Modelling crowding discomfort in Santiago´s Metro: influence on time perception and policy implications

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Abstract:

Day-to-day travel decisions such as route and mode choice are influenced by a myriad set of qualitative aspects that enhance or harm the experience of travelling. In the case of public transport, the availability of a seat and perception of crowding levels have been found to have significant behavioural impacts (see e.g., Cox et al., 2006; Wardman and Whelan, 2011; Mohd Mahudin et al., 2012). With the continuingly growing level of urbanisation worldwide, it is fair to assume that behavioural aspects related to riding comfort will become even more relevant for transport policy in future years. Increasing income levels in both developing and developed countries also suggests that more weight will be assigned to quality and comfort features of public transport trips, relative to the common cost and time variables. In this context, there are plenty of evidence of the multiple effects of passenger crowding on public transport demand and supply, including impacts on waiting and in-vehicle times, travel time variability, vehicle and route choice, passenger wellbeing, and the optimal value of service frequency, vehicle size and fare (for a review see Tirachini et al., 2013).

In this paper we analyse differences in time perception on metro trains, by estimating train choice models using a recent stated choice survey designed in Santiago de Chile. Crowding multipliers, that is, the increment in the value of travel time savings as in-vehicle passenger density increases, are estimated for different occupancy levels, using both MNL and mixed logit models. Preliminary results show sitting multipliers in the range 1.0-1.7 and standing multiplier in the range 1.2-1.95, the highest values are reached with occupancy of 6 passengers per square metre. Results are compared with values previously obtained in studies from other countries and differences are discussed. Our approach presents two relevant novelties over previous studies on the value of crowding. We included questions on smartphone ownership and use while travelling, which is expected to have an influence on time and crowding perception. Second, three forms of crowding representation (text, 2D diagrams and pictures of metro trains) were shown to respondents in the stated choice experiment. We investigate if there is any difference in the time parameters induced by the alternative forms of representation.

Implications of the results for policy are discussed, in particular, for cost benefit analysis of projects aimed to increase public transport service frequency (and therefore, to reduce crowding levels at stations and vehicles) and for decisions regarding optimal frequency levels. Using a total cost minimization model (including both operator and user costs), we will show how sensitive is the optimal headway between trains and the resulting occupancy levels, to different specifications of the value of in-vehicle time savings, in particular, to which extent the explicit inclusion of people´s willingness to pay to reduce crowding levels

influences optimal metro supply in terms of passengers per hour and seats per hour.

References

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