., Vanoutrive et al., 2012); parents in home-school trips (e.g., Arbour-Nicitopoulos et al., 2012); and students and employees in home-university trips (e.g., Bruglieri et al., 2011).

In the literature, two significant reasons to stimulate carpooling are presented (e.g., Arbour-Nicitopoulos et al., 2012; Bellemans et al., 2012; Wang & Chen, 2012):

- a. Decreasing the number of cars travelling to/from a destination;
- b. Broadening the possibilities to intervene in travelling for longer distances (more than 3 kilometers);
- c. Contribute to environmental quality.

These three reasons are strongly related to the interest of politicians and planners. Of course, there are also reasons from the perspective of the car drivers themselves.

- d. Decrease of travel costs (e.g., Qian & Zhang, 2011; Seyedabrishami et al., 2012);
- e. Benefit from other company organized measures such as special parking spaces (e.g., Brugliere et al., 2011).

When studying carpooling, researchers make a distinction regarding the way carpooling is organized. For example, Brugliere et al. (2011) distinguish *casual* and *organized* carpooling. The first type refers to the situation that a car driver picks up passengers for example to be able to use a high occupancy vehicles lane or to share costs. The participants in the carpool are more or less formed on the spot. The second type of carpooling deals with a more

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