**Heterogeneity of preferences for infrastructure and services among cyclists and pedestrians**

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A white paper prepared by the Norwegian Ministry of Environment and approved by the government in 2012 sets a goal of absorbing the growth in passenger transport in major urban areas through public transportation, bicycling and walking. This goal is now adopted in the Norwegian National Transport Plan of 2014-2023 and by emphasizes investments in infrastructure and services for walking and cycling around the major urban areas.

The share of short distance trips by slow modes (walk and cycle) as the main mode of transport in Norway is much lower than in other European countries. Hence, it is important to address the potentials for cycling and walking among different groups with different characteristics and preferences. The focus of this paper is on comparison of the profiles of the cyclists and pedestrians and the heterogeneity of value of time savings among cyclists and pedestrians and implications for policy design and appraisal.

This study relies on the data collected in the Norwegian value of time study (Ramjerdi, et al, 2010). The main purpose of the cycle and walk studies was to provide estimates of the value of travel time savings and valuations of different cycling infrastructure and services.

To address the payment vehicle for cycle (walk) as the main mode of transport, the first choice experiment was designed as a mode choice exercise between cycle (walk) and the chosen alternative mode of respondents (car or public transport). Those who rejected to choose car, public transport or new hypothetical bus service were not included in the study. The first experiment was followed by three more (route) choice experiments, between two alternative cycle (walk) for the respondents' valuation of cycle (walk) infrastructure and services. These experiments focused on the trade-offs between travel time by cycle (walk) and the provision of infrastructure and services. The cycle and walk questionnaires include questions on respondents' attitudes, habits and socioeconomic characteristics.

By applying factor analysis technique using the attitudinal variables and the socioeconomic characteristics of respondents, we identify three different classes of cyclists and pedestrians and present a comparison of the profile of these three groups.

The results of the exploration with factor analysis are used in the construction of latent class models for cyclists and pedestrians. The latent class model captures

preference and response heterogeneity. Alternatively, the mixed logit model specifies a continuous probability density function (e.g., normal distribution) for preference parameters (Train, 2003). This approach ignores any systematic variations in preference and response across individuals Bhat (1997). However the identification of latent classes needs careful consideration including identification issues stemming from missing data, identification of the number of classes to be used and the homogeneity of the latent classes (see Collins and Lanza, 2010).

A latent class model was applied to the cyclist data and was reported in a paper by Ramjerdi, Knockaert and Veisten (2012). Maximum likelihood estimations are done simultaneously for the latent class models, including the measurement equations for the attitudinal variables, and two class-specific choice models using the extended version of the software package BIOGEME (Bierlaire, 2003). The marginal rate of substitutions between time and cost estimated based on data from the first experiment and the marginal rate of substitution between time and other attributes estimated based on data from the following experiments were used for the calculation of the monetary values of infrastructure and services. This approach does not allow for class specific values to be estimated for infrastructure and services.

In this paper we present the result of joint estimation of the data from the first experiment with data from each of the following experiments. Hence it makes it possible to identify distinct classes of cyclists and pedestrians with different values of travel time savings and different valuations of infrastructure and services. We compare the results with those based on mixed logit models.

We discuss the implications of the results for design and appraisal of policies for the promotion of cycling and walking. We emphasize the importance of identification of the different classes of cyclists and pedestrians in this paper.

Bhat, C.R. 1997. An endogenous segmentation mode choice model with an application to intercity travel. Transportation Science 31, 34–48.

Bierlaire, M. 2003. Biogeme: a free package for the estimation of discrete choice models Swiss Transport Research Conference (STRC).

Collins, L. and Lanza, S. 2010. Latent Class and Latent Transition Analysis: With Applications in the Social, Behavioral, and Health Sciences, first ed., Wiley Series in Probability and Statistics, Boston.

Ramjerdi, F., Knockaert, J. & Veisten, K. 2012. The heterogeneity of value of travel time among cyclists and implications in policy appraisal, Paper prepared for Latsis Symposium 2012 -1st European Symposium on Quantitative Methods in Transportation Systems 5-7 September 2012 Lausanne, Switzerland

Ramjerdi, F., Flügel, S., Samstad, H. & Killi, M. 2010. Den norske verdsettingsstudien – tid (The Norwegian Value of Time Study). TØI rapport 1053B/2010

Train, K., 2003. Discrete Choice Methods with Simulation. Cambridge University Press, Cambridge.