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Where to park? A behavioural comparison of bus Park and Ride and city centre car park usage in Bath, UK

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ABSTRACT

Integrating car parking facilities with public transport in Park and Ride (P&R) facilities has the potential to shorten car trips, contributing to more sustainable mobility. There is an ongoing debate about the actual effects of P&R on the transport system at the subregional level. A key issue is the relative attractiveness of city centre car parks (CCCP), P&R and public transport. The paper presents the findings of a comparative empirical case-study based on a field survey of CCCP and P&R users conducted in the city of Bath, UK. Spatial and statistical analyses are applied. Radial distance to parking, availability of P&R sites in the direction of travel, gender, age, income and party-size are found to be important factors in a binary logistic regression model, explaining the revealed-preference of parking type. Stated analysis of foregone parking alternatives suggests more use of public transport and walking/cycling would likely occur without first-best parking alternatives. The policy implications and possible planning alternatives to P&R at the urban fringes for achieving greater sustainability goals are also discussed.

1. Introduction

Park and Ride (P&R) has been widely adopted in developed countries in the last 20 years. In its most common form, P&R involves a car park adjacent to an intermodal transfer point which allows a traveller to change from car to public transport – commonly bus or rail – for the reminder of the journey. P&R comes in a variety of guises and formats, ranging from more to less formal arrangements (Parkhurst and Richardson, 2002). Mingardo (2013) identifies three categories of P&R sites based on urban proximity and location:

- Remote P&R – These sites aim to intercept car drivers near the origin of their trips, and are usually located near users' homes in suburban locations.
- Peripheral P&R – The model typical to the UK and US, these sites aim to intercept drivers for the final leg of their trip, normally from the urban fringe into the urban centre; hence these sites are usually located on the urban periphery.
- Local P&R – These sites aim to intercept drivers at a number of points along their routes, with smaller distributed sites arrayed along main transport corridors. This format closely resembles the concept of 'Link and Ride' (Parkhurst, 2000a).

Bos (2004) suggests a number of factors which might contribute to creating a high-patronage P&R scheme: an optimally organised and complete network of P&R sites; a compact urban area; the development of incidental services and facilities at P&R sites; readily-available travel information; and strong, recognisable branding.

In the UK, the term P&R has generally become synonymous with bus-based systems (bus P&R), with parking lots usually located in the urban periphery (i.e. Mingardo's 2nd category above) providing a relatively fast and cheap connection to urban centres. Parking at rail stations is generally not marketed as P&R and often provides a long-range journey function, notably for commuting to central London. In contrast, in the Netherlands, as well as in other European countries, P&R promoted for a local and regional function is more commonly found on light and heavy rail lines.

The UK was one of the countries that pioneered the use of bus-based P&R in the early 1970s. Since then there has been substantial investment nationally – with P&R becoming an important feature of many local transport policies. By 2000 there were around 70 sites in operation (Parkhurst and Richardson, 2002) and by 2007 over 130 operating in Great Britain; together serving approximately 60 towns and cities across the country. Overall, this capacity is estimated to provide 70,000 parking spaces and to utilise more than 400 buses

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daily. The most recent national census of P&R capacity found it was accounting for around 46 million passenger journeys and generating revenues of £40 m annually (TAS Partnership, 2007).

The focus of the present paper is to examine travel behaviour with respect to the interaction between supply and demand for both conventional city centre parking (CCCP) and bus-based P&R services for travel into the historic city centre of Bath, southwest England. The paper contributes to the P&R debate through an empirical spatial analysis of the parking choices of Bath city centre visitors, providing a novel analysis of the similarities and differences between city centre car park (CCCP) users and P&R users. The analysis examines the extent to which P&R users and CCCP users are part of the same mobility group, distinguished only by their mode choice and consequent travel behaviour in the final leg of their trip. Through understanding which users choose the P&R services and which choose to park in the city centre, the differing travel behaviours and their motivations can be elucidated. Additionally, new insights into improving sustainable demand management strategies are raised, with a view to informing local policymakers and transport providers. The paper contributes to these goals using Bath as a case study for examining the social and geographical attributes of P&R users and CCCP users, and using those attributes to explain motorists' motivations to use (or not use) P&R.

The rest of the paper is organised in the following manner: Section 2 introduces the debates in the scientific literature surrounding the traffic effects of bus P&R, which are then placed in the wider economic and parking policy context. Section 3 outlines the geographic and policy context of the Bath case-study. Section 4 describes the methodology employed in data collection and subsequent analysis procedure. Section 5 presents the results of the analysis whilst the final discussion (Section 6) considers the policy implication for Bath and integrated parking and public transport strategy more generally.

2. Park and Ride: Motivations and policy effectiveness

Over the past two decades there has been an on-going academic debate about the real benefits of bus P&R for achieving sustainable mobility goals, including car traffic and emissions reduction. Bus P&R initially developed in the UK as a specialist solution for historic cities, but later captured wider central government and local authority interest as a means of addressing capacity limitations on local infrastructure in a wider range of settlement types (Meek, 2008). In the later 1990s the UK government widened the potential role seen for P&R to include a broader range of issues central to its transport policies – mainly in relation to sustainability and modal integration (Meek et al., 2010). This explicit support for P&R at the national policy level contributed to P&R acquiring an enduring, positive image in the perceptions of local policymakers as a highly effective method of reducing traffic congestion and air pollution in urban cores, whilst simultaneously being seen to raise the profile of other public transport schemes (DETR, 2000; Meek et al., 2010). More recently, however, there are indications that local policymakers and practitioners across Europe are becoming more cautious about the direct traffic reduction benefits of P&R investment (Dijk et al., 2013).

A growing body of empirical evidence – gathered by a number of studies into the actual traffic impacts of P&R schemes and their wider contribution to sustainability – has identified mixed outcomes. A number of inefficiencies with P&R have been demonstrated. First, although P&R is often associated, in urban centres, with avoided car trips (and therefore emissions), in achieving the interception of those trips, congestion and resulting environmental externalities may well have increased at and beyond the fringe of urban areas, in green-belt zones and other rural areas. One reason for this paradoxical outcome is the direct presence of surface car parks with associated lighting and access infrastructure, which make P&R sites more attractive and perceived as safe by users. Second, whilst the majority of P&R users are usually found to be motorists who would have previously used the car for the whole length of the trip without P&R, the empirical evidence also points to a significant presence in P&R sites of public transport users who did not previously use cars (Papoulias and Heggie, 1976; Parkhurst, 1995). In other words, by incentivising the use of P&R for the final leg of the trip through cheap, accessible parking, P&R schemes have unexpectedly attracted some people from bus and train services, with the consequence being that they use cars for the main leg of the journey. The behaviour of these users generally represents a relatively large reduction in public transport use and an overall increase in car use. Third, in addition to this *abstraction* of travellers onto P&R from other public transport modes, a level of trip generation and attraction of new trips not previously made to that city can occur (Parkhurst, 2000b). Overall, and contrary to the assumed car traffic-reduction benefits of P&R, there is a lack of evidence for consistent reductions in mean vehicle-km travelled (VKT) by users, while some evidence demonstrates that, in several cases following the introduction of P&R, total traffic actually increased (Parkhurst and Stokes, 1994; Parkhurst, 1995, 2000a; Guillaume-Gentil et al., 2006; Mingardo, 2013).

P&R could possibly encourage a step-change in motorists' travel behaviour towards using public transport for the entire trip – if they form a favourable impression of P&R from experience, and then decide to try out other public transport options as a result. Or it has the potential to raise the profile of public transport more generally. However, the removal of conventional public transport trips and the encouragement (or even incentivising) of car travel to access P&R outweigh these benefits (Meek et al., 2010). Concerns with P&R have also been raised in relation to issues of social equity. Except perhaps in very specific circumstances, such as airport parking, dedicated P&R sites will rarely be commercially viable in terms of recovering the costs of infrastructure investment and operations. Rather, they generally receive public subsidy justified by the social function of improving accessibility by offering lower-cost parking options (Bos, 2004). Access to P&R is most often predicated on car ownership; however car ownership is often taken as a key measure of social inclusion. Therefore questions of equity may arise where P&R schemes are developed and subsidised at the expense of conventional public transport: in the UK context citizens with cars available may be provided with free parking and subsidised bus fares in order to incentivise P&R use, whilst those without access to cars face market-rate fares on mostly deregulated, privatised bus services (Parkhurst, 2003).

Whilst several of the detailed studies are from England, the unintended consequences of P&R are not exclusive to the UK; similar issues have been observed in the US (e.g. Bowler et al., 1986; Merriman, 1998; Foote, 2000). In mainland Europe a slightly different situation exists due to greater heterogeneity in the types of P&R system in operation, which includes a mix of both bus and rail-based remote P&R systems, peripheral P&R systems, and mixed P&R systems (Mingardo, 2013). The negative implications of trip abstraction and trip generation will be perhaps less severe in the context of remote P&R and local P&R, in which the proportion of the trip length made by car is relatively small. Nonetheless, studies have observed these effects in some European contexts, including in respect of rail-based P&R, and also highlight the abstraction of trips from bicycle to P&R, reducing active travel trips and negatively influencing wider health and wellbeing outcomes. These latter negative effects have not been observed in studies conducted in in the UK and US (See: Mingardo, 2013).