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Title A HYBRID DISCRETE CHOICE MODEL TO ASSESS THE EFFECT OF AWARENESS AND ATTITUDE TOWARD ENVIRONMENTAL FRIENDLY MODES

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Abstract

The traffic is the main culprit of air pollution in urban areas, due to the emissions of the combustion products of fuels and their subsequent chemical transformation, as well as due to the evaporation of unburned hydrocarbons. In the recent years, the objective of transport research has then shifted considerably toward methods to reduce emissions by private vehicle use. The need to reduce car use has led to the development of *Soft Measures*, also referred to as "Voluntary Travel Behaviour Change" programs (Ampt, 2003), aimed at re-educating car users through information processes that raise their awareness regarding the benefit environmental friendly modes, encouraging them to voluntarily change their mode choice (level of services characteristics being equal).

At the same time individuals show often *cognitive dissonance* (Aronson, 1988; Golob *et al.*, 1979; Tertoolen *et al.*, 1998), i.e. inconsistency between attitudes and behaviour. This means that despite individual's attitude to behave for example environmentally friendly, their actual behaviour is different from the intended one. A reason can be that people behave pro environmentally only when it is easy to do so (Stern and Oskamp, 1987). Soft measures are designed to increase car users awareness about the environmental consequences related to their travel behaviour and can play a role in overcoming the barrier created by the cognitive dissonance.

The objective of the present work is to provide theoretical evidences on the one hand on the effect of awareness after the implementation of a soft measure and on the other hand on individual attitude toward environment to understand what is the relationship between awareness, behaviour and attitude in the context of mode choice. Using a dataset gathered in two waves, before and after individuals are informed about the benefits of using park and ride (P&R) instead of their car, we built a hybrid mode choice model to assess the effect of awareness in shifting modes from car to park and ride after controlling for the effect of individual attitude toward environment.

The data used in this study is derived from the implementation of a Personalized Travel Planning (PTP) conducted in Cagliari (Italy) which promoted the usage of a light metro. The program involved two-weeks data collection of activity travel patterns using a GPS active data logger called Activity Locator (Meloni *et al.*, 2011). In particular, these are revealed preference data collected before and after the implementation of soft measure, where people were given information that make them aware of the benefit of using P&R.

Then the joint estimation of the discrete choice structure, using these data, is similar to the traditional joint revealed/stated preference model (Ben-Akiva and Morikawa, 1990) but in our case a possible change of mode (car vs. P&R) is not due to some attributes variation but to an increased level of information and awareness of the other (existing) alternative. Personal information are introduced in the utility of the P&R, in the II week, and are defined by the following two variables representing the benefits showed with the PTP:

- Economic benefit: difference between the annual cost of the car only trip and the annual cost of the P&R trip mode;
- Health benefit: difference between the calories consumed by each individual in the first week and computed on the basis of the number of meters walked from and to the place where the car was parked, and the calories consumed by each individual, computed on the basis of the number of meters walked from and to the metro station.

As indicators, we use responses to survey question about the level of commitment with respect to the following four items: Waste, Energy, Daily behaviour and Eco-compatible technologies. For each indicator the respondent has to select one among: "Not at all, Shortly, Moderately, Highly, Extremely"; the outcomes have then a natural ordering but no quantitative interpretation therefore we code the answer using five-point numerical scale (Likert), so the measurement equation of the indicator ( $I_{iq}$ ) is expressed as an ordered probit model.

Our results seem to confirm that indeed there is cognitive dissonance especially between environmental attitude and behaviour. Individuals in fact are pro-environment but behave differently. Our results show also soft measures that make people aware of the environmental consequences of their current behaviours are not enough to break the cognitive dissonance. Soft measures seem to be instead powerful when make people aware that they are discarding a mode more advantageous than car mode (Economic and Health benefits).

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