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Identifying resident preferences for bus-based and rail-based investments as a complementary buy in perspective to inform project planning prioritisation

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ABSTRACT

Much of the debate associated with the development of new public transport infrastructure appears to have an emotional bias with communities in favour of one mode, especially rail. This, in turn, carries much sway at the political level as if there is no budget constraint or consideration of value for money and coverage. This paper presents a stated choice experiment to investigate this context as two unlabelled options described by 20 potential drivers of community preferences for improved public transport. Each choice scenario is conditioned on a given route length but with different costs, reflecting different modal investment options for the same route length. To establish whether a modal bias exists within and between geographical jurisdictions, the choice scenario is followed by a labelling of each investment option to reveal whether the option is bus rapid transit (BRT) or light rail transit (LRT). Data from all eight capital cities of Australia, collected in mid-2014, form the empirical setting. Mixed logit random regret models provide new evidence on the nature and extent of community modal bias in this choice setting. The paper also proposes a complementary tool to benefit-cost analysis that uses the residence preferences model to show, through scenario analysis, the potential gains in public support for BRT over LRT. The results suggest that BRT should be in the mix of candidate projects if more than one mode is considered and not ignored, as is so often the case in developed economies.

1. Introduction

In most developed countries, the car dominates the modal share for travel for all purposes. Moving to a more sustainable future means being able to create a significant switch from the car to public transport (PT). However, without improvements to quality and service that is brought about by investment, public transport is not managing to appeal to travellers in order to gain this significant change. Transport investments are expensive, and many cities or national governments face competing needs for funding (e.g., health or education) or budget constraints. The budget constraint means that improvements to PT are typically limited to certain corridors rather than the many corridors that might be required to have a significant impact on traffic congestion, accessibility, and liveability.

In many urban areas, new transport infrastructure projects are presented in terms of the performance of a single mode, with its attached price ticket. Rarely is the community provided with any evidence on what might really matter to both users and non users of PT, or what the price ticket might have been if the proposed improvement was to be met using a different mode. Whilst there is significant evidence of modal bias in favour of rail based modes (e.g., Hensher et al., 2015a[1]), the evidence for new projects is often presented as if different modes are perfect substitutes for a given or hypothetical transport improvement. This issue exists regardless of a well-documented literature on differences in characteristics and costs for each mode, particularly rail versus bus. The question posed in this paper is: if a particular corridor must be served, how will community support vary? In particular, the support for one modal solution, be it bus rapid transit (BRT) or light rail transit (LRT), will depend on the characteristics of the system and/or whether the

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[1] A recent media comment is http://www.theguardian.com/commentisfree/2014/nov/22/trams-are-back-in-fashion-so-is-a-sense-of-collective-imagination-about-our-cities.

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community is always in favour of LRT regardless of its higher costs and lower coverage compared to the BRT solution.

The issue of public preference of rail over bus has been investigated in a number of studies, some of which found a significant preference of rail over bus, whilst others found no evidence of such a bias towards rail service. For example, Yannes et al. (2010) found no significant public preference for rail service over bus service. Ben-Akiva and Morikawa (2002) also found no evidence of such a bias towards rail services when both services had equivalent travel times and fares. The same study found that a bias did exist when rail offered a higher quality of service. However, these studies did not consider the reality of limited budgets and a pressing need for public transport investments.[2] In these circumstances, it is important to understand how the majority of society would temper a preference for a new modern light rail system compared to a bus-based system if the latter can deliver an equivalent service and coverage for the city for the same or lower cost.

This paper investigates these issues using a stated choice experiment. The next section identifies potential drivers of community preferences for an inclusion in the experimental design. This is followed by a description of the random regret model and the empirical setting in which community preferences for improved PT are examined. Estimation results are then presented and model application for project planning is discussed. The paper ends with a summary of the main findings and concluding remarks.

2. Drivers of community preferences for public transport

There is a huge and disparate literature on the factors that influence an individual's preferences with respect to mode. The challenge in setting up the experiment was, on the one hand, to select relevant attributes but, on the other hand, not to select too many as this is known to influence the ability of respondents to complete the experiment effectively (see Hensher, 2010). The choice of attributes was informed by the quality of service literature and the discussion in this literature as to what it is about public transport that makes it attractive to users. A literature search, based on academic, technical and grey literature, revealed a long list of potential attributes that were subsequently selected for a phase one best–worst experiment (Hensher et al., 2015a; Mulley et al., 2014) as a way of synthesis and creating a short list of the most important quality attributes for use in this current experiment. This use of the best–worst methodology allowed the selection of the key attributes and in particular, those which were identified as important to voting choices which are naturally of great interest to policy makers (see Hensher et al., 2015a).

The literature underpinning the best worst experiment came from a review of the more technical papers by Hensher (1991), Swanson et al. (1997), Cirillo et al. (2011), dell'Olio et al. (2010a,b), Eboli and Mazzulla (2010, 2008a,b), and Marcucci and Gatta (2007), and the strategic studies of Hass-Klau and Crampton (2002), Hensher and Waters (1994), Hensher (1999), Mackett and Edwards (1996a,b), CUTA (2004), Cornwell and Cracknell (1990), Kain (1988), Pickrell (1992), and Sislak (2000). This synthesis was supplemented by the recent literature on the ridership drivers of public transport (Currie and Wallis, 2008; Currie and Delbrosc, 2013; Hensher et al., 2014). However, it has become clear that there is more than simply the physical attributes of the mode or aspects of a mode's impact that are important. This paper draws on the empirical evidence presented in the literature that has benefited from the input by transport psychologists.

Although the role of perceptions are included in many of the papers cited above, which seek to demonstrate the role of perceptions in user satisfaction (e.g., Stradling et al., 2007; Cirillo et al., 2011; dell'Olio et al., 2010a,b; Eboli and Mazzulla, 2010, 2008a,b; and a more recent review by Redman et al., 2013, that widens the discussion to car users), this paper has included a more fundamental consideration of the role of image in determining preference. There is a considerable literature on why individuals prefer the car over public transport (TCRP, 2000), including literature from marketing (e.g., Wright and Egan, 2000) with suggestions as to how to orientate a marketing strategy in favour of public transport (Ellaway et al., 2003).

The attributes included in the experiment are the tangible attributes associated with public transport travel. However, it is important to recognise that the perceptions identified by the literature will play a part in the way in which respondents complete the experiment. In particular, the way in which BRT appears to have gained its image indirectly from its association with buses, which is often tainted by the reputation that bus-based modes have in mixed traffic (slow, unreliable, etc.) (e.g., Hensher and Waters, 1994; Hensher and Mulley, 2015). The studies of differing perceptions between car and public transport suggest, drawing a parallel from the TCRP (2000) on the importance of familiarity, that LRT is better known than BRT in developed countries, with the reverse being true in developing countries. This effect should show up in our study if we find that residents of Brisbane are more positive to BRT in the experiment, as they have pervasive BRT as their public transport, as opposed to any other city in Australia that is more positive towards the LRT mode.

The literature described above, together with our previous empirical work in exactly the same setting, led to attributes being included to capture differences in cost and coverage between rail- and bus-based modes for a given route length. These factors are classified into different groups to describe the nature of the investment construction cost, construction time, maintenance and operating costs, population serviced, percent dedicated right of way, service levels (service capacity, peak and off-peak frequency, travel time, and public transport fare), features of the system (fare payment, interchange penalty, safety and security, and ease of boarding), and other general characteristics shown to be important in voting between transport systems (the assurance of a minimum period of operation and risk of being closed down after this period, value uplift around stations, mode switch from cars, and environmental friendliness of the system). These were introduced into the survey instrument.

It should be noted that the context of the experiment is on identifying preferences for BRT and LRT for a given route length (which is varied across the choice scenarios but the same across the two modal investment options for each choice scenario). This is the position in which governments typically find themselves when committing to improving public transport infrastructure. This, of course, means we are not asking our respondents whether they would use public transport or either of these modes, which, although a legitimate research question, is different from the one considered here (see, for example, Hensher and Rose, 2007).

[2] A very relevant real-world setting that highlights the focus of this paper is events in Cleveland (and to a lesser degree, Nashville) where the cost of LRT when compared to BRT was significantly greater. The community rebelled against the higher costs and insisted that a system be designed that generated similar travel time savings and other user benefits as the LRT. Cleveland designed and built a BRT system that mimics LRT in every respect, except it operates buses instead of light rail vehicles. The acceptance of the Cleveland BRT system has been astounding and has led to smaller-scale BRT development in another part of the city. The transit authority in Cleveland runs a cottage industry hosting tours for other cities who are trying to decide to build LRT or BRT. They want to see for themselves the success of the Cleveland BRT to minimise their "regret" in building an expensive LRT system when they could have spent 50% less to achieve the same level of service and economic development impact near stations. We thank a referee for these observations.