Welfare economic performance of bicycle infrastructure: Case study for extending the super cycle highways infrastructure of Copenhagen

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Abstract

Historically, bicycles have been a transport mode for shorter distances primarily and with a limited share of the daily travelled kilometres. Hence, from a societal welfare perspective, bicycles has received little attention as opposed to cars and public transport. The recent adaptation of electric bicycles on a large scale, combined with better bicycle infrastructure in the form of supercycle highways, however, represent two fundamental changes that can potential shift the level of welfare benefits of cycling significantly.

In this paper we consider the socio-economic performance of an ambitious yet realistic bicycle infrastructure in Copenhagen in combination with realistic levels of electric bicycles. The analysis consist of two parts. First, at the general level, we present new Danish external costs estimates for bicycle use. These estimates, which combine the positive effects of bicycle use by including health effects and accidents, is measured as a monetary welfare benefit per kilometer. However, as opposed to many other studies, benefits is considered differently for electric bicycles and conventional bicycles to acknowledge that electric bikes provide less exercise while having a different risk profile. Secondly, we apply the external cost estimates in a welfare assessment of an extension of the Copenhagen supercycle highways infrastructure. The underlying transport model (Hallberg et al., 2020) distinguish between bicycle types across a range of scenarios and enables the socio-economic analysis to take advantage of differences in the consumer surplus evaluation between conventional and electric bicycles. By further adapting cost estimates for the infrastructure upgrade, the study represent a first attempt of a large-scale societal welfare analysis where new bicycle technology is accounted for. The study finds that the examined extension of the Copenhagen supercycle highways infrastructure render highly significant welfare gains with a B/C rate that is significantly higher than for most public transport and car infrastructure projects.

Keywords: Bicycle infrastructure, welfare analysis, cost-benefit, external costs, travel demand, supercycle highways.