TESTING THE SENSITIVITY OF PARKING BEHAVIOUR AND MODAL CHOICE TO THE PRICE OF ON-STREET PARKING

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Abstract

Parking pricing has been suggested as a 'second-best' approach to managing road space. However, its effectiveness will depend upon the responsiveness of parking behaviour and modal choice to the price of parking. This paper examines the sensitivity of parking behaviour and modal choice to the price of on-street parking in the city of Dublin, Ireland. This analysis utilises contingent valuation data sets from two large-scale surveys of on-street parkers in a prime area for parking in the centre of the city. On aggregate over the two surveys, some 70% of the users surveyed indicated a behavioural change to a hypothetical localised only on-street parking price increase scenario. Results indicate that the most likely impact of the localised price increase amongst those who reacted is parking relocation, with 75% on aggregate over the two surveys choosing this option. Such relocation was predominantly to a multistory facility. The remainder of the reactions were accounted for by modal alternatives at 15% of users on aggregate over the two surveys, and trip cancellation at 6%. The balance were indecisive about their reaction, other than to stop parking in the newly higher priced area. Although quality of modal substitutes and the scale of parking price change are clear factors, results show significant potential for parking policy to cause a modal shift, especially were a more widespread approach taken to the price increases.


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Introduction

Rising car ownership levels and increased dependence on private motor transport is a well-documented trend in many cities across the globe. Increasing levels of traffic congestion pose considerable challenges for traffic managers. Congestion costs include lost time and higher concentrations of both air and noise pollution. In response, where infrastructural possibilities are limited, a large field of research has been devoted to transport demand management tools and policies. A first-best approach to the management of the demand for road space is congestion charging (also known as road pricing) and this has been studied in depth by authors such as Goh (1), Sterner (2) and Verhoef (3). Successful road pricing schemes have been implemented in both London and in Singapore. Nevertheless, the technology involved in road pricing can be expensive and it can prove to be politically unpopular. Thus, considerable interest has developed into the potential for the use of parking pricing as a proxy for congestion charging in cities. Garland et al. (4) suggest parking pricing as a potential ‘push’ pricing measure. The concept being that as opposed to a ‘pull’ measure, such as public transport subsidies which seek to encourage users from their vehicles by making alternatives relatively more attractive, the ‘push’ measure influences private motorists away from driving by making it relatively less attractive to other modes through increased trip costs.

Button and Verhoef (5) have listed the numerous advantages inherent in parking policy. The main potential for its use derives from the fact that on-street parking affects road capacity and so its management has consequences for congestion. In particular, vacancy rates are important in congested areas as ‘cruising’ for parking (search time) is a contributor to congestion. As a result of relatively inexpensive parking, searching for parking spaces in busy overused areas is a major factor in city congestion. As vehicles cruise for an available space they remain in the traffic system, and travel at a slower speed – they stack with ‘through traffic’ and other searching vehicles alike – slowing the entire system, until they find a space. As noted by Arnott and Rowse (6) this process increases traffic volume, slows it down, and generates additional costs in terms of time lost both to the individual searching and those who they delay. Thomson and Richardson (7) have built upon this particular area of parking research in their development of a parking search model that attempted to model the decision process of motorists seeking a spot.

The cost of parking (for those who pay themselves) is a large and often the largest monetary component of a car trip and so parking pricing has the potential to be a significant factor in influencing the decision to drive. In previous research, cheap parking has been shown to be a significant influencing factor with regard to trip generation decisions and modal shift (8; 9)

Relative to the implementation of a road pricing scheme, Button (10) and Button and Verhoef (5) note that parking pricing can offer a means of influencing and charging private transport
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while avoiding the political and toll collection complications which road pricing faces. Indeed, parking pricing is generally considered more easily implemented than road pricing due to the fact it is a recognised and established system of charging in many facilities and countries across the world (11). As such, the largest barrier in terms of public acceptability of 'any level of charge' has already been won. Upgrading of parking meters and restructuring of the pricing system may encounter some comment and complaint. However it is unlikely that the reaction would be as severe as the introduction of an altogether new form of charging such as road pricing.

This paper examines the potential for an increase in the price of on-street parking in a localised prime area to influence parking decisions and modal choice. While there is relatively little published empirical work in the area of parking policy, examples include Tsamboulas (12) who employed contingent valuation data (and revealed preference data but in the sense of questions where the answer was observed not asked) to profile and model a large sample of motorists and their behavioural responses to changes in parking pricing in Athens. His study presents interviewees with 3 choice scenarios. These scenarios test aspects of the parking decision and relative importance of two main factors, price and walking distance. Similar to the above and very close to the concept of this study is the work of Shiftan (13) who queried a sample of 200 parkers in regard to three hypothetical pricing scenarios in a central mall parking area in Haifa, Israel.

The case study in this paper is in Dublin, Ireland. Ireland has experienced a record rate of economic growth in the last ten years. Growth in Gross Domestic Product averaged 8% per annum between 1990 and 2000 and the rate of car ownership grew similarly. Infrastructural development has not kept pace and, allied to a limited potential for developing extra road capacity in urban areas (Dublin, in particular, being a medieval city), has led to a considerable worsening of traffic congestion. Unlike the aforementioned papers, this paper is concerned with the stated reactions of consumers to an increase in the price of parking in a single localised central area with no additional pull factors i.e. with all other parking options and modal alternatives remaining constant. The questions at hand are: what influence would a change of on-street parking pricing in a high demand area have on parking behaviour in that area, and what alternatives would people choose? Thus even at a local level, and assuming a more widespread parking policy would have a greater proportional effect, what might parking policy achieve. Actual reactions to a citywide change in both the structure and level of the on-street parking charges in Dublin will be assessed using revealed preference data in a forthcoming paper.
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Methodology

The area chosen for an analysis of price responses is Dublin's prime parking area, St. Stephen's Green in the centre of Dublin. St. Stephen's Green is located just south of the river Liffey, which divides Dublin city into northern and southern halves. ‘The Green’ is one of the most popular and best-known on-street parking areas in the city centre. Parking spaces are available on each side of this large square park located at the centre of one of Dublin’s most popular shopping and entertainment areas. In addition to the on-street parking facilities there are two multi-story car parks in the immediate area. It is reiterated that the responses in this study are in relation to a localised price change in this area alone, with all extraneous available parking left unchanged in the contingent valuation style questioning scenario.

Aside from the Green itself as an attraction, the immediate area contains a number of office buildings. The Green is also host to a number of bars and restaurants, and the entrance to a large Shopping centre, which is built upon its own substantial parking facility. The area also borders on a number of other prime streets in the city including, Grafton Street, one of the most popular shopping and social districts in the city. The area is often described as the 'heart' of the city centre.

Stated-preference methodology

Contingent valuation data for the purposes of this paper were derived from two face to face parking surveys commissioned in sequential years. The scope of these surveys was quite broad and targeted a wide range of information for parking policy related study. The questionnaires were designed by the authors with the input of the Director of Traffic of Dublin City Council and a professional survey company who were commissioned to implement the survey. The population being sampled was those people who park their car between Monday and Friday at peak hours (8:00 hours to 17:00 hours). Interviewers positioned themselves along different sections of St. Stephen’s Green and approached people as they left or returned to their car, generally the latter. It was considered more appropriate to approach people when they returned to their car as interviewees were less likely to be in a rush and less likely to perceive the interview as using up their parking time. The interviews lasted approximately ten minutes each.

The first such survey began on St. Stephen's green in late July of 2000 and an effective sample of 1,062 responses was achieved in two weeks (10 days). This gives a margin of error of approximately +/- 3% with 95% confidence.

The second survey took place in the same location the following summer in early August of 2001. A revised but comparable questionnaire was drafted and the same market research
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company contracted to administer the questionnaires. The sample size for this second survey was 1,007 giving a similar error margin.

The before and after aspect of the surveys is not relevant to this paper per se, as this aspect was necessary for other stated and revealed preference work on the impact of an actual citywide price change, on this test area, in terms of profile and demand. However there were economies of scale to be exploited by including further hypothetical pricing questions in the second year survey.

The two surveys contained a wide range of questions to ascertain the profile of those people who park, i.e. the population in question. This provides the context for the answers to the pricing scenarios and allows for the assessment of any potential sub-populations (for example, business and non-business users, socio-economic profile etc.) and also facilitates the testing of priors using regression analysis. However, for the purposes of this paper, the profile information is not dealt with in great depth but is simply to provide some context for the main results on modal choice and give an impression of those who were reacting to the pricing scenarios.

Consideration was given to the potential weaknesses of stated preference data when interpreting results. Indeed a number of concerns were addressed in both survey design and implementation to improve the reliability of responses. The survey questions were designed consistent with the Dillman (14) method in a clear and concise fashion. The scenario used for the price change related to a single parking area they were familiar with (St. Stephen’s Green) and a form of charge they were accustomed to (parking meter charges). This was achieved by conducting the face-to-face surveys in the test area itself. Also the price change was presented as a ceteris paribus increase in local charges only, thus if a user found this unacceptable and would reduce or cancel all parking behaviour in the test area, the subsequent questions simply checked the next most likely course of action.

Advisement was taken from the market research firm, and their researchers were all thoroughly briefed on survey implementation and impartial questioning. Also it was felt utilising the same firm in both years contributed to the consistency of technique and approach.

**Pricing scenarios**

The primary results presented in this paper are derived from replies to two similar base questions, one from 2000 and one from 2001 which comprised a contingent valuation exercise. These base questions essentially presented interviewees with a randomly ordered set of hypothetical pricing scenarios and gathered contingent valuation data on a parkers reactions to each price level presented in a form of contingent valuation.
Respondents could register the effect of a given price change on their parking frequency in one of four ways. These were, 'no change', 'don't know', 'park less often' or 'cease parking in the area altogether'. If a respondent either replied "Don't know" or "No Change" to each and every pricing scenario presented to them, then the interviewer would proceed on to a new line of questioning not related to the pricing scenarios, as no effect could be gauged from the pricing scenarios presented.

However, for those who responded to any given pricing scenario with "Park less often..." or "Would not park here at all" there were a series of cascading questions to establish a clearer result for how exactly the price change would affect the person's behaviour.

These cascading questions trace the user's propensity simply to make fewer trips, to travel to park in an alternate location (categorised) or to use an alternative mode of transport (categorised). It is important to note that this particular paper deals solely with changes in parking frequency (number of trips) and not duration (parking time). However both surveys also contained near identical questions which dealt specifically with reductions in parking time due to the price increases as opposed to reductions in trip frequency to the area. These data will be utilised in other forthcoming work.

The pricing options they were presented with varied in both years, and represented differing levels of % price increase from the base level in each year. In 2000 the prices suggested were IR£1.50 (€1.90), IR£2 (€2.54) and IR£3 (€3.81). These represented increases of 50%, 100% and 200% respectively from the actual price in that year. In 2001, suggested prices ranged from IR£2 (€2.54) to IR£4 (€5.08) and IR£7 (€8.89), representing increases of 33%, 167% and 367% respectively. For the purpose of limiting bias to responses, ordering was altered in the questionnaires and respondents were not always presented with an appreciating set of values.

An important note is that within the survey, whilst users were queried on how they would react to three distinct pricing scenarios, the follow up questions on the exact impact with regard to either modal choice or alternate parking location are not segregated according to the price at which users claimed they would make the change. The reason for this was due to a belief this would over complicate and significantly lengthen the survey. The survey was finalised in trials at roughly ten minutes, per interview This was the maximum time threshold that was considered workable by the market research firm for face to face cold (literally!) questioning. As such, asking users for a distinct pattern of behaviour prediction at each price level for both frequency and duration changes in their behaviour was not feasible. Instead it was accepted that, as the survey was querying users on the impact of a localised price change, the first point at which they would change their mode of travel or parking location would remain the
same at higher prices, as they would have already 'left' the area so to speak. In a local area price change, there seems no reason why someone would opt to take a bus if the price of parking was IR£2 (€2.54) per hour, but would cancel the trip if the price of parking was IR£3 (€3.81) per hour. Thus the survey looked to estimate the degree of achievable change and the likely types of change based on 1st response actions to an unacceptable pricing level. The final figures utilized represent the maximum achieved reaction at the IR£3 (€3.81) price in 2000 and IR£7 (€8.89) price in 2001. These two highest prices, unsurprisingly, elicited the greatest proportional response from the sample in terms of behavioural change. As stated earlier no distinctions are made in this paper for reductions in duration.

It is not felt the ex ante ex post aspect of the data collections was of significance to these questions. However, as part of the other studies, a considerable amount of effort was devoted to examining potential confounding factors before and after the actual price change that occurred in on-street parking charges, i.e. the period of each survey. Space restricts the details of this analysis suffice to say the proportion of regulated on-street parking and multi-storey spaces did not alter in any significant way in the interim year and other potential factors such as changes in traffic flow were not considered to be significant. Figures have not been adjusted from nominal to real terms however in this particular paper, however average nominal income increase was 11.78% between the two years with a CPI of +4.9% for the same period. The timing of the surveys was held constant to avoid possible seasonal impacts on profile and hence response. In addition, other than a small degree of profile shift caused by the actual on-street pricing increase, the confounding factors generally relate more to possible increases in supply or demand levels. The possible impact of the profile change is discussed more in the results section.

Results

Profile of parkers

The change in parking pricing between the two surveys was a citywide increase in the cost of on-street parking by generally 50%. This section makes note of significant or unchanging profile attributes for those parking in the test area. The purpose of this is to address the most significant potential confounding factor, as the price shift may have delivered a profile change that would impact upon the price response, modal shift and parking relocation behaviour of those sampled in the second year relative to the first.

The results show that the age profile remains remarkably consistent and balanced across the full spectrum of age brackets in both years, with almost no discernible change. In fact, the two most notable changes in the area sample were in regard to class and gender. In 2001 there was a reduction in the class AB (upper classes) in favour of C1 (upper middle class). The shift
was significant with an increase from 38% of the sample being C1 in 2000 to 47% in 2001. Changes in classes C2 (lower middle class) and DEF (lower classes) were insignificant. In gender terms, there was a notable shift in favour of female parkers to the area under study. The balance in 2000 was 64% male, whereas in 2001, the proportion of male parkers was at 57%. Still the majority, but the margin of difference had narrowed notably. No satisfactory reasoning has accounted for this shift in gender at this point.

With regard to frequency of parking in the area, there are no significant changes in the proportions between the two years generally. The biggest change in this regard is a 6% drop in parkers who only visit the area every 6 months or less, from 20% in 2000 to 14% in 2001. This could be indicating a slight shift away from the more sporadic visitors, although with a margin of error of +/- 3% at 95% confidence, this finding is only marginally significant. However, other than this, the mix of frequencies remained very consistent over both years.

With regard to purpose of trip, which is one of the most interesting profile areas for parking managers, another small shift is noted. The number of individuals ‘meter feeding’ or parking again after their time limit is expired (3 hours is the maximum allowable parking time) remains at 1% for both years. In the distinction of either business or non-business users, there has been an almost mirror shifting in the proportions of the two populations. In 2000 the greater balance lay with business users who accounted for 53% of all users, to 46% of non-business users. The balance being made up of people parking again or meter feeding. However in 2001, following the price changes, this balance has reversed in favour of non business users who now account for 53% of the sample relative to 46% of business users. It should be noted that these “business” users are only in a few cases (due to 3 hour parking requirements and the need to meter feed) all day commuters, and are otherwise classed as business users due to the nature of their trip. It is accepted that not all users would admit to meter feeding given its illegality.

Thus this was the minimal shift in profile that occurred in the area between the two surveys. In terms of how these results might affect the outcome of the modal and parking relocation questions, it is believed that the most likely impact would be small. Ordered probit regression analysis from a forthcoming work was consulted to assess the likely direction of variance in reaction for each of the changed categories, in terms of price sensitivity to a local on-street price increase. In regard to the shift in class from AB to C1, no variance is noted between the reactions of these two categories. However in terms of fewer men, fewer very light users and fewer business users, there are possible effects. Men and business users are highly correlated categories and as such, only business users relative to non-business users were used in the ordered probit model. The indication is that at the highest pricing scenario (IRE7/€8.89) business users are 22% less likely to cease all parking activity in the area than
non-business users whilst light users were found to be 14% more likely to cease all parking in the area at the IR£7 (€8.89) price relative to heavy users.

Thus the effect on the sample in 2001 with 6% less business users is a possibly a more price sensitive sample, whilst the lower proportion of the most infrequent parkers would likely reduce sensitivity somewhat.

It is noted that the actual change that occurred was a citywide change and as such different from the effects of the localised change measured in these regressions, however the indication from the regression work is that the likely effect of the profile shift that occurred would be small, with possibly an aggregate increased degree of price sensitivity due to the higher proportion of non business users.

**Modal alternative and city context**

The next sections will consider results from questions on modal alternatives and reasons for driving. The purpose of this is to give some insight into perceptions of the quality of these modal alternatives and to understand the factors involved in the decision to drive. These results are presented as a total examination of all users, though forthcoming work will distinguish all aspects of the survey results by user type, parking frequency, income, social class etc. In order to provide a comparative context for this study, Box 1 presents a brief overview of the state of Dublin city's transport system and modal alternatives.

One of the questions put to those interviewed asked them why they chose the private car mode of transport over any other option such as public transport. The results from this question were broken into listings of the main reason for any given user as well as a list of any reasons they considered a factor. The 'main' reason given in both years was a catchall "It is simply easier to drive" response. Indicating the users habits and reliance on the private car to be reasonably well enforced. For others, approximately 12.5% over both years cited a problem with public transport as the main reason for their driving, listing factors such as poor connecting routes, slow times, unknown routes and general unreliability as specific problems. In 2000 15% had issues with public transport, whereas in 2001 this had dropped to about 10%.

In terms of qualified 'need' for a vehicle, approximately 20% over the two years claimed that the main reason for driving was that their vehicle was needed for work. In addition roughly another 15% on aggregate needed their vehicle over both years for carrying shopping or because of passengers they were traveling with or picking up.
Thus the indication is that the majority of these users drive out of habit, simplicity or some issue with the public transport system. Again such a result has positive implications for a policy seeking to reduce car use, given that the proportion that claims to have a qualified need is in the minority.

Users were also queried as to why they chose on-street parking at that time rather than using a multi story facility. In response, almost 40% aggregate over the two years cited the primary reason as convenience to destination. In other words, the most influencing factor was that it was near where they wanted to go. The second most common main reason for parking on-street in both years was cost. In 2000 almost 20% of the sample stated the cheap cost was their prime influencing factor for parking on-street as opposed to in a multiistory. At this time on-street was 60% cheaper per hour. In 2001, only about 10% of the sample gave cheaper cost as the reason, given that the actual on-street parking cost increases had left on-street just 20% cheaper per hour, the result is somewhat expected.

After location and cost, the other significant factor appears to be impulsive opportunism; with an aggregate of 12% simply stating it was the first place they saw. In these cases users behaviour and patterns are probably at their most erratic.

Other more minor reasons given included, feelings of safety in parking on-street, dislike of MSCP queues and it being physically easier to park the car on-street than in an MSCP facility.

**Pricing results**

This section deals with the primary results to the pricing scenarios in terms of modal shifts or parking relocations.

Table 1 shows the absolute number who reacted to the top on-street price, those who claimed they would be unaffected by any price presented, and those who simply did not know. In 2000 approximately 63% of the sample reacted to the top price of IR£3 (€3.81) per hour, whereas in 2001 with the higher pricing scenarios, almost 79% of the total sample reacted to the top price of IR£7 (€8.89) per hour. The remaining interviewees either said they would not react, or did not know. In Table 1, the percentages for trip cancellation, alternate modes and parking relocation represent a proportion of the total number who reacted (i.e. 63% and 79%) not the entire sample.

In 2000 7% indicated they would cancel trips as a reaction to one of the pricing changes, whereas in 2001 this had fallen slightly to 5%, though in absolute terms the number remained the same. In addition, the proportion that would shift mode fell from 19% in 2000 to 11% in 2001. Perhaps the added severity of higher suggested localised parking increases in 2001
resulted in a backlash of some sort towards being "pushed" out of the private car mode. However this will be examined in more detail in forthcoming work.

The majority in both years cited an alternate parking location as their reaction to a localised pricing change, with 66% in 2000 and 83% in 2001 opting for this as their primary reaction.

It should be noted that the defined results are somewhat distorted by a significant discrepancy in the percentage of unstated reactions. In 2000 8% of users said they would change behaviour but did not know how, whereas in 2001 only 1% gave this reply.

However, the indication from these results is encouraging with respect to the potential for achieving some degree of modal shift or trip cancellations. Especially given that the prime response was to relocate their parking as a reaction to the price shift. Given this was only a hypothetical local price increase; a *citywide* price change of magnitude could have a more pronounced effect on modal choice and trip cancellation.

The results in Figures 1 to 4, highlight the splits within the categories above. Thus Figure 1 deals with "where" users would relocate their parking to in 2000, and Figure 2 deals with which modes of transport the modal shift sample would adopt for 2000. Figures 3 and 4 deal with the 2001 results for the same.

Figure 1 is representative of approximately 127 of the users surveyed. In other words, 19% of the total proportion who reacted at some point in the pricing question on parking frequency stating they would react by parking less or not at all in the area. Their primary reaction to a suggested local area price change is to park in a local MSCP, which interestingly was priced at IR£1.60 (€2.03), 60% more expensive than the existing actual on-street charge of IR£1 (€1.27) at the time. Bear in mind however that MSCPs offer parking for greater than 3 hours, whereas on-street is limited to 3 hours at a time.

In Figure 2, the bus is shown clearly as the most popular modal alternative for users in Dublin who would alter their mode as a result of the parking price changes. With the train and walking accounting for 18% and 7% respectively. Cycling and car sharing only account for 4% and 2% of the potential mode shift in 2000. Interestingly 10% of users claim they would simply use a taxi, presumably the cost of a taxi would for some become a more attractive option should the cost of car parking increase. Also 7% of those who would shift mode would switch to walking.

As shown in Figure 3, and similar to 2000, the primary response of users in 2001 is to park in a MSCP. In 2001 the price of on-street was IR£1.50 (€1.90) relative to IR£1.80 (€2.29) per
hour in the local MSCP alternatives. Thus in 2001 the relative price difference in nominal terms between these parking options was just 30% as opposed to 60% the year before.

Also it is notable that, approximately half as many users in 2001 as 2000 think they would find cheaper or "free" on-street parking. No doubt as a result of an ongoing roll back of free spaces, and a citywide increase in parking tariffs. However now twice as many users claim they would use a private space for their parking needs.

Figure 4 highlights again that the bus remains the most likely modal alternative for users who would shift modes in Dublin, followed once more by the train which would account for 22% of the 2001 mode shifts. In 2001 the proportions of users who would shift to cycling or car sharing is again at the lowest level for any modes, with only 1% of users considering car sharing for their modal shift. Also 10% of the 120 users who would shift mode at some pricing level claim they would walk.

Discussion

Parking pricing, in the same sense as Road Pricing, is a ‘Push’ factor with regard to causing a modal shift. Users are not being attracted from their cars by a much-improved public transport system, rather they are responding to their price sensitivity and altering their behaviour accordingly. It is likely that the means of achieving a more balanced modal split is through a combination of both push and pull factors. Stradling et al. (15) noticed from a household survey in the UK that users all preferred to be "pulled" rather than "pushed". However, in the same piece of research it was made clear that although many users (one third of the sample) desired to change and drive less, only 7% thought this might actually happen. The result is not unique with Verhoef (3) and Thorpe et al. (16) also noting that people unsurprisingly would rather see improvements in public transport as a means of effecting modal shift rather than a new charging system.

Thus, perhaps the added motivational factor of pricing is required only once alternatives are in place. If viable alternatives are not available, users price sensitivity will be reduced, as they will have fewer options. A user cannot be forced to use a metro if one has not been built, or if it has already reached maximum capacity. However as summarised by Bonsall (17) with regard to pricing, once alternatives are provided “There is a need for sticks as well as carrots!”

It is evident from this work that parking pricing in this case study could prove to be a viable tool for influencing the parking patterns of users, even given the current poor state of modal alternatives in Dublin. While the primary reaction to suggested local price changes was parking relocation, the results for modal shift and trip cancellation are also promising given the localised nature of the suggested change. In a situation with a more widespread pricing
change and development of alternatives, the impact of a structured parking pricing policy could be quite pronounced at certain levels.

In summary, the findings of this research do indicate the potential for a well-structured and widespread parking pricing charge to impact noticeably on modal choice, trip generation and parking patterns and behaviour. However the prices required to achieve this are considerably higher than the current levels in use.

Acknowledgements

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Bibliography


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BOX 1  Transport Network Overview for Dublin 'City' Area

TABLE 1  Stated reactions of users who would react to a price 2000/2001

FIGURE 1  Alternate parking locations for users who would park elsewhere 2000

FIGURE 2  Modal split proportions for those who would change mode 2000

FIGURE 3 Alternate parking locations for users who would park elsewhere 2000

FIGURE 4  Modal split proportions for those who would change mode 2001
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BOX 1 Transport Network Overview for Dublin 'City' Area

<table>
<thead>
<tr>
<th>Roads and motoring in the Dublin Area:</th>
</tr>
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<tbody>
<tr>
<td>• 42.8km of National Primary Roads and 5.8km of National Secondary Roads.</td>
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<tr>
<td>• 1.133km of non National Roads.</td>
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<tr>
<td>• No High occupancy lanes or contra flow system</td>
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<tr>
<td>• No congestion pricing system or parking charges for non residential off street spaces</td>
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<tr>
<td>• High insurance and petrol costs</td>
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<td>Rail:</td>
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<td>• Dublin's Dart network is an overland rail system which runs in a linear manner along the coastline. The Dart carries some 80,000 passengers per day.</td>
</tr>
<tr>
<td>• The Dart network is quite reliable and has benefited from the introduction of electronic notice boards advertising the arrival times of the next number of trains.</td>
</tr>
<tr>
<td>• However the Dart has limited capacity and suffers somewhat from overcrowding at peak times.</td>
</tr>
<tr>
<td>• There is also suburban rail, which brings longer distance commuters to the city.</td>
</tr>
<tr>
<td>Bus:</td>
</tr>
<tr>
<td>• Dublin Bus carried 193 million passengers in 1997. The bus network operates in a less linear fashion than the rail network and services a wider area of the county (see Maps 2.3 and 2.4).</td>
</tr>
<tr>
<td>• QBC&quot;s (quality bus corridors) are in effect on a limited number of routes in order to improve reliability and speed of bus transport. However many routes remain susceptible to traffic congestion.</td>
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<tr>
<td>Cycle/walk:</td>
</tr>
<tr>
<td>• 320 km of cycle lanes have been provided, though some cyclists would dispute the definition of 'cycle paths' as some are very poor quality, shared with motorists or poorly marked. The Dublin cycling communities are generally dissatisfied with current infrastructure (<a href="http://groups.yahoo.com/group/dublin-cycling/">http://groups.yahoo.com/group/dublin-cycling/</a>)</td>
</tr>
<tr>
<td>• Generally poor weather and lack of work place changing facilities tend to discourage a widespread move to regular cycling or walking.</td>
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<td>Taxi:</td>
</tr>
<tr>
<td>• Taxi's are permitted to use bus corridors and hence are a reasonably fast means of travel if somewhat expensive relative to other public modes.</td>
</tr>
<tr>
<td>• Deregulation within the past two years has improved availability and usage of taxis, though peak weekend hours still seem to lead to unacceptable waiting times.</td>
</tr>
<tr>
<td>Light rail/Tram:</td>
</tr>
</tbody>
</table>
- Part of the LUAS light rail system is due for completion shortly in Dublin. This will provide new modal alternatives for more areas. Details can be found at [www.Luas.ie](http://www.Luas.ie)

**General:**

- Dublin still lacks an integrated ticketing/connection system for public transport
- Reliability of public transport (particularly buses) remains a concern
- A port tunnel to reduce heavy goods traffic in the city is due for completion shortly, along with the Luas tram in a few years and a proposed Metro in the long term.
TABLE 1  Stated reactions of users who would react to a price 2000/2001

<table>
<thead>
<tr>
<th>Reaction Type</th>
<th>Proportion of those who reacted</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2000 Results: IR£3 (€3.81) 200% increase in price n=668</strong></td>
<td></td>
</tr>
<tr>
<td>Reduced number of trips</td>
<td>7%</td>
</tr>
<tr>
<td>Modal shift</td>
<td>19%</td>
</tr>
<tr>
<td>Park in an alternative area</td>
<td>66%</td>
</tr>
<tr>
<td>Unspecified reaction</td>
<td>8%</td>
</tr>
<tr>
<td><strong>2001 Results: IR£7 (€8.89) 367% increase in price n=789</strong></td>
<td></td>
</tr>
<tr>
<td>Reduced number of trips</td>
<td>5%</td>
</tr>
<tr>
<td>Modal shift</td>
<td>11%</td>
</tr>
<tr>
<td>Park in an alternative area</td>
<td>83%</td>
</tr>
<tr>
<td>Unspecified reaction</td>
<td>1%</td>
</tr>
</tbody>
</table>
FIGURE 1  Alternate parking locations for users who would park elsewhere 2000

n=441
Testing the Sensitivity of Parking Behaviour and Modal Choice to the Price of On-Street Parking
J.P. Clinch and J.A. Kelly

FIGURE 2 Modal split proportions for those who would change mode 2000

n=127
FIGURE 3 Alternate parking locations for users who would park elsewhere 2001

- Private Space
- MSCP
- Cheaper PD
- Free OS
- Don't Know
- Other

n=655
FIGURE 4 Modal split proportions for those who would change mode 2001

- **Train**: 22%
- **Car Share**: 1%
- **Don't Know**: 3%
- **Bus**: 50%
- **Walk**: 10%
- **Taxi**: 8%
- **Motorbike**: 3%
- **Cycle**: 3%

n=87