

# Estimating availability effects in travel mode choice among e-bikes and other sustainable transport services: Results of a stated portfolio choice experiment

## Abstract

Electric bikes (e-bikes) are seen as an important sustainable innovation that offer an alternative to private cars and lead to less congestion, emissions, use of scarce parking space, etc. Our study focuses on pedal-assisted e-bikes: pedelec and speed pedelec. To increase the acceptance, urban and transportation planners and product developers need information about the likely factors that influence the choice of e-bike. Meanwhile, e-bikes have to compete with other new mobility services, such as Shared Mobility and Mobility as a Service (MaaS). We include them in the choice set as these sustainable alternatives to private cars may all have an effect on individuals' mid-term travel mode choice decisions. In reality, those new mobility services may not always be available in the area, which may lead people to face a variety of choice sets in regards to the availability of certain mobility services in different regions or different stages.

Despite the relevance, studies including all these modes are scarce at best, and most of the choice models do not consider the availability effects. Instead, they are based on the rigorous assumption that the nonavailability of a particular travel alternative does not affect the utility and relative choice probability of any other travel alternative included in a choice set (the independence of irrelevant alternatives or IIA property). Ignoring the competition between modes and their availability effects may bias estimated acceptance and market shares of these modes. Estimating the availability effects of products in the competitive choice set could be important in understanding the structure of the market as the utility of an alternative may change as changes occur in the competitive set of alternatives, including not only the attributes of the alternatives, but the presence or absence (availability) of alternatives as well.

This paper reports the formulation and estimation results of a model of e-bike choice incorporating the availability effects of new mobility services through a stated portfolio choice experiment based on a survey conducted in the Netherlands. It contributes to the existing literature primarily by explicitly modeling the latent demand and shedding light on the market structure of e-bikes and other new mobility services considering varying choice set compositions (Shared Mobility or MaaS may not available), enabling a more accurate simulation of reality. Mixed logit models were formulated to analyze the effects of availability of transportation modes and socio-demographics on the decision, and to capture unobserved heterogeneity in individuals' preferences as well as unobserved correlation among alternatives. We expect to gain knowledge regarding the willingness to buy and/or use pedelec and speed pedelec in the presence or absence of other motorized shared mobility options. This insight has major practical implications as some of the pilot studies have given indications of decreasing the use of active mode once motorized shared mobility becomes conveniently available. This observation, if it becomes the norm, has serious repercussions for the health and well-being of citizens and the reverse effect on congestion and emission. Studies such as the current one can provide policy recommendations in order to keep the active modes sufficiently attractive and competitive in the market.

*Keywords:* availability effects; e-bike; pedelec; speed pedelec; shared mobility; Mobility as a Service (MaaS)