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Urban Public Transport Pricing Schemes The Context and Options

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Executive Summary

1. Decisions on fares can seek to achieve a wide range of objectives, including profit maximisation, relatively simple maximising of use of public transport, broad social and economic objectives and to a limited extent attempts to maximise overall benefits. Running through these tend to be a resistance to change and creating 'losers'.
2. Marginal social cost pricing is not evident in decision-making, and indeed consideration of any impact on costs is often absent (perhaps partly because the network is often seen as fixed). In this context, the breadth of objectives includes many factors that are not currently tackled within the quantification of marginal social costs. These include social, equity, and land use considerations that are often key to priorities of the politicians involved in setting fares.
3. In setting fares, decision makers have extensive knowledge of the likely impact on public transport use, but have much less understanding of the external impacts and in particular a disaggregated knowledge of these effects. Decisions tend to be dominated by budget constraints, concern over equity and short term political priorities.
4. There are a multitude of options for fares structures, but few of these have significant differentiation that reflect marginal social costs, though often peak and central area travel attracts higher fares and these are perhaps the markets with highest marginal social costs. However fares decisions are more dominated by marketing and communication issues and the desire for an operationally simple structure. The resultant fares structures are evidently successful, but they inevitably mask differences between cost structures. New technology should be helpful in reducing the marketing barriers to more differentiated fares, but marketing considerations will remain a major factor.
5. In a pricing context, the priority of public transport authorities would be the introduction of road user charging fully reflecting costs of road use. Alongside this omission refining the charging structure of public transport can be seen as a second-order concern. Indeed it can be argued that maximising public transport use may anyway be an adequate proxy.
6. Without a framework for marginal social costs that includes the wider objectives it is difficult to envisage the approach being adopted. A key priority is to address this issue.
7. Even more fundamentally there will need to be an integration of all decisions on transport pricing, with public transport currently often separated from road user charging decisions (on fuel tax, parking and direct road user charges). There will also need to be greater integration of funding decisions and greater flexibility to tackle the

potentially large changes in financial results and to deal with the impact on private sector providers.

8. It is, however, particularly important to understand the impacts of marginal social cost pricing better. How will it affect each city? At what level of disaggregation need it be applied? It seems possible that public transport would be close to the optimum with a very broad-brush approach – differentiating perhaps for only peak and central area fares.
9. As well as development of the marginal social cost framework, better integration of decisions and funding, and more understanding of the consequent changes and impacts, if marginal social cost pricing is to be adopted the arguments and benefits need to be widely promoted. Without popular support and clear evidence of significant benefits decision makers are unlikely to change from their present pragmatic solutions.

Introduction

10. This paper discusses the processes for setting fares, the factors that influence these processes and introduces some of the structural options. In doing so it examines the way in which consideration of marginal costs is considered in the process.
11. Inevitably both the level and structure of fares tends to be a particularly political issue and this thread runs strongly through the processes considered. Equally, fares are not determined independently of other transport decisions. There will inevitably be many trade-offs to balance, recognising that high fares will tend to provide greater funding for improved services, and conversely users may only be willing to pay high fares for high quality services. While economic analysis is vital in assessing the impacts of fares decisions, these are only one of a range of factors.

Fares Objectives

12. Fares objectives tend to be set in relatively high level, general and unquantified terms, reflecting the political context in which decisions are made. There are nonetheless very many potential objectives in setting fares, which are variously used across Europe. Indeed many different objectives can be seen within individual states or even cities. In most cases there is some hybrid of the objectives in operation – often without any explicit definition. The principal potential objectives are set out below:

Maximising use: A simple and intuitive objective that presumes (generally with limited analysis) that increasing public transport use is a positive step to increased mobility and reduced car use, promoting environmental improvement, reduced emissions and sustainable development. Inevitably there are exceptions to this assumption, particularly where overall transport use is increased as a consequence and land-use implications are less sustainable. In any case there will be a limit to available funding, so the objective becomes maximising use within the financial constraint. There also needs to be a value for money test which itself will place a limit on funding.

Profit maximisation (or minimising losses): Public transport tends to be regarded as a social necessity and consequently even where the operations are in the private sector some regulation of fares is often introduced. However increasing privatisation has diluted this public sector involvement and profit maximisation is often a key objective. Within the United Kingdom, bus fares outside London are totally deregulated. Although the economics of competition would in principle determine fares, in many areas local monopolies exist diluting that potential impact of competition – which is solely from rail or the car. Naturally the private sector operators’ objective is to maximise profits. Also in the UK, the privatised railways are highly regulated, but only a limited range of fares are regulated. For other fares profit maximisation, with significant monopolistic power, is the objective.

Minimising objections: The drag of inertia in determining fares should not be underestimated. Politicians are likely to be more concerned to avoid losers in any fares decision than to create winners – particularly if the individual gains and losses are marginal. This encourages decision makers to hold down fares and specifically exaggerates the importance of the comparison with general price inflation. Similarly decision makers are reluctant to withdraw any ticketing options and are generally cautious of change that is not universally beneficial.

Social Objectives: Alongside the direct transport considerations, transport is routinely seen as an instrument of social policy, both in the ability to create positive social outcomes and the concern that there might be adverse impacts. “Affordable” fares often feature in overall objectives, reflecting social priorities and concerns over equity as well as views on the impact on economic performance – considered below. More specifically, low fares are routinely seen as a means of reducing social exclusion, and most authorities and operators have low fares policies for young and elderly people. At its widest level, extreme fares differentiation by route (reflecting cost perhaps) would generally be considered unfair, though anyway uniform fares structures across an operation are also simpler for the operator and user.

Economic Objectives: As with social objectives, transport is often used as a tool in economic development. This may be through operation of severely loss-making ‘pump-priming’ services at ‘standard’ fares to help initiate regeneration or with more general fares policy to promote development or, by providing an alternative to the car, improving the overall attractiveness of a city.

Maximising overall benefits: At their most sophisticated, objectives bring together a range of factors, including social, economic and environmental. Such frameworks are, however, more often used in judging investment options than fares decisions. Routinely such frameworks employ detailed social benefit-cost analysis of those factors amenable to such quantification (in principle giving the outcome of marginal social cost pricing with the right options tested), and more general frameworks of impact evaluation for wider factors.

13. Below these top-level objectives there are numerous more specific ambitions. For example, as well as providing a core travel choice for those without cars, fares policy will often have a specific objective of providing a competitive alternative to the car.

Fares Structure Options

14. While overall fares levels have a fundamental impact on overall objectives, the detailed structure of fares can be equally important. In particular targeting fares to different markets and sectors can significantly affect the overall attractiveness of public transport.
15. At the structural level, there are two principal choices:
 - a) Distance based, graduated fares: Conceptually simple and related to cost of provision (assuming costs relate to distance travelled), most systems have at some stage operated such a structure. In practice, however, they are complicated, with users unable to easily predict fares and with potentially high transaction times and costs.
 - b) Zonal Structures: providing simpler fares structures, zonal systems with through ticketing can also be seen as fairer – fares relate to the journey, not the number of vehicles or modes required. Without through ticketing the principal benefit is simplicity. Within the generic zonal structures, however, there remain fundamental choices regarding the structure of the zones. Is there in fact a flat fare with a single zone (as on the Paris Metro), are there few, often ‘ring’ zones (as in London for buses – two zones – and the Underground – six zones) or is there an extensive matrix of zones (as in Copenhagen with 95 zones). The fewer zones there are the easier to understand but the greater potential for increasing overall travel and costs of provision. Conversely systems with large numbers of zones can be considered to be merely a simplification of graduated fares – but generally with through booking.
16. Routinely within such structures, there will be a premium for travel within or to/from the city centre – which in part reflects the higher costs but is equally influenced by the lower elasticity for such trips.
17. Alongside this overall structure there are a range of choices of ticket validity, market segmentation and integration between modes. Principal amongst such options are:
 - a) Ticket validity: while few would question the need for single trip tickets, a variety of options for period based tickets are routinely offered. For the regular traveller, traditional season tickets offering point-to-point validity along a specific route are now just one option alongside area based unlimited travel passes and multi-trip pre-payment (carnets). All offer discounts on buying single tickets, in practice for ‘loyalty’ and social reasons rather than a reflection of a reduced cost of ticket transactions. In offering discounts there is no recognition of the low elasticities in these markets (and consequently likely low externalities) or the typically high cost of provision of peak services. Moreover, for passes and season tickets, once they are

purchased all trips are 'free'. Similar daily tickets are also common. In many cities, tickets giving perhaps one hour's unlimited travel have also adopted this approach.

- b) Time based pricing: Cities and operators will routinely offer discounts to off-peak travel and surcharges for night-time journeys. This approach is being extended to encourage pre-peak travel with 'early-bird' tickets, once common as 'workers' tickets. This is perhaps the one area where costs have been prominent in guiding fares decisions, striving to reduce on-system congestion and the pressure on expensive peak service provision. Rarely, however, does this consideration include extensive evaluation of the external impacts. Indeed, costs themselves are very much only one of the issues. In London a premium on night bus fares has just been removed in the interest of simplification and to ensure there is a low cost alternative to high taxi tariffs.
- c) Market or niche products: Specific tickets aimed at particular groups or market segments proliferate in many cities. The most common are tickets for elderly people, children and students. The principal motivation is a social one, recognising low income and lack of access to cars. In practice high elasticities in these sectors (due to low incomes) means low(er) fares also help maximise use, though lack of access to cars is likely to mean external benefits (congestion and environmental impacts) will be limited. Family tickets, however, tend specifically to compete with the low cost per person of group travel by car. However, the cost comparison is with the competitor, not the marginal cost of carrying the passengers themselves.
- d) Integrated tickets: Increasingly authorities and operators are seeking to integrate fares structures, between individual services and different modes. In some cities this has long been a feature of their systems, but for others this is a new approach or has previously been limited to only some products. The tickets may give through ticketing and common pricing on individual trips or (generally on an area basis) over a period of time. In a number of cases the presentation is that the integrated ticket provides extra modes as a free bonus.

- 18. A further factor and consideration in fares structure decisions is the sales strategy, including whether and which tickets will be sold on-system and off-system.
- 19. As will be seen there are a vast range of options for structuring fares, with in reality most cities using many or most of them in combination. As will be discussed later, the structures and products are not generally a direct outcome from consideration of costs of provision, and indeed some choices are likely to result in increased costs.

The Influences on Setting Fares

- 20. If these are the options to achieve a range of objectives, what are the key influences that are examined in setting fares?
- 21. Inevitably budget constraints are the first issue. Although in principle a highly beneficial fares policy should be justification for increased funding, the reality is

generally one of limited flexibility – often with a city authority determining fares, but a national or regional authority having a key role in funding decisions. In addition, there can often be competing spending priorities within the transport arena itself that may have higher priority. For example, research in London has suggested that London Underground users would be willing to pay more if the service was improved as a result – despite fares already being amongst the highest in the world.

22. Alongside this are short-term political priorities - most obviously not to raise taxes even if it is to fund fares reductions. Equally the concern discussed earlier not to create ‘losers’ from fares policy is a major inhibitor, particularly if the real benefits of changes only emerge over the medium term and potentially beyond the next election.
23. Running through most decisions is a strong sense of equity. For example to what extent is it fair to price up the low elasticity, relatively ‘captive’ users to fund reductions to those who can be persuaded out of their cars. This is also particularly important where a high proportion of public transport users are low income, often without a car, and will be particularly affected by high fares. Inevitably because they often have no alternative, this may be a reasonable description of a disproportionate number of the users of most public transport networks.
24. Most operators have a reasonable understanding of the principal elasticities of demand, which guides fares decision. However much less is known at a highly disaggregate level and except at a very global level few operators have good knowledge of cross-elasticities or the impact on external factors. Consequently it is much easier to see the impact on an objective to maximise use than an objective to maximise overall benefits.
25. Finally there is relatively little recognition of the impacts of fares on costs, never mind the marginal cost of carrying the marginal user. In part this is understandable because transport ‘supply’ can come in lumps (a whole train for example) or service levels are seen as fixed and consequently gaining or losing a passenger may not have an impact on costs. However, even where this is evidently not the case, costs of extra or reduced services are often not taken into account in assessing even the net financial outcome of a fares revision. Nonetheless different fares structures can fundamentally alter costs. As an example, an extensive flat fare is likely to generate a lengthening of trips compared to more distance based fares, with a potentially quite different service structure required.

The Complications in Setting Fares

26. Setting fares in the real world is a complex process with many factors which are difficult to quantify or be precise about.
27. Most fundamentally, marketing and communications issues can substantially affect use. These factors produce a tendency towards fares simplification with broadly based relatively uniform pricing – across mode, services, time, distance and market. The implementation of simplified fares has had demonstrable benefits in increasing use. For example, the fairly modest simplification of London’s bus fares to a two-zone structure

generated some 2-3% growth compared to the previous 3-4 zone structure with the same overall fares level.

28. A similar effect is seen with pass-based tickets. In offering a time based, unlimited travel ticket, many users 'trade-up' to higher value tickets, generating additional revenue, and most users travel more by public transport – with at least some of these trips likely to be transferred from cars.
29. In both cases the simplicity generates additional use compared to traditional fares structures, which already are substantially 'averaged' relative to the differences in cost structure (marginal or average) for different trips.
30. Alongside the marketing and communications difficulties, highly differentiated fares structures can have significant operational costs. This arises due to increased transaction times but also in areas such as increased fraud. The most sophisticated differentiated fares would in practice require advanced technological solutions.
31. A major factor in fares setting is their use to tackle social priorities. Issues such as affordability tend to result in fares calculated by comparison with earnings, largely ignoring cost structures. Similarly targeted low fares, for example for children, cut across the fact their impact on costs – notably in the peak – may be similar to every other user.
32. The substantial private sector involvement in transport is a particular issue. At the extreme, deregulated markets may create local monopolies with profit maximisation as an objective, together with fares policies geared to protecting the operator's market. Often the fares of these private sector operators will be regulated, but this generally selects particularly high profile tickets and leaves others un-regulated. Similarly the regulation tends to provide a blanket 'cap' on average fares and permits significant variation between markets. This can create perverse incentives. For example, in the United Kingdom a number of key National Railways fares are linked to inflation, but off-peak fares are not. Consequently these have often increased substantially despite both the low marginal cost at this time and the very high cost of providing extra peak capacity. The high elasticity in the off-peak market would mean that lower fares at the expense of peak would be likely to maximise use.
33. Involving the private sector often does not give them direct influence on fares, as in many public-private partnerships. However, even then there is a tendency for the fares and funding assumptions in the initial contract to be based on total project funding and for this to create constraints on any variation in fares from that initial forecast.
34. Finally, in setting fares there are often key factors that are outside the remit of the fares decision maker. The public transport authority or operator may have little responsibility for wider congestion, accident, environmental and other issues. Similarly, land-use considerations are often not considered to be part of the decision maker's framework.

Omissions from the Fares Framework

35. It is true that increased public transport use generally has positive benefits, and as an assumption this underlies most policy making on fares. Nonetheless this will not always be fully tested for particular fares options – which can have very different external impacts. For example fares designed to provide services to those without cars will have very different impacts on congestion and emissions compared to policies designed to attract car users. Equally the two policies will have very different impacts on equity, overall mobility and total use.
36. A key gap in the decision-making framework in most cities is the lack of integration of pricing (and taxation) decisions. Obviously the attractiveness of public transport relates only partly to public transport fares (and public transport quality issues). It is also substantially determined by the costs of the alternatives, particularly for the car - fuel tax, parking costs and highway infrastructure charges. Without co-ordinated decision-making across all these areas public transport pricing can only seek to achieve a second-best solution.
37. However, even if all these decisions are taken together they tend to be taken against a set of financial constraints. Subsidy to (or the financial requirements of) public transport is often largely ring-fenced and does not allow for radical re-balancing between, for example, public transport fares and new road infrastructure charges.
38. In the same way that there is a resistance to radical re-shaping of fares, there is a similar attitude to services. There is a tendency to regard the existing network as sacrosanct. A market or area may be served in a different way, but withdrawing services can be particularly difficult. Conversely service increases to accommodate additional users are often seen as inevitable and unavoidable. A consequence is the tendency to ignore the cost of services in making fares decisions.
39. Finally, there is no robust framework for evaluating social, equity and land-use consequences alongside the more directly measurable and/or quantified effects. Without such a framework the tendency is for decision makers to use subjective judgment and a political assessment, often with a presumption that social and equity considerations are of greatest importance.

The Opportunities

40. In the same way that valuation of environmental effects and accidents has improved over recent years, one can anticipate better understanding of the scale and value of all impacts. Nonetheless it would be unwise to expect more for fares policy than that it will become a better-informed political decision, but still retain a very large subjective element.
41. New technology does, however, have the potential to reduce the marketing and communication barrier to fares targeted more closely to marginal costs. Counter-peak pricing, early-bird tickets and the introduction of ‘stored value’ (with a potential move

away from passes) are all in prospect. Again, however, this will have only a limited impact. Marketing issues will still emphasise the importance of simplicity. Fares and ticketing decisions will continue to be made on sometimes apparently perverse but positive grounds. As a parallel, retail supermarkets appear effective in attracting shoppers and increasing sales by promoting loss-leader products, regardless of their minimal impact on the total shopping bill.

42. Most fundamentally, we can hope to see much greater integration of decision-making. Moves towards highway infrastructure charging and the likely significant surplus income will reinforce existing moves in favour of integrated transport authorities. It will, however, also be beneficial to integrate transport decisions with wider land-use and economic development decisions, ideally through integrated authorities but potentially through frameworks established by 'senior' authorities – most obviously regional or national. Finally the integration of financial frameworks across transport will be necessary to ensure resources are allocated and prices set to maximise overall benefits. Since decisions on this are often split between national, regional and local authorities this is perhaps the most difficult area to address.

Best Practice

43. The author is not aware of any city where fares are set by direct reference to marginal social costs. Unfortunately it is too easy to find examples where fares regulation and wider issues of equity or social policy create fares that run counter to pricing on the basis of marginal social costs.
44. Nonetheless there are examples of relatively good practice.
 - Cities which have a good understanding of their markets
 - Cities with successful fares policies with use of public transport increasing
 - Fares targeted to maximise use, generally exploiting simpler fares and niche market tickets
 - Fares directed at attracting car users and marketing focused on transferring car trips
 - Extensive analysis of external impacts and incorporation into decision making – using social cost-benefit analysis though this is principally in investment decisions
45. A good example in this context is London, where a number of initiatives have been taken to specifically target car users and off-peak travel, while attempting to price up peak travel and journeys in the congested central area. These correlate closely with marginal social cost, but assessed largely using across the board average estimates of externalities proportionate to changes in car use. Nonetheless the linking of London's fares to inflation is essentially a consequence of political concern, and there are extensive social tariffs and issues of equity directing policy.
46. Across Europe existing ticketing systems are being replaced by smartcard systems. As noted, these do in principle offer the opportunity to match fares much more closely to marginal social costs. In practice, however, most of the development is seeking to

target specific markets, rather than balance fares to marginal cost, and in creating more integrated products that as a by-product almost certainly mask cost differences between modes.

47. One factor in the limited interest across authorities in marginal social cost pricing must be the gross distortion present in the absence of road user charging. A key issue for public transport is achieving a balance of charging and in particular giving buses priority on the road network proportionate to their efficiency. While road user charging would dramatically alter this balance, most authorities currently rely on the relatively crude and partial solution of physical road-space re-allocation – principally using bus priority, traffic signal priority and parking restraint.
48. A reasonable expectation might be that optimising the public transport fares structure would produce only second order benefits compared to the major shift in balance with road user charging.
49. Indeed without road user charging, it is not clear what measures public transport should take to deliver even a second-best solution. For cities with high fares the conclusion of marginal social cost pricing would probably be to reduce fares – almost certainly a step in the right direction even in the absence of road user charges. However for cities with low fares the optimum might be to increase fares alongside road user charging. Increasing public transport fares in the absence of road user charges is likely to worsen the position.

Can the European Union Help?

50. One of the difficulties for decision-makers in adopting a closer match between fares and marginal social costs is the paucity of reliable information in many areas. Further research and development is needed.
 - a) There needs to be an analytical framework for incorporating the wider factors that are critically important to the decision maker but largely omitted from the current calculation of marginal social cost, particularly to help integrate social, equity and land-use considerations
 - b) Predictive, modelling tools are needed that enable each city to see in practice the impact on them of pricing on the basis of marginal social cost – while global estimates have been presented, each city needs to know at least the direction and broad scale of changes that would result
 - c) There is a need to understand the implications of second-best solutions and identifying the optimum within constrained conditions. Most obviously from this paper, what is the right fares policy in the absence of road user changes that fully reflect marginal social costs. Equally important, however, is understanding the impact on benefits of public transport pricing that might perhaps only on average reflect marginal social costs.

- d) Greater clarity is needed on the pace and priority for change. Partial implementation or a particular phasing of marginal social cost pricing may actually worsen the position – for example charging for the full cost of peak rail provision without equivalent charging on the road network.
51. Alongside this, the European Union has a key role in promoting standardisation to reduce the cost of the development and the introduction of new systems but also to help increase understanding and acceptability of new solutions. This applies to both physical equipment, but also promoting greater commonality between policies – while resisting the potential risk of stifling innovation as a consequence.
52. Finally there is a vital role for the European Union in promoting more efficient pricing mechanisms, fostering best practice and promoting it, and ensuring there is widespread dissemination of information on the potential benefits of change. In particular the adverse consequences without such a shift in policy need to be highlighted - in increasing urban congestion, a worsening environment and declining mobility despite increasing car ownership.

Marginal Social Cost Pricing of Public Transport

53. The economic basis of pricing based on marginal social costs is well understood. However for public transport there are various key impacts that are not, and perhaps cannot, be captured in the economic theory. Consequently it is difficult to see how the theory can be applied directly to determining the detailed fares tariff.
54. There is a clear understanding that marginal social cost pricing for road use must be closely related to distance and specific traffic (and perhaps road) conditions to be fully effective, and averages simple will not suffice.
55. This may be less true for public transport. It may be that relating the overall level of fares to the overall marginal social cost would lead to a solution relatively close to the optimal. Alternatively if this is not the case then differentiating pricing for fairly broad categories such as peak (direction?) or city centre travel – with high marginal social costs – and off-peak and suburban – with low marginal social costs – might be adequate. If this were the case then it may be practicable to achieve these average levels while also meeting the wider objectives of the decision makers. Understanding the impact of different levels of aggregation is essential in identifying practical options for increasing the role of marginal social cost pricing in public transport.
56. At its extreme one might conclude that existing objectives such as maximising use approximate acceptably to the outcome with full marginal social cost pricing. What such objectives do not do is identify the optimum level of support and fares, which analysis of marginal social cost pricing should help to do.

Conclusions

57. Fares decisions are based upon a very diverse range of factors, amongst which marginal social cost pricing is not key. Indeed some of the most critical factors are effectively not included within the current development of marginal social cost pricing.
58. If decision makers are to adopt the marginal social cost approach, there will need to be much greater clarity that the economic benefits are substantial and identifiable but fundamentally clarity will be needed on the potential political benefits.
59. Essential to acceptance will be financial frameworks that tackle the potentially large changes in financial performance of each mode or operator and which deal with the concerns of private sector profit maximising operators.
60. Critically the very real impacts of interest to the decision maker – social equity and land-use - need to be incorporated or at least reconciled within the marginal social cost pricing approach.