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A preliminary analysis over the factors related with the possession of an electric bike

Paola Astegiano ^{a*}, Chris M.J. Tampère ^a, Carolien Beckx ^b

^a *L-Mob Leuven Mobility Research Center, KU Leuven, Celestijnenlaan 300,3001 Heverlee, Belgium*

^b *Transport and Mobility Unit, VITO NV, 200 Boeretang,2400 Mol, Belgium*

Abstract

In recent decades different studies focused on how to incentivize a shift from car to bicycle. In this context the electric bike is gaining more and more popularity. Because of its higher speed and longer reach, the e-bike could be an attractive alternative to the car. Through an online survey (together with a GPS tracking campaign and a weekly travel diary) conducted in the city of Ghent (Belgium) we define the profile of the e-bike users (age, income, ownership, etc...) and analyze their mobility habits (distance travelled, purpose of the trip, etc...). The initial results obtained from a travel diary survey show how the e-bike is highly used for commuting trips while for more occasional trips (at most once per week) the car is the preferred alternative. Moreover, the analysis of the changes in the mobility habits after the acquisition of the e-bike shows how the e-bike has mainly incorporated the trips performed by bike while also causing an increase of the frequency for some trips. Summarizing, in this paper we propose a preliminary analysis over the factors correlated with the ownership of an e-bike and an overview about how people changed their mobility habits after the acquisition of the e-bike.

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* Corresponding author. Tel.: +321637862; Fax: +321632483.
E-mail address: paola.astegiano@kuleuven.be

1. Introduction and literature review

In recent decades, the promotion of non-motorized modes of transport is increasing as part of more sustainable eco-mobility vision. In particular, the mode that was most influenced is cycling, due to the fact that it is low-cost, low-polluting and produces great health benefits. Therefore, a broad literature has been recently focusing on better understanding the determinants of bicycle ownership and the way to further promote bicycling (Handy et al., 2010).

Considering this, different research directions were taken among the experts in this sector.

Groundbreaking studies (Stinson and Bhat, 2004) aimed at evaluating the factors that impact bicycle frequency use for an individual's commute to and from work as well as the integration of cycling with public transportation (Pucher and Buehler, 2008). More recently, Heinen (Heinen et al., 2010), (Heinen et al., 2011) showed the influence of bicycle commuters' attitudes on mode choice decisions, under the assumption that when the commuting journey intensifies, either in terms of distance or frequency, the general attitude towards cycling becomes more positive.

In the same historical period, numerous were also the studies that collected cycling trends and policies over different countries (Pucher John and Ralph Buehler, 2012), (Vandenbulcke et al., 2011) making a comparison among them, while also aiming to offer information about cycling safety and infrastructure facilities (bikeways, bike parking, etc...). In The Netherlands, Denmark and Germany for example, policy increases driving costs, as well as render it inconvenient in city centres through taxes and restrictions on car ownership, use and parking. Different from UK (where only about 1% of trips are by bike) these countries encourage the coordination of different sets of cycling policies. Knowledge about infrastructure preferences for cyclists led to determine how a correlation between the level of cycling confidence and preferred types of infrastructure exists (Caulfield et al., 2012), (Broach et al., 2012).

Unlike the aforementioned studies, our research focuses on the e-bike, which is nowadays gaining more and more popularity. Because of its higher speeds (compared to the ordinary bike) and longer reach, it extends the capabilities of normal cycling and could be an attractive alternative to the car. In the near future, it could become the best way to incentivize a shift from car to bicycle in order to reduce road congestion, traffic-related air pollution, road accidents and infrastructure costs.

Currently, the world's leader e-bike market is China but, in the last few years, a positive trend of the e-bike market share is also observed in north Europe (e.g the Netherlands and Germany have respectively a share of 20% and 10% in sales numbers) and in the U.S.

In (Weinert et al., 2007) and (Cherry and Cervero, 2007) the first investigation on how and why e-bikes developed so quickly in eastern countries has been performed, providing important insights to policy makers in China and abroad. They showed how timely regulatory policy can influence the purchase choices of millions, incentivizing the use of a new mode of transport introduced in the market. An additional way to increase electric bike use would also be considering control strategies that limit the number of stops for this mode, through signal coordination or grade separated intersection, thus increasing the travel time advantage of electric bikes. In (Cherry, 2007) the environmental and safety impacts of alternative modes, such as public transport or personal cars that are the usual competitor of the e-bike are analyzed. He suggested that electric bikes are a clean mode of transport with low noise levels and zero tailpipe emissions. In terms of safety, he also showed how the fatality rates are nearly as low as bicycle fatality rates and much lower than cars.

Another important role is played by the U.S. and North America. Their markets are still behind China and Europe, but a strong group of researchers (MacArthur et al., 2014), (Dill and Rose, 2012), (Popovich et al., 2014) is investigating which factors influence purchase decisions in these countries and, with a comparison between ordinary bikes and e-bikes, trying to understand whether e-bikes can effectively address barriers to bicycling and therefore encourage more sustainable mobility. Their results suggested that e-bike users cycle more often and to more distant locations. Moreover, e-bikes allow people with physical limitations to cycle thanks to electric assist.

In this big context it is important to connect past and present research efforts (regarding ordinary bikes as well as e-bikes) to current policy questions and guide research priorities for the future (Handy et al., 2014).

This paper, through an online survey together with a GPS tracking conducted in the city of Ghent, aims to contribute in defining the profile of e-bike users (age, income, residential location, ownership) and in analyzing their mobility habits. GPS data, validated with a weekly travel diary, allows us to discover for which activity the e-bike is

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