THE INFLUENCE OF PARKING PRICING ON PURPOSE OF VISIT

J. Peter Clinch and J. Andrew Kelly
University College Dublin

PEP 04/01

Department of Planning and Environmental Policy
University College Dublin
www.ucd.ie/pepweb
THE DISPROPORTIONATE INFLUENCE OF PARKING PRICING 
ON PURPOSE OF VISIT

J. Peter Clinch and J. Andrew Kelly
Department of Planning and Environmental Policy
University College Dublin

Abstract

The potential of parking-pricing as a policy tool within the field of transport demand management is gaining greater acknowledgement as empirical research highlights the potential impact it can have on trip generation and modal choice. However, although the aggregate effect of a TDM pricing measure is often noted or estimated, the potential distributional impact of pricing measures initially, and as tariffs increase progressively, is an important consideration for those seeking to implement a strategic TDM policy. Using stated preference survey data from a case study in Dublin, Ireland, this paper examines the influence of parking price on purpose of visit. The results show a progressively widening gap in price sensitivity between business and non-business users as the pricing scenarios scale upwards. Ordered probit regression analysis results reveal, that at a price increase of IRE1.50 to IRE4 (€1.90 to €5.08) per hour, non-business users are over 20% more likely than business users to cease all parking in the area, whereas at a price increase of IRE1.50 to IRE2 (€1.90 to €2.54) per hour, the corresponding percentage shows business users just under 5% more likely to cease all parking in the area as a result. This paper presents evidence for concern amongst policy makers seeking to introduce TDM pricing measures. It highlights the complication that the varied price sensitivity of particular market subsets can bring to development of a pricing policy and warns of threshold points where distributional impacts become considerably more pronounced.
The influence of parking pricing on purpose of visit

J.P. Clinch and J.A Kelly

Introduction

The incidence of efforts in urban areas globally to manage and reduce levels of congestion on road networks needs little introduction in the field of transport policy. Congestion and reliance on the private car in favour of alternate non-motorized or higher capacity ‘sustainable’ modes, presents a dilemma for many policy makers. Whilst the provision of viable alternatives, of sufficient capacity and reliability, alongside road and network planning improvement can alleviate somewhat the well documented congestion problems (Calthrop and Proost, 1998, Johansson-Stenman 1999), there are an increasing number of examples of transport demand management (TDM) pricing measures being employed to ‘push’ users away from private car use in order to ease the demand for road space and encourage either a reduction in vehicle use or some degree of modal shift away from single occupancy private car use.

Parking pricing, as a TDM policy tool, offers potential for the stimulation of modal shift and trip reduction (Clinch and Kelly 2003 a, Shiftan 2002). As the price of parking forms a large and often the largest component of an urban vehicle journey, its influence can be significant at higher tariff levels. However, in this regard, consideration should not only be on the aggregate impacts that a given price may stimulate. If a given pricing option delivers a certain degree of aggregate change in behaviour in the area where price was altered, a shrewd policy maker will also be concerned with the distributional impacts of the price (Clinch and Kelly 2003 b), in other words, are certain types of individual being forced out in favour of another? For example, a city manager may wish to favour shoppers over business users, but, in general, it is difficult to price discriminate directly. By taking a case study of on-street parking in Dublin, Ireland, this paper examines the influence of parking pricing on purpose of visit.

Methodology

The results in this paper are based upon a stated preference data set from an on-street survey conducted in 2001 at St. Stephen’s Green, Dublin. St. Stephen's Green is located just south of the river Liffey, a large river which separates Dublin city into northern and southern halves. ‘The Green’ is a well known and popular on-street parking area in the city centre. Parking spaces flank each side of a large square park and the area is convenient to a number of office blocks as well as some of the most popular shopping and entertainment areas of the city. In addition to the on-street parking facilities, there are two multi-story car parks in the immediate area.
Stated Preference Methodology

Contingent valuation style data for the purposes of this paper were drawn from a face-to-face parking survey conducted over a period of two weeks in August of 2001. The authors and a professional survey company, who were also commissioned to implement the survey, designed the questions and structure of the questionnaire. The survey sampled users at St. Stephen’s Green, Dublin between Monday and Friday at a time between 08:00 hours and 17:00 hours. The sample size for this survey was 1,007 thereby delivering a margin of error of +/- 3% with 95% confidence. Interviewers were positioned along different sections of St. Stephen’s Green and approached people as they left or returned to their car. Each interview lasted approximately ten minutes from point of contact.

The objective of the questionnaire was to gather a wide-ranging set of data on those parking in the test area and their attitudes and behavioural pattern in regard to parking. The questionnaire contained a set of questions to ascertain the profile of those people who park, i.e. the population in question. The responses to these questions allow for the assessment of reactions by any potential sub-populations, including, purpose of visit. Also included in the survey was a contingent valuation style question, which queried users on their most likely reaction to a series of suggested local price increases. The question put forward some suggested new hourly tariffs for the local area and obtained the first stated reaction of parkers to each price. These two questions are combined in this paper to allow testing of the variation in price sensitivity of users parking for either business or non-business related reasons.

With regard to possible concerns over the validity and accuracy of stated preference methods, there was considerable consideration given to the potential weaknesses of stated preference data both when designing the questions and interpreting the results. As regards survey question design, the queries were kept consistent with the Dillman (Dillman, 1978) method in so far as they were kept clear and concise and as uncomplicated as possible given the objectives of the study.

With regard to interpretation of results, four common biases put forward in challenging stated preference results are interview bias, bid level bias, information bias and strategic behaviour (Arrow et al., 1993). In addressing how these biases were considered in regard to this study, consideration is given to the two primary questions used in formulating the results in this paper. These are the profile question, which ascertained the user’s purpose of visit, and secondly the pricing scenario question, which established a user’s reaction to 3 suggested local area parking tariff increases.

The first question to be considered is the profiling question, which determined a user’s purpose of visit and subsequent classification as either ‘business’ or ‘non-business’. In regard
The influence of parking pricing on purpose of visit

J.P. Clinch and J.A. Kelly

To interview bias, it is not felt that this would have been a significant issue. In terms of purpose of visit, numerous categories were provided for describing their primary activity in the area, which then were amalgamated into business or non-business use. It is not felt that a professional interviewer would accidentally lead a user in a particular direction nor is it seen why a user would seek to mislead in this response. As for information bias, it is expected that users were capable of classifying their primary purpose of visit to the parking area with relative ease. In regard to the other two biases and the profile question, bid level bias is not relevant to the profile questions, nor is it seen how strategic behaviour could come into play when identifying the primary purpose of visit in an area.

The local parking pricing change scenario question however is, by its nature, more susceptible to the weaknesses of these biases. However, steps were taken to limit the possible influence. Firstly, interview bias was reduced somewhat by giving users a showcard from which they read and then replied to the question. Thus interviewers did not involve themselves in leading or probing with regard to this question. In relation to bid level bias, the preset pricing scenarios were presented in alternate orders so that users were not always presented with an always appreciating or depreciating set of alternate tariff scenarios and no ordering effect was detected.

Finally, with regard to strategic behaviour, in addition to the usual precautions in survey design, interviewers were instructed carefully on how to introduce themselves and the survey. As it was felt that users may react differently to a government backed survey, the survey was presented to users as a university research project, to allay suspicions that perhaps their responses may lead to a policy shift.

Pricing Scenarios

The pricing scenarios used in the survey form the core basis for the testing of price sensitivity by a specific profile type. Using the responses to the pricing scenario questions the degree of price sensitivity of a given subset is tested. The questions from the 2001 survey are presented as they were at the time in Figure 1. The question shows the pricing scenario, which asked users how they would change their parking frequency behaviour when faced with local parking charge increases from the base price of IR£1.50 (€1.90) to IR£2 (€2.54), IR£4 (€5.07) and IR£7 (€8.89) per hour.

- Insert Figure 1 about here -
Statistical analysis – Ordered probit modelling

Ordered probit regression analysis is used on the stated-preference responses of users in the survey to the series of suggested localised on-street parking price increases. The model analyses the categories of business and non-business user in order to assess the degree of variance, if any, between price sensitivity and a user’s purpose of visit. The dependent variable in each model was the pricing scenario responses of users to a given tariff, the 3 options upon which independent variables are assessed are whether the reaction as a result of the given tariff would be:

1. No change in parking behaviour
2. Park less often in the area as a result of the local price change
3. Cease all parking activity in the area as a result of the local price change

Parameters other than purpose of visit (business and non-business), which were included in the modelling, were, origin of journey (city, county, outside of county), frequency of parking in the area (heavy, medium, light) and engine sizes (included as a proxy for income).

Results

Table 1 presents the results of the ordered-probit regression analysis of business users against non-business users from the on-street parking survey. These results indicate that the distinction between user type and price sensitivity is smallest at the lowest suggested price change. At a suggested tariff of IR£2 (€2.54) per hour (only a 33% increase from the base price), the reaction of non-business users shows them to be just under 5% more likely to cease all parking in the area as a result of such an increase. At the second suggested tariff of IR£4 (€5.07), however, the gap between business and non-business users has increased fourfold to a gap of just over 20%. In other words non-business users are 20% more likely to cease all parking in the area as a result of such a price increase. Thus there is a clear and progressive distinction noted in the proportional likelihood of these two types of user to have varied reactions to localised price increases. As price scales upward, the initial disparity between these subsets becomes more and more pronounced. It is noted however that at the third and highest pricing scenario presented (IR£7/€8.88) non-business users are 22% more likely to cease all parking in the area. Thus, although IR£4 (€5.04) represents a 167% increase in price, and IR£7 (€8.89) represents a 367% increase in price, the added difference in the proportional likelihood of non-business users to cease parking in the area compared to business users is just 2%.
To consider these results from another angle, those users who claimed they would not change behaviour whatsoever as a result of the price change are examined. In this case the same trend is noted though on a slightly smaller scale as the balance of users is being made up of a consistently small percentage that would reduce the number of trips they would make as a result of the price change. The marginal effects for both non-business and business users for each possible response to the pricing scenario are also found in Table 1.

Discussion

The results of this econometric modelling work, based around the 3 price scenarios as dependent variables, have delivered a number of important findings. Firstly, it is noted that distinctive population reactions in this case do not pre-exist at a consistent level for all pricing levels. Rather, they are triggered as price scales upwards and effects are amplified in tandem with price. The importance of this finding is notable with regard to parking pricing policy (and most likely other TDM pricing measures) as it indicates certain price thresholds where distributional issues are either non-existent or marginal. Thus, as the price change from IR£1.50 (€1.90) to IR£2 (€2.54) seemed to have comparatively little distinctive effect on the measured sub sets, it would appear that large distributional impacts with regard to the purpose of visit of a customer at this tariff level would be avoided. However, results from the higher pricing scenarios indicate that, beyond certain price levels, distributional issues become far more pronounced in relation to purpose of visit.

It is also noted that although the difference in marginal effects between business users and non-business users is small in relation to a suggested 33% price increase, and large in relation to a 167% price increase, there is little added disparity at the highest tariff suggested, which represented a 367% price increase. Thus, there is comparatively little difference in terms of distributional impact between a price increase of IR£4 (€5.07) relative to a price increase to IR£7 (€8.89). One interpretation of this finding is that the IR£4 (€5.07) tariff represents a key threshold point, wherein there is a broad range of prices which all maintain a similar level of distribution impact on business and non-business users.

In the full scope of testing (although this paper only deals with business and non-business results) it was also generally observed that response to price is not uniform for the entire population. The degree and scale of a price increase will have a notable influence on the population subsets affected and the level of their reaction. In terms of specific parameters and their marginal effects, purpose of visit, specifically business versus non-business use, is shown to be the most constant and significant result when compared to other parameters tested in this manner. In almost every model it is shown as significant at the 1% level and the marginal effects become more and more pronounced as the prices increased, with business users clearly less responsive to the price changes than non-business users. The general
conclusion then with regard to on-street pricing policy is that, as prices are progressively raised, the influence on business users will be disproportionately lower than on leisure users. This could result in progressive pricing activity leading to a higher proportion of business users in an affected parking area.

Conclusions

This paper has highlighted an important consideration for those seeking to implement TDM pricing measures and, specifically, that of parking pricing. In this case study it has been shown that, at the lower levels of price increase, the disparity in effect on business relative to non-business users is not very significant. However, as price scales upwards, the two subsets become progressively more different in terms of their responses, with business users generally less likely to change behaviour relative to non-business users.

Whilst the concept of equity and distributional issues with pricing measures is not new, and prudent policy makers will consider the likely impact of their policy decisions on specific subsets of their market, this study suggests attention should be paid to the range of potential price scenarios, as distributional issues are not a concern at all pricing levels and may only become apparent as price is gradually scaled upwards.

In terms of further research, an important path to be pursued is that of investigating a means of influencing specific subsets and also further work on identifying classifications of users with varied degrees of pricing sensitivity. Results here would suggest that a disproportionate influence could be attained over non-business users, using price alone. However the approach is somewhat crude and certainly does not offer an independent means of influencing a single distinct group. In other words, whilst the varied price sensitivity of some subsets signifies that a given level of tariff will disproportionately affect them, the effect is not exclusive and will still influence a smaller portion of a related subset. Thus, whilst a policy maker may be able to influence a greater number of a specific group, the effect of the pricing measure will remain non-exclusive.

Given the other primary parking charge modification of time and location variable prices, tariffs could be set, following empirical work, to establish the primary user of a specific area at given times of the day or week. Once again, however, one is gaining only a disproportionate influence, rather than a full targeted influence over a particular subset. This paper offers evidence of the disproportionate influence of price, whilst in some cases a policy maker may dismiss such concerns as unavoidable, further work is recommended to establish whether there is a potential means of a more targeted pricing instrument which can, if desired, avoid unintentional distribution consequences of a given policy.
Acknowledgments

Financial support from the Irish Council for the Humanities and Social Sciences and Dublin City Council is greatly appreciated. We are most grateful to Owen Keegan, Director of Traffic Dublin City Council, for his advice and support. Thanks also go to Finbarr Brereton of U.C.D Planning and Environmental Studies for his input on modelling. The views expressed are those of the authors.
The influence of parking pricing on purpose of visit

J.P. Clinch and J.A. Kelly

References


Table 1 Ordered probit regression results for business versus non business users to hourly local on-street tariff increases

<table>
<thead>
<tr>
<th>Business versus non-business users</th>
<th>Mean marginal effects at IR£2.00 (£2.54)</th>
<th>Mean marginal effects at IR£4.00 (£5.07)</th>
<th>Mean marginal effects at IR£7.00 (£8.89)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No change in behaviour</td>
<td>0.044193</td>
<td>0.15376</td>
<td>0.13062</td>
</tr>
<tr>
<td>Park less often in the area</td>
<td>0.0053049</td>
<td>0.050776</td>
<td>0.094032</td>
</tr>
<tr>
<td>Cease all parking within the area</td>
<td>-0.049498</td>
<td>-0.20454</td>
<td>-0.22465</td>
</tr>
<tr>
<td>p-value</td>
<td>.139</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>t-statistic</td>
<td>-1.47988</td>
<td>-6.56789</td>
<td>-6.70784</td>
</tr>
<tr>
<td>Standard Error</td>
<td>.086412</td>
<td>.084441</td>
<td>.093243</td>
</tr>
</tbody>
</table>


**Figure 1 Pricing scenario question**

<table>
<thead>
<tr>
<th>Pricing scenario question</th>
<th>£2 per hour (10)</th>
<th>£4 per hour (11)</th>
<th>£7 per hour (12)</th>
<th>(10-12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q20 And which of the following statements best describes how often you would park here if the price increased to ....... INTERVIEWER: PLEASE START WITH UPPER OR LOWER PRICE, ROTATE ORDER OF READING OUT BETWEEN INTERVIEWS. TICK START.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• I wouldn’t change my behaviour I would park as often as I do currently ................................................................. 1 ......... 1 ........... 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• I would park here less often than I do currently .................. 2 .......... 2 ........... 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• I wouldn’t park here at all ................................................................. 3 ......... 3 ........... 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Don’t know ................................................................................. 4 ......... 4 ........... 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>