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Markets, Government And Environmental Policy Issues For Public Transit

by

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ABSTRACT: This paper considers the wider transport policy implications of bus deregulation, especially the links with environmental objectives. The major themes are the role of markets in creating opportunities through incentives to innovate which impact positively on the environment without the intervention of government, but which accord with political agendas, defining an appropriate set of goals and performance criteria for urban passenger transport which give credence to environmental sustainability, distinguishing outcome and outputs and structuring the regulator to deliver. We use the experience with mini-buses in Britain to show how markets create environmentally compatible incentives.

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Introduction

The United Kingdom experience of bus deregulation and privatisation, started by the 1985 Act, has been taken as perhaps the most important example of the role of using market forces to meet government objectives in transport. The academic debate on this is extensive (see the previous four conferences in the series in Australia, Finland, Canada and New Zealand, and the papers in *Transport Reviews* by Mackie et al 1995, Beesley and Glaister 1985, Gwilliam et al 1995). It has tended to be polarised as a confrontation of two views: either to let market forces decide what should be provided in terms of bus outputs and qualities or retain government definitions of what should be produced, while using market processes to provide the means via competitive tendering. It is common ground that either leads to substantial cost savings; the disagreement is about the resulting level and quality of outputs.

We have reservations about how useful putting the debate in this form has been on several grounds. First, the UK government, as seen in its White Paper preceding the Act, and by its apologists and opponents, argued as if what was done was intended to create a perfectly contestable market in bus services, and that deregulation was sufficient to achieve this. This is to ignore that the function of a White Paper is as part of the process of shifting the political agenda. In this a clear cut message is essential. The correct analytical description of deregulation in 1985 is that it removed the binding constraint on competitive bus entry, leaving the latent barriers to entry to be revealed. Deregulation was a necessary instrument; the debate about revealed forces should have centred on the existing barriers as modified in the new conditions.

Second, we have doubts about the counterfactuals employed in the debate. A primary government objective, not emphasised for obvious reasons in the White Paper, was specifically to reduce subsidy going into bus operations, which had been rising markedly in previous years. It was quite successful in doing this (Mackie et al 1995, Table 4, White 1997). The question is what would have been the subsidy level in subsequent years had the reform not been attempted? Selection of a trend is critical to the counterfactual, because of the direct implication for bus output. A further doubt concerns innovation in bus service production. There is uncertainty about how far the principal changes, ascribed to privatisation in particular towards mini-bus or smaller bus operations would have been adopted in publicly owned bus operations. That opponents of the 1995 changes are prepared to concede causation to the 1985 reforms to the extent of enlarging and speeding up the process does not nail down the counterfactual. The lapse of time also undermines the implicit comparisons.
At a more fundamental level, the argument has been about the relevance of concepts of market failure and government failure as used in neoclassical theory, or as criticised by those of Austrian views. We should explain where we stand on these issues. The opponents of the 1985 policy emphasise what they regard as continuing market failure, arguing from the implied welfare ideal. The proponents, following public choice theory, emphasise probable government failure in supplanting market forces. The Austrian view points on the other hand to the revelation of information via market transactions, so in effect saying that relevant information which might underlie government planning of outputs, can only be generated if markets are allowed to function, and on the other hand, points out that markets depend on the search for profit in order to function at all (Klein 1993).

We accept the Hayekian position on information, but note that in terms of formulating government policy on buses, as anywhere else, it emphasises the learning element in prescriptions and their development through time. The Schumpetarian emphasis on the way in which profits are generated seems to us essential when, as in buses, policy is seeking to enlist market processes. On the government versus market failure issue, we think that any attempt to invent a system which keeps the perfectly competitive market ideas in place through seeking simultaneous correction of both (Hensher 1994) is both far too ambitious and at the same time neglects Austrian home truths. The essential shortcoming of the neoclassical ideal in real policy issues is that it fails to address the political market place in which economic ideas are traded. The practical question is in what directions should we seek to make improvements in what is put into that market place.

It seems that one important argument in the political debate which has assumed much greater practical importance in the last 10 years, namely environmental objectives, has been neglected in the exchanges on bus policy. Specifically, it is unclear what influence the changes have had on emissions which are seen of great environmental significance. We offer a preliminary view, concentrating in particular on the impact of the minibus ërevolutioní on greenhouse gas emissions and using the counterfactual of a similar aggregate bus sector output. To be politically plausible, the means employed to realise policy objectives must themselves be credible. We see a need and an opportunity to improve the accountability and reporting practices of bus management, consistent with incentives, now largely driven by market conditions, that are fundamental to profit. Such improvements are a necessary part of shifting political agendas at least in the countries with which we are most familiar, the UK and Australia.

Here there emerges a warning for analysts: one has to recognise the particular position which transport policy occupies in political exchanges. In most ways, transport policy is the most securely rationalised of all the political portfolios, as is evidenced in the development of such policy tools as cost-benefit analysis (CBA). What we urge may well improve the technical content of cost benefit analysis (eg in its environmental arguments), but that in itself merely shows up further CBA deficiencies in non-transport areas, and does not lead to a greater political will to back transport. The solution to influence is not bigger and better CBA studies, but in demonstrating that policy changes in a particular area have a high chance of succeeding. That is, that they are well founded in reinforcing political initiatives via understandable feedback to those responsible.

Many countries are moving to emulate the changes which have taken place in the United Kingdom since the late 1980s. The major themes developed in this paper are the role of government and markets, defining an appropriate set of performance criteria for urban passenger transport, distinguishing outcome and outputs and lining up the regulator to deliver, and establishing how environmental pressures can become an opportunity for a competitive public transit business to internalise a number of the negative externalities attributable to a service supply which is uninhibited by government control. It has still to be shown that in terms of externalities, there is any difference between such alternative UK approaches so warmly debated.

Market Forces as Natural Generators of Innovative Activity

The view that government must intervene in an overt way for negative environmental impacts to be minimised is as alive today as it was 30 years ago when in July 1966, the U.K. Minister of Transport presented to Parliament the white paper titled Transport Policy (HMSO 1966). Paragraph one stated that:

> "...The rapid development and mass production of the motor vehicle over the past 20 years has brought immense benefits to millions of people; increased mobility, a fuller social life, family enjoyment, new experiences. .... But at the same time it has brought severe discomforts: congestion in the streets of our towns; the misery of the journey to work for commuters; noise, fumes and danger as the setting of our lives; a rising trend of casualties on our roads and a threat to our environment in both town and countryside which if it continues unchecked, will ensure that the pleasure and benefit for which we use the car will increasingly elude us. The aim of a rational transport policy must be to solve this paradox".

The policy statement went on to state:

> "... Our towns and cities will never be able to cope with their traffic, or the transport needs of millions of people, without strengthening, improving and expanding their public transport services.... Clearly these services must adapt themselves to new technological developments, but to get more people... moved with less road space is vital to the solution of our transport problems. ..... New thinking is required, not only about types and combinations of public transport, but also about how they should be financed. To attempt to solve these problems in exclusively commercial terms is to bring the Victorian mentality to the solution of modern needs".

An implication of the 1966 White Paper is that Government through planning processes has a greater chance of providing the necessary incentives to secure improved public transport as an antidote to the automobile, in contrast to the market. This duly underpinned government attitudes to public transport, and its willingness to subsidise to do so, whatever party was in power, up to the early 80ís. The position promoted in this paper is that the information required by government to plan can only be generated *efficiently* if markets are allowed to function. Deregulation in Britain since 1985 provides the best empirical setting for evaluating the innovations which have been *initiated* by the power of the market (even if the benefits have spilled over into all supply regimes) (Gomez-Ibanez and Meyer 1997).

While it is true that to date demonstration of gains to bus business from environmental innovativeness in particular is not widespread, there is very encouraging evidence emerging (see below) that market forces create substantial opportunities for innovative activity which is not only supportive of profits but has desirable environmental outcomes. Through the example of minibuses - a product of market driven incentives, we can show that government prior to the 1985 Act may have restricted the

opportunities to improve public transport in contrast to acting as if they were embellishing opportunities for better public transport.

The question not addressed in the literature on bus provision is the extent to which innovative opportunities are greater under regimes which lessen the power of the regulator in delivery of services. It may be the case that the empirical evidence, as limited as it is, is misleading because of the failure of incentive structures to deliver the gains which are inherent in a less constrained market. What we need to understand are the circumstances under which incentives can evolve and be effective. One problem with the bus industry may be that the lack of experience in managing change and/or the reticence in being innovative given a history of suppression of innovation is hampering the speed of taking up opportunities waiting for action. Generational inheritance, for example, which often lacks an understanding of the need to sustain wealth and survival leads to a reduction in entrepreneurial activity and hence a decline in any potential innovation. Why has the minibus and hail-n-ride only been introduced in the era of deregulation/competitive regulation and potential competition in UK, New Zealand and Australia? As Porter and van der Linde (1995) comment in the context of environmental innovativeness spurred by competition:

> "We are currently in a transitional phase of industrial history where companies are still inexperienced in dealing creatively with environmental issues" (page 99).

The literature which looks at the broader set of potential benefits concentrates on *direct* benefits to users (e.g. Nash 1988, Ellis et al 1996, Evans 1990, Mackie et al 1995) showing variability in gains and losses to users. A strong case has also been mounted against supply opportunities which do not preserve the regulator's control on demand-coordinating mechanisms such as timetables and ticketing (see also Tyson 1995). Indeed Evans (1990) argument for natural monopoly in the supply of local schedule route services is predicated entirely on the role of economies of network interdependencies so as to minimise uncertainty and waiting time etc in transfers.

When does a timetable become commercially necessary? This question signals very insightful concerns about the probable failure of government rules and regulations, and the constraints imposed on innovation. Economic deregulation is designed to remove all the *economic* constraints imposed by governments on potentially efficient competitive markets. Subsequently operators may introduce specific constraints on their own practices (eg timetables) if they are deemed to carry commercial weight (such as benefits to profitability through patronage). Where open-service delivery is preferred as revealed by the market, such as fixed-route hail-n-ride, the efficient operator will provide such a service. The growth in mini-bus services with flexible timetabling is an example of a market revealing innovation aided by the information produced by the market. We think that government would find it impossible to set up procedures to produce the equivalent information from the market without deregulation.

The Mini-Bus and The Environment

The mini-bus experience in Britain which has delivered increased frequencies, greater vehicle kilometres and more fuel-efficient vehicles illustrates the potential for noticeable environmental gains from opening up markets. The story below - while preliminary - suggests a research agenda for establishing the gains and losses of alternative economic regimes for service delivery on many environmental dimensions. We concentrate on greenhouse gas emissions, and estimate the impact of a market-led innovation in urban bus transport on savings in carbon dioxide emissions from substitute modes and other sized buses.

Urban passenger transport demand is multi dimensional. It encompasses the location of activities, the alternative travel opportunities available, and the availability of types of motorised and non-motorised transport. A potential user of the transport system faces choice opportunities with varying degrees of availability. In the long run, individuals have increasing opportunities to review all key transport-related choices - where to live, where to work, the number and types of automobiles in the household, the choice of means of transport and time of departure for the journey to work, and even negotiation of the temporal and spatial nature of working hours (i.e. flexitime, a compressed work week and telecommuting). In the short run, some of these choices are not available, and hence condition the choices which can be evaluated and changed.

Thus, it is difficult to identify evidence of strong causality without monitoring the spectrum of competitive and ownership models; such monitoring with sufficient rigour is rare, with previous efforts resorting to broad based ‘cross-section’ like comparisons. A substantial effort needs to be registered as part of the research agenda. The tools required to do this are necessarily complex because of the systems interactions. To illustrate what is required, we draw on work undertaken by the Institute of Transport Studies (Hensher et al 1995) in which we have investigated the environmental implications of changes in levels of bus service frequency with the introduction of mini-buses in Perth, West Australia over the period 1993-2003.

Using a model system of the household sector developed for Perth, West Australia (Hensher 1996), we have evaluated their impact over the period 1993-2003. The model system is an integrated land-use and transport system incorporating linked models for household location decisions, vehicle choice decisions and travel decisions (timing, mode choice, workplace location choice).

The behavioural models in the simulator are presented in sub-modules representing the four natural divisions of:

(i) *commuter choice:* spatial and temporal choice of working hours, departure time choice, mode choice, and workplace location choice

(ii) *automobile choice:* vehicle type choice and household fleet size choice

(iii) *residential choice:* location and dwelling type choice, and

(iv) *automobile use:* total annual vehicle and household kilometres and the spatial composition of kilometres.

The decision blocks for location decisions, vehicle decisions, and travel decisions and their major linkages are summarised in Figure 1. Each of the blocks has a set of internal linkages; the blocks are themselves linked by a set of external linkages. Three instruments (land rents, used vehicle prices and commuting travel times) are used to equilibrate within three of the decision blocks, with the option to bypass vehicle market equilibration. The non-commuting car use decision block does not have a market clearing facility in the current specification.

There is an assumed decision hierarchy in which residential location is the uppermost decision of a household, and as we move down the decision tree we condition each of the worker-related choices on the higher order decisions. The choice of workplace location for each worker in a household is conditional on the household's choice of residential location. Likewise the choice of commuter mode is conditional on the choice of residential and workplace location. The presence of more than one worker in a household is allowed for by having a separate choice for each worker, together with additional exogenous variables to account for the influence of the number of workers on each workers choice of mode, workplace and household residential location. The modal opportunities include the set of available alternatives and possible future investments in 'new' modes in specific spatial contexts such as light rail and bus priority systems. Stated choice experiments are combined with revealed preference data in the estimation of the departure time choice and commuter mode choice models. Full details of the simulator are presented in Hensher (1996) and Hensher et al (1995).

To understand how we identify the impact of a policy instrument, consider an increase in service frequency. The imposition of this improved service via its impact on the generalised cost of using buses has an immediate and direct influence on (i) the use of each competing means of transport for particular trips such as the commuter trip (ii) a possible change in the timing of the particular journey which creates a further change in the generalised costs associated with traffic congestion, and hence (iii) a possible change in the overall and non-commuting use of each automobile available to a household. It may directly affect the household's choice of types of automobiles. The indirect impacts may in the longer term include a change in residential location via the change in modal and spatial accessibility to work opportunities, and a change in the number of vehicles in a household (given the reduced demand for auto use). Changes in residential location may further affect the total use of each automobile, as well as the mix of urban (commuting and non-commuting) and non-urban kilometres. The adjustment in commuter travel may also affect non-commuting car use.

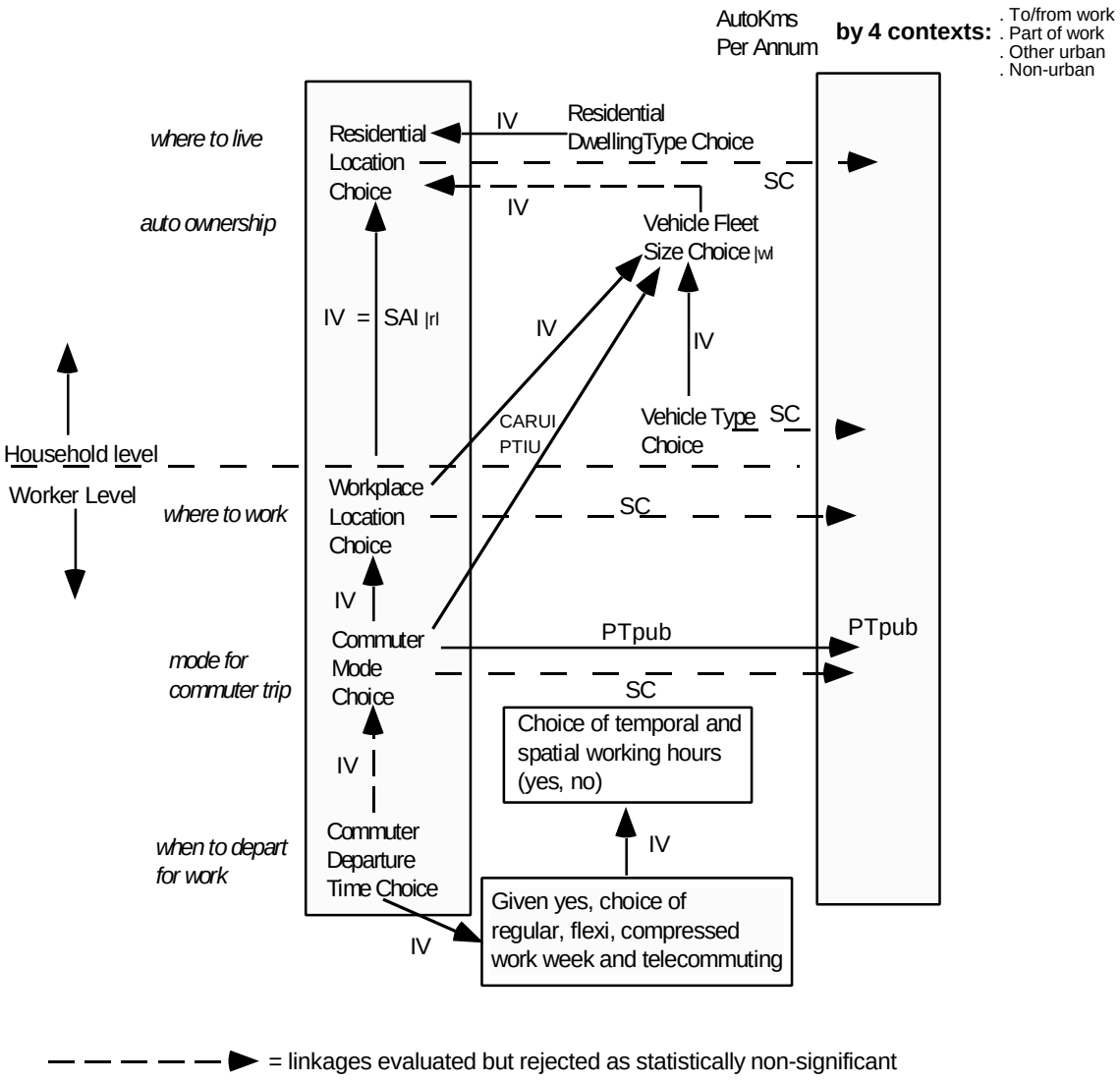

Figure 1 The Linked Model System (IV = inclusive value index, SC = selectivity correction)

The adjustments in vehicle, travel and location choices at the household level translate at the aggregate level into a new set of equilibrium levels for traffic congestion (broadly measured by the ratio of travel time to distance travelled), residential densities, total kilometres of travel by automobiles and various forms of public transport, fuel consumed and greenhouse gas emissions. Table 1 summarises the results of emission changes (and other interesting statistics) in bus frequency with the introduction of minibuses in which we replace *all* large buses with mini-buses. This substitutes better fuel consumption (in litres per 100 kms) and changes the frequency of service. All changes commence in 1996. The cost items are calculated in constant dollars ($93), but are converted into present values at a real discount rate of 8% per annum over 10 years for all dollar-based items. Minibuses average 15-20 litres per 100 kms in UK in the late eighties (White 1988), 16-18 litres/100km in Sydney, Australia in 1997 (Westbus Nepean Nippers), compared to a large bus of 38-42 litres per 100kms. The simulations undertaken are an improvement over the very aggregate

partial analysis of the impact of minibuses undertaken by Banister and Banister (1995) which concludes that a minibus is 27% less fuel efficient on a per passenger basis than a large bus; and the study by White and Turner which estimates on balance, due to a partial shift to minibuses in Britain, less than 2% saving in fuel costs per bus kilometre (White and Turner 1990, Table III).

Table 1 The impact of Mini-bus Substitution in Perth, West Australia 1993-2003

notes: i = increase, d= decrease

	Mini-Bus Substitution		
Outputs Change in:	Bus freq 10%i	Bus freq 20%i	Bus freq 10%d
CO2 (mean % pa)	-0.16	-0.34	0.18
End user cost ($mpa)	-3.0	-4.8	3.1
Car vkm (mean%pa)	-0.23	-0.51	0.20
Auto Energy (mean%pa)	-0.24	-0.56	0.22
Govt auto rev (%pa)	-0.21	-0.47	0.20
Car commuting share (%)	-1.0	-1.8	0.85

The change in CO2 with increased frequency is the net effect of: 1. changes in vehicle fuel efficiency (litres/100km) due to switching large buses for small buses, 2. changes in aggregate vehicle kilometres provided by buses with increased frequency, 3. modal switching from car to the improved bus service, and 4. possible changes in household automobile fleet size and composition and the location of work and residential activity. Although small as a percentage change, minibuses accompanied by increased service frequency decrease carbon dioxide emissions. This is primarily due to increased bus kilometres, offset by reduced car kilometres, which is highly correlated with emissions of CO2.

The increase in service frequency (often linked to the introduction of mini-buses) has a noticeable impact on total end user costs (money and time costs), reducing them by up to $4.8m per annum for all travel for a 20% improvement in frequency compared to headways offered by large buses under current timetables. The impact on energy consumed, automobile kilometres, and revenue to government from automobile use is small, less than 1%.

Fuel Excise and The Environment

Another policy instrument with positive environmental outcomes is a fuel excise applied to all modes. The impact of reduced greenhouse gas emission is substantial as might be expected (Table 2). The net changes in CO2 associated with a fuel excise tax are predominantly due to changes in vehicle use (and the mix of vehicle types in the car park), with very little associated with substitution between cars and large buses under existing timetables. Clearly a general policy instrument applied to all modes, especially the automobile, will have a greater impact on the environment than a policy applied to a public transport mode; and thus in evaluating the change in innovation attributed to the mini-bus we will never be able to establish a level of environmental benefit which can match any level achievable with even a relatively modest fuel excise. Importantly however the real difference between the two policy instruments is that people are revealed to prefer minibuses and dislike taxes.

Table 2 The impact of Fuel Excise in Perth, West Australia 1993-2003

notes: FEX = fuel excise on cars and buses

	Fuel Excise	
Outputs Change in:	Fex 60c/l	Fex 80c/l
CO2 (mean % pa)	-9.0	-17.4
End user cost ($mpa)	68.9	125
Car vkm (mean%pa)	-9.07	-17.4
Auto Energy (mean%pa)	-8.80	-17.3
Govt auto rev (%pa)	18.3	32.4
Car commuting share (%)	-0.61	-1.23

As an environmentally attractive policy instrument, sizeable fuel excise increases achieve more impact than does adjustments in levels of frequency of buses. Although improvements in vehicle fuel efficiency reduce total end user cost substantially, the impact on energy and CO2 is significantly less than a fuel excise. However, in terms of the political cost of policy changes, the pay-off to minibuses is highly likely to be superior; changes in tax levels associated with minibus deregulation are negligible. The example for greenhouse gas emissions should be extended to include other environmental impacts such as air quality, noise and safety.

Deregulation and Innovation in Bus Operations

To throw some light on the issue of innovations accompanying deregulation to complement the simulation undertaken in the previous section, we undertook a survey of a number of operators of route services in New Zealand and the United Kingdom who are operating under a deregulated regime. Information was also sought from some Sydney (Australia) operators who provide services under an area contract subject to minimum service levels and maximum fares. The survey instrument is reproduced in Appendix A together with responses. Counterfactual knowledge of the situation under regulation is not available. All that we have to rely on is the evidence offered by operators in the deregulated market. The findings suggest that there have been noticeable beneficial changes in vehicle kilometres delivered and patronage as well as innovative examples, especially under economic deregulation. Innovations attributed to the deregulated environment are the introduction of mini-buses, increased frequency, marketing by segments, more fuel efficient buses and more flexible route design.

What we find not only supports the position that relaxing constraints on the markets operations has a direct innovative effect on operators now in deregulated markets, but it appears to create spillover effects into restricted markets who see the benefits of such innovative activity. A good example is minibuses increasingly used on competitively tendered routes as well as on operations where the incumbent remains protected by anti-competitive area franchises as is the case in the main throughout Australia.

Concern for the environment means a shift towards a larger number of modal opportunities for transport users as well as a recognition that environmental benefits may arise from many behavioural responses such as the endogenous set of location, vehicle and travel choices operating in the travel simulator applied to Perth. This leads to less reliance on mode outputs as proxies for the greater good, and increasing input or reliance on market driven means. This is consistent with a shift towards more indirect instruments of policy such as indirect taxes and competitive rules, rather than protection or enhancement of particular transport modes.

Furthermore, allowing markets to generate fresh opportunities for profit making is a means to encourage relevant charitable activities. Successful businessmen are able to pursue their own enthusiasms because of that profit. Indeed, the outstanding innovations have arisen in this way. Perhaps most notable in the UK were the pioneering efforts in housing and planning by the chocolate and soap entrepreneurs, Cadbury, Rowntree and Lever. Nowadays environmental innovation should be no exception, and successful transport operators are seen as a fertile ground. In the research for this paper, for example, we found minibus operators to be unaware of the possible connection between their operation and pollution reduction. Once it is pointed out via the indirect effects we have described, interest is stimulated by the perception that here is another reason for mini-bus operations to be preferred by policy makers, and is a case of promoting the public interest while making a profit. It is then quite conceivable that their interest will broaden into trade-offs which create more benefits

even where this involves some increases in their outgoings, for example on an excise tax imposed on all vehicles of a given engine capacity.

Though we have shown that market processes in transport have been less beneficial in environmental terms, it remains true that in transport the principal effective instrument is a congestion tax. For businesses, as for many other interests, taxes are unpopular. This is however insufficient to account for its manifest failure over 30 years or more to be adopted by government, despite the approval of nearly all economists and most environmentalists. No doubt the line we have developed will do something to add to the case. But clearly, the problem of persuading politicians to take up the cause remains.

Some progress has recently been made on one of the traditional difficulties - the question of who in particular is to benefit from the yield from a greatly expanded tax base? The ërule of threeí being promoted in Britain is an appealing marketing strategy of political persuasion to demonstrate how the raised revenue can benefit the public transport community, the environmental lobby and car users. We think that political lobbying must become more subtle, in the way suggested in the next section.

The Role of Government as a Deliverer of Outcomes

Political lobbying for a congestion tax has failed in large part because what would be achieved by this instrument is not very clearly articulated by governments in terms of intended outcomes. If governments are not encouraged more clearly to articulate intended outcomes (e.g. 'we want to promote better access' rather than 'we want to build a light rail line'), it is difficult to measure performance (indeed to give political signals to innovation) and, more particularly, to measure and compare the performance of those who are competing to provide government services. A more open and competitive economy relies on an outcome orientation. The General Manager Policy of New Zealand's Ministry of Transport has remarked on the centrality of defining outcomes in this respect:

> *" The key to structural reform is accountability. Each organisation has been developed to have clear and non conflicting goals and targets to achieve; to clearly understand the available resources, opportunities and risks involved in those tasks; and to be publicly judged against its performance" (Toleman, 1995: 13).*

The pursuit of outcomes rather than outputs is essential to better planning practice. A clear distinction between *means* (outputs) and *ends* (outcomes) is necessary. As difficult as it is, we need to seek agreement about the ends (or goals or results or outcomes) to be aimed for and debate the various possible means which may contribute towards achieving these outcomes.
Reporting back to management of performance outcomes (through a set of indicators) is not only important for feedback into the capitalist system (ie markets) to guide profitability but is also important in practice in meeting and moving political objectives. This distinction is important; the political agendas are never transport exclusive, with trading taking place in a different set of markets - the political markets.

If it can be shown that there are political credits from innovations in the bus sector which are supportive of broad based environmental objectives of government, then this gets political attention. The generic application of cost-benefit analysis and the promotion of better cost-benefit analysis is marginal in impact and its return is probably negative in a political sense - at the margin CBA enhancements cannot be traded since other politically-competing sectors fail dismally in producing such sophistication in technique to evaluate projects.

Conclusion

The empirical evidence that economic deregulation in the UK has produced sizeable increases in vehicle kilometres but no noticeable increase in passenger kilometres might in a partial equilibrium setting lead to the conclusion that the broad set of environmental externalities which vary by vehicle kilometres have indeed increased per passenger kilometre. If the unchanged quantity of patronage is now travelling on more environmentally friendly bus systems in contrast to the pre-deregulated era, then the system wide environmental benefits are positive. That is, less air pollutants, greenhouse gas emissions and noise pollution are being generated in the delivery of an economic deregulated service.

The broadening of the debate to encompass a set of goals of urban management and associated performance indicators does not mean that we are heading for a return to the days of government dominance. Indeed government failure is a curse. Deregulation promotes more environmental friendly opportunities for innovation via the market for entrepreneurial interest which is not entirely confined to profit making. With respect to congestion taxes, we have suggested that government needs to do more to set out the impacts and means.

References

Banister, D. and Banister, C. (1995) Energy consumption in transport in Great Britain: macro level estimates, *Transportation Research*, **29A (1)**, 21-32.

Beesley, M.E. and Glaister, S. (1985) Deregulating the bus industry in Britain - (C) a response, *Transport Reviews*, **5**, 105-132.

Berechman, J. (1993) *Public Transit Economics and Deregulation Policy*, North Holland, Amsterdam.

Brindle, R.E. (1992) Transport and land use: a 'neo-modern' approach, *Proceedings 16th Australian road Research Board Conference*,**Part 6**, 111-136.

Ellis, C.J. and Silva, E.C.D. (1996*) British bus deregulation, preemption and demand coordination*, Department of Economics, University of Oregon, Eugene (mimeo).

Evans, A. (1990). Competition and the structure of local bus markets, *Journal of Transport Economics and Policy*, **XXXIV (3)**, September, 255-282.

Gastaldi, M., Pradayrol, J-P, Quinet, E. and Rega, M. (1996) Valuation of environmental externalities: from theory to decision-making, *Transportation Planning and Technology*, **19**, 207-219.

Gomez-Ibanez, J.A. and Meyer, J.R. (1997) Alternatives for urban bus services: an international perspective on the British reform, *Transport Reviews*, **17 (1)**, 17-30.

Goodwin, P.B., Hallett, S., Kenny, F. and Stokes, G. (1991) *Transport: The New Realism*, Report to Rees Jeffrey Road Fund, Transport Studies Unit, University of Oxford.

Gwilliam, K. M. and Van De Velde, D.M. (1990) The potential for regulatory change in European bus markets, *Journal of Transport Economics and Policy*, **XXIV (3)**, September, 333-350.

Gwilliam, K. M., Nash, C.A. and Mackie, P.J. (1985) Deregulating the bus industry in Britain - (B) the case against, *Transport Reviews*, **5**, 105-132.

Hensher, D.A. (1994) Transport planning, markets and government: challenges for the future, *International Journal of Transport Economics*, **XXI (2)**, 147-156.

Hensher, D.A. (1996) An Integrated Approach to Modelling the Impact on Urban Travel Behaviour of Strategies to Reduce Enhanced Greenhouse Gas Emissions *World Transport Research*, Proceedings of the 7th World Conference on Transport Research, edited by Hensher, D.A., King, J. and Oum, T., Pergamon Press, Oxford, **Vol 1**, 271-286.

Hensher, D.A., Milthorpe, F.W. and Lowe, M.(1995) *Greenhouse Gas Emissions and the Demand for Urban Passenger Transport: Final Report: Summary of Approach and Selective Results from Application of the ITS/BTCE Simulator*, Report 8, Institute of Transport Studies, The University of Sydney, November

HMSO (1966) Transport Policy, Cmnd. 3057, HMSO, London.

Kennedy, D. (1996) London bus tendering: a welfare balance, *Transport Policy*, **2 (4)**, 243-250.

Klein, P.G. (ed.) (1993) *The Fortunes of Liberalism: Essays on Austrian Economics and the Ideal of Freedom*, The Collected Works of F.A. Hayek, Volume IV, Routledge, London.

Mackie, P., Preston, J. and Nash, C.A. (1995) Bus deregulation: ten years on, *Transport Reviews*, **15(3)**, 229-251

Nash, C.A. (1988) Integration of public transport: an economic assessment, in Dodgson, J.S. and Topham, N. (eds) *Bus Deregulation and Privatisation: An International Perspective*, Avebury, Aldershot, 97-118.

Porter, M.E. and Van Der Linde, C. (1995) Toward a new conception of environment-competitiveness relationship, *Journal of Economic Perspectives*, **9 (4)** 97-118.

Salomon, I., Bovy, P. and Orfeuil, J.P. (EDS.) (1993) *A Billion Trips a Day: Tradition and Transition in European Travel Patterns*, Kluwer Academic Publishers, Dordrecht.

Toleman, R. (1995) *Refocussing the role of government in transport: the New Zealand experience*, paper presented to 7th World Conference on Transport Research, July 16-21, Sydney.

Tyson, W.J. (1995) Bus deregulation - the planning dilemma, *Transport Reviews*, **15 (4)**, 307-314.

White, P.R. (1997) What conclusions can be drawn about bus deregulation in Britain, *Transport Reviews* **17 (1)**, 1-16.

White, P. R. (1988) An overview of urban minibus operations, paper presented at symposium on experiences of urban minibus operations in Britain, City University, London, 12 May.

White, P. And Turner, R. (1991) Overall impacts of local bus deregulation in Britain, *Transportation Planning and Technology*, **15**, 203-229.

APPENDIX A

"...I am investigating the innovative opportunities that have arisen as a result of the change in the regulatory environment in which you operate your bus services. Please indicate what has been the impact of the changes in your ***route service***, in terms of past and present provision.

Can you list specific notable changes to the types of services provided:

Can you estimate the overall change (in terms of Route Services only) in:

Please Circle

1. Total vehicle kilometres offered ..... INCREASE/DECREASE by ☐ %

2. Total passengers ..... INCREASE/DECREASE by ☐ %

3. Total passenger kilometres ..... INCREASE/DECREASE by ☐ %

4. Fare levels ..... INCREASE/DECREASE by ☐ %

Did you intentionally change your corporate strategy in response to the new regulatory environment? If yes, briefly describe your innovation.

What have you done under your current market environment that you could or would not contemplate doing under the previous market conditions?

Can you list up to three actions that you have taken to reduce the environmental impact of your operations on the environment?'

Table A1. Innovative opportunities and key changes in operations for 'Better-Practice' Operators

Monopoly Operations (threat of tendering only)
Specific notable changes: I. enhanced cross-regional services, improved off-peak services and introduced 'set-down' on request *Overall change in kilometres:* I. over period 92/93-95/96 increased by 12% *Overall change in passengers:* I. over period 92/93-95/96 increased by 3% *Overall change in fare levels:* I. over period 92/93-95/96, increased by 2% p.a. *Change in corporate strategy:* I.none *New opportunities under tendering:* I. nil *Actions to reduce environmental impacts:* I. CNG buses, Euro II engines, disability trials, all depot facilities conform to environmental standards, working with clean Air 2000 initiative in Australia

Deregulated Market	Competitive Tendering/Contracts
Specific notable changes: I.Large buses phased out, mini/midi buses introduced with increased frequency, urban mileage increased, interurban mileage increased, greater penetration of housing estates, 'hail-n-ride', rural mileage decreased II. higher frequency, minibuses and cross-town services III. concentrate marketing/product on high frequency key services	*Specific notable changes:* I.Better route structures - changed 80% of what we inherited; headways no more than 30 mins, better trained drivers, introduced mini-buses and major refurbishment of inherited buses, II. more flexibility in route design and scheduling, new buses
Overall change in kilometres: I. average of 10% pa increase II. 8%pa increase III. increase by 5%pa	*Overall change in kilometres:* I. over 30 mths increased by 23%, II.12% increase
Overall change in passengers: I.average increase of 8.6% over 3 years compared to ave national decline of 5% II. 20% pa increase III. increase by 15% over 3 yrs	*Overall change in passengers:* I. increased by 20%, II. 8% increase
Overall change in fare levels: I. 20% increase over 6 years compared to CPI increase of 30% II. no real fare change III. remained static	*Overall change in fare levels:* I. increased by 5% II. no increase
Change in corporate strategy: I. no cross-subsidisation between routes or times of day or week, no fare scales - market pricing route by route, never knowingly undersold by the competition II. emphasis on cost reduction, improved customer service and improved relationships with regulatory authority and wider community III. much more innovative and immediate in response	*Change in corporate strategy:* I. Frequencies revised significantly upwards especially off-peak and weekends; minibuses introduced into 70 new residential streets and 80% of existing routes changed II. compliance procedures in place
New opportunities under deregulation: I.market segmentation - high quality and low grade services on same route, experimented more with routes - frequencies, fares, special promotion; let the customer decide rather than a Local Authority II. reduce costs and increased customer service delivery III. improve frequencies, bold expts with fares	*New opportunities under tendering:* I.As a new private entrant able to make all changes above which were impossible under public monopoly II. quicker response to problems, clearer defined contract areas previously disputed wit neighbouring contractors
Actions to reduce environmental impacts: I. using low sulphur diesel, choose Euro1 or Euro2 specifications of vehicles, experimenting with gas vehicles II. refurbished trolley buses, extended use of trolley buses, introduced Euro I compatible diesel buses - now 30% of fleet, increased market share relatively to less	*Actions to reduce environmental impacts:* I. Rebuilt 90 transmissions, 50 engines and introduced minibuses to give better fuel economy. II. none

environmentally friendly modes. III. emission controls through Euro I and II engines

MARKETS, GOVERNMENT AND ENVIRONMENTAL POLICY ISSUES FOR PUBLIC TRANSIT

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ABSTRACT

This paper considers the wider transport policy implications of bus deregulation, especially the links with environmental objectives. The major themes are the role of markets in creating opportunities through incentives to innovate which impact positively on the environment without the intervention of government, but which accord with political agendas, defining an appropriate set of goals and performance criteria for urban passenger transport which give credence to environmental sustainability, distinguishing outcome and outputs and structuring the regulator to deliver. We use the experience with mini-buses in Britain to show how markets create environmentally compatible incentives.

INTRODUCTION

The United Kingdom experience of bus deregulation and privatisation, started by the 1985 Act, has been taken as perhaps the most important example of the role of using market forces to meet government objectives in transport. The academic debate on this is extensive (see the previous four conferences in the series in Australia, Finland, Canada and New Zealand, and the papers in *Transport Reviews* by Mackie et al 1995, Beesley and Glaister 1985, Gwilliam et al 1995). It has tended to be polarised as a confrontation of two views: either to let market forces decide what should be provided in terms of bus outputs and qualities or retain government definitions of what should be produced, while using market processes to provide the means via competitive tendering. It is common ground that either leads to substantial cost savings; the disagreement is about the resulting level and quality of outputs.

We have reservations about how useful putting the debate in this form has been on several grounds. First, the UK government, as seen in its White Paper preceding the Act, and by its apologists and opponents, argued as if what was done was intended to create a perfectly contestable market in bus services, and that deregulation was sufficient to achieve this. This is to ignore that the function of a White Paper is as part of the process of shifting the political agenda. In this a clear cut message is essential. The correct analytical description of deregulation in 1985 is that it removed the binding constraint on competitive bus entry, leaving the latent barriers to entry to be revealed. Deregulation was a necessary instrument; the debate about revealed forces should have centred on the existing barriers as modified in the new conditions.

Second, we have doubts about the counterfactuals employed in the debate. A primary government objective, not emphasised for obvious reasons in the White Paper, was specifically to reduce subsidy going into bus operations, which had been rising markedly in previous years. It was quite successful in doing this (Mackie et al 1995, Table 4, White 1997). The question is what would have been the subsidy level in subsequent years had the reform not been attempted? Selection of a trend is critical to the counterfactual, because of the direct implication for bus output. A further doubt concerns innovation in bus service production. There is uncertainty about how far the principal changes, ascribed to privatisation in particular towards mini-bus or smaller bus operations would have been adopted in publicly owned bus operations. That opponents of the 1995 changes are prepared to concede causation to the 1985 reforms to the extent of enlarging and speeding up the process does not nail down the counterfactual. The lapse of time also undermines the implicit comparisons.

At a more fundamental level, the argument has been about the relevance of concepts of market failure and government failure as used in neoclassical theory, or as criticised by those of Austrian views. We should explain where we stand on these issues. The opponents of the 1985 policy emphasise what they regard as continuing market failure, arguing from the implied welfare ideal. The proponents, following public choice theory, emphasise probable government failure in supplanting market forces. The Austrian view points on the other hand to the revelation of information via market transactions, so in effect saying that relevant information which might underlie government planning of outputs, can only be generated if markets are allowed to function, and on the other hand, points out that markets depend on the search for profit in order to function at all (Klein 1993).

We accept the Hayekian position on information, but note that in terms of formulating government policy on buses, as anywhere else, it emphasises the learning element in prescriptions and their development through time. The Schumpetarian emphasis on the way in which profits are generated seems to us essential when, as in buses, policy is seeking to enlist market processes. On the government versus market failure issue, we think that any attempt to invent a system which keeps the perfectly competitive market ideas in place through seeking simultaneous correction of both (Hensher 1994) is both far too ambitious and at the same time neglects Austrian home truths. The essential shortcoming of the neoclassical ideal in real policy issues is that it fails to address the political market place in which economic ideas are traded. The practical question is in what directions should we seek to make improvements in what is put into that market place.

It seems that one important argument in the political debate which has assumed much greater practical importance in the last 10 years, namely environmental objectives, has been neglected in the exchanges on bus policy. Specifically, it is unclear what influence the changes have had

on emissions which are seen of great environmental significance. We offer a preliminary view, concentrating in particular on the impact of the minibus ërevolutioní on greenhouse gas emissions and using the counterfactual of a similar aggregate bus sector output. To be politically plausible, the means employed to realise policy objectives must themselves be credible. We see a need and an opportunity to improve the accountability and reporting practices of bus management, consistent with incentives, now largely driven by market conditions, that are fundamental to profit. Such improvements are a necessary part of shifting political agendas at least in the countries with which we are most familiar, the UK and Australia.

Here there emerges a warning for analysts: one has to recognise the particular position which transport policy occupies in political exchanges. In most ways, transport policy is the most securely rationalised of all the political portfolios, as is evidenced in the development of such policy tools as cost-benefit analysis (CBA). What we urge may well improve the technical content of cost benefit analysis (eg in its environmental arguments), but that in itself merely shows up further CBA deficiencies in non-transport areas, and does not lead to a greater political will to back transport. The solution to influence is not bigger and better CBA studies, but in demonstrating that policy changes in a particular area have a high chance of succeeding. That is, that they are well founded in reinforcing political initiatives via understandable feedback to those responsible.

Many countries are moving to emulate the changes which have taken place in the United Kingdom since the late 1980s. The major themes developed in this paper are the role of government and markets, defining an appropriate set of performance criteria for urban passenger transport, distinguishing outcome and outputs and lining up the regulator to deliver, and establishing how environmental pressures can become an opportunity for a competitive public transit business to internalise a number of the negative externalities attributable to a service supply which is uninhibited by government control. It has still to be shown that in terms of externalities, there is any difference between such alternative UK approaches so warmly debated.

MARKET FORCES AS NATURAL GENERATORS OF INNOVATIVE ACTIVITY

The view that government must intervene in an overt way for negative environmental impacts to be minimised is as alive today as it was 30 years ago when in July 1966, the U.K. Minister of Transport presented to Parliament the white paper titled Transport Policy (HMSO 1966). Paragraph one stated that:

> "...The rapid development and mass production of the motor vehicle over the past 20 years has brought immense benefits to millions of people; increased mobility, a fuller social life, family enjoyment, new experiences. .... But at the same time it has brought severe discomforts: congestion in the streets of our towns; the misery of the journey to work for commuters; noise, fumes and danger as the setting of our lives; a rising trend of casualties on our roads and a threat to our environment in both town and countryside which if it continues unchecked, will ensure that the pleasure and benefit for which we use the car will increasingly elude us. The aim of a rational transport policy must be to solve this paradox".

The policy statement went on to state:

> "... Our towns and cities will never be able to cope with their traffic, or the transport needs of millions of people, without strengthening, improving and expanding their public transport services.... Clearly these services must adapt themselves to new technological developments, but to get more people... moved with less road space is vital to the solution of our transport problems. ..... New thinking is required, not only about types and combinations of public transport, but also about how they should be financed. To attempt to solve these problems in exclusively commercial terms is to bring the Victorian mentality to the solution of modern needs".

An implication of the 1966 White Paper is that Government through planning processes has a greater chance of providing the necessary incentives to secure improved public transport as an antidote to the automobile, in contrast to the market. This duly underpinned government attitudes to public transport, and its willingness to subsidise to do so, whatever party was in power, up to the early 80ís. The position promoted in this paper is that the information required by government to plan can only be generated *efficiently* if markets are allowed to function. Deregulation in Britain since 1985 provides the best empirical setting for evaluating the innovations which have been *initiated* by the power of the market (even if the benefits have spilled over into all supply regimes) (Gomez-Ibanez and Meyer 1997).

While it is true that to date demonstration of gains to bus business from environmental innovativeness in particular is not widespread, there is very encouraging evidence emerging (see below) that market forces create substantial opportunities for innovative activity which is not only supportive of profits but has desirable environmental outcomes. Through the example of minibuses - a product of market driven incentives, we can show that government prior to the 1985 Act may have restricted the opportunities to improve public transport in contrast to acting as if they were embellishing opportunities for better public transport.

The question not addressed in the literature on bus provision is the extent to which innovative opportunities are greater under regimes which lessen the power of the regulator in delivery of services. It may be the case that the empirical evidence, as limited as it is, is misleading because of the failure of incentive structures to deliver the gains which are inherent in a less constrained market. What we need to understand are the circumstances under which incentives can evolve and be effective. One problem with the bus industry may be that the lack of experience in managing change and/or the reticence in being innovative given a history of suppression of innovation is hampering the speed of taking up opportunities waiting for action. Generational inheritance, for example, which often lacks an understanding of the need to sustain wealth and survival leads to a reduction in entrepreneurial activity and hence a decline in any potential innovation. Why has the minibus and hail-n-ride only been introduced in the era of deregulation/competitive regulation and potential competition in UK, New Zealand and Australia? As Porter and van der Linde (1995) comment in the context of environmental innovativeness spurred by competition:

> "We are currently in a transitional phase of industrial history where companies are still inexperienced in dealing creatively with environmental issues" (page 99).

The literature which looks at the broader set of potential benefits concentrates on *direct* benefits to users (e.g. Nash 1988, Ellis et al 1996, Evans 1990, Mackie et al 1995) showing variability in gains and losses to users. A strong case has also been mounted against supply opportunities which do not preserve the regulator's control on demand-coordinating

mechanisms such as timetables and ticketing (see also Tyson 1995). Indeed Evans (1990) argument for natural monopoly in the supply of local schedule route services is predicated entirely on the role of economies of network interdependencies so as to minimise uncertainty and waiting time etc in transfers.

When does a timetable become commercially necessary? This question signals very insightful concerns about the probable failure of government rules and regulations, and the constraints imposed on innovation. Economic deregulation is designed to remove all the *economic* constraints imposed by governments on potentially efficient competitive markets. Subsequently operators may introduce specific constraints on their own practices (eg timetables) if they are deemed to carry commercial weight (such as benefits to profitability through patronage). Where open-service delivery is preferred as revealed by the market, such as fixed-route hail-n-ride, the efficient operator will provide such a service. The growth in mini-bus services with flexible timetabling is an example of a market revealing innovation aided by the information produced by the market. We think that government would find it impossible to set up procedures to produce the equivalent information from the market without deregulation.

THE MINI-BUS AND THE ENVIRONMENT

The mini-bus experience in Britain which has delivered increased frequencies, greater vehicle kilometres and more fuel-efficient vehicles illustrates the potential for noticeable environmental gains from opening up markets. The story below - while preliminary - suggests a research agenda for establishing the gains and losses of alternative economic regimes for service delivery on many environmental dimensions. We concentrate on greenhouse gas emissions, and estimate the impact of a market-led innovation in urban bus transport on savings in carbon dioxide emissions from substitute modes and other sized buses.

Urban passenger transport demand is multi dimensional. It encompasses the location of activities, the alternative travel opportunities available, and the availability of types of motorised and non-motorised transport. A potential user of the transport system faces choice opportunities with varying degrees of availability. In the long run, individuals have increasing opportunities to review all key transport-related choices - where to live, where to work, the number and types of automobiles in the household, the choice of means of transport and time of departure for the journey to work, and even negotiation of the temporal and spatial nature of working hours (i.e. flexitime, a compressed work week and telecommuting). In the short run, some of these choices are not available, and hence condition the choices which can be evaluated and changed.

Thus, it is difficult to identify evidence of strong causality without monitoring the spectrum of competitive and ownership models; such monitoring with sufficient rigour is rare, with previous efforts resorting to broad based ‘cross-section’ like comparisons. A substantial effort needs to be registered as part of the research agenda. The tools required to do this are necessarily complex because of the systems interactions. To illustrate what is required, we draw on work undertaken by the Institute of Transport Studies (Hensher et al 1995) in which we have investigated the environmental implications of changes in levels of bus service frequency with the introduction of mini-buses in Perth, West Australia over the period 1993-2003.

Using a model system of the household sector developed for Perth, West Australia (Hensher 1996), we have evaluated their impact over the period 1993-2003. The model system is an

integrated land-use and transport system incorporating linked models for household location decisions, vehicle choice decisions and travel decisions (timing, mode choice, workplace location choice).

The behavioural models in the simulator are presented in sub-modules representing the four natural divisions of:

(i) *commuter choice:* spatial and temporal choice of working hours, departure time choice, mode choice, and workplace location choice

(ii) *automobile choice:* vehicle type choice and household fleet size choice

(iii) *residential choice:* location and dwelling type choice, and

(iv) *automobile use:* total annual vehicle and household kilometres and the spatial composition of kilometres.

The decision blocks for location decisions, vehicle decisions, and travel decisions and their major linkages are summarised in Figure 1. Each of the blocks has a set of internal linkages; the blocks are themselves linked by a set of external linkages. Three instruments (land rents, used vehicle prices and commuting travel times) are used to equilibrate within three of the decision blocks, with the option to bypass vehicle market equilibration. The non-commuting car use decision block does not have a market clearing facility in the current specification.

There is an assumed decision hierarchy in which residential location is the uppermost decision of a household, and as we move down the decision tree we condition each of the worker-related choices on the higher order decisions. The choice of workplace location for each worker in a household is conditional on the household's choice of residential location. Likewise the choice of commuter mode is conditional on the choice of residential and workplace location. The presence of more than one worker in a household is allowed for by having a separate choice for each worker, together with additional exogenous variables to account for the influence of the number of workers on each workers choice of mode, workplace and household residential location. The modal opportunities include the set of available alternatives and possible future investments in 'new' modes in specific spatial contexts such as light rail and bus priority systems. Stated choice experiments are combined with revealed preference data in the estimation of the departure time choice and commuter mode choice models. Full details of the simulator are presented in Hensher (1996) and Hensher et al (1995).

To understand how we identify the impact of a policy instrument, consider an increase in service frequency. The imposition of this improved service via its impact on the generalised cost of using buses has an immediate and direct influence on (i) the use of each competing means of transport for particular trips such as the commuter trip (ii) a possible change in the timing of the particular journey which creates a further change in the generalised costs associated with traffic congestion, and hence (iii) a possible change in the overall and non-commuting use of each automobile available to a household. It may directly affect the household's choice of types of automobiles. The indirect impacts may in the longer term include a change in residential location via the change in modal and spatial accessibility to work opportunities, and a change in the number of vehicles in a household (given the reduced demand for auto use). Changes in residential location may further affect the total use of each

automobile, as well as the mix of urban (commuting and non-commuting) and non-urban kilometres. The adjustment in commuter travel may also affect non-commuting car use.

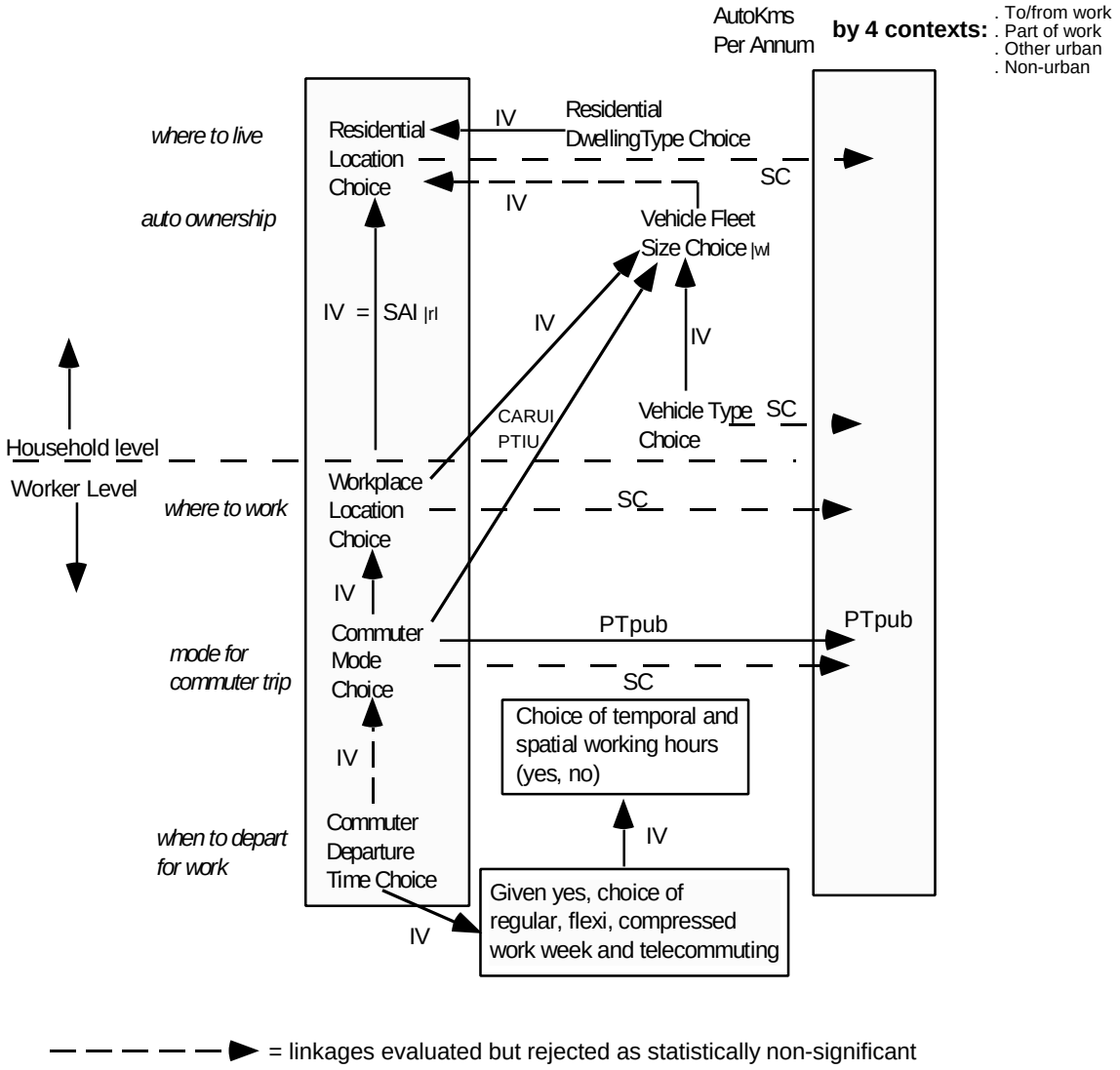

Figure 1 ***The Linked Model System (IV = inclusive value index, SC = selectivity correction)***

The adjustments in vehicle, travel and location choices at the household level translate at the aggregate level into a new set of equilibrium levels for traffic congestion (broadly measured by the ratio of travel time to distance travelled), residential densities, total kilometres of travel by automobiles and various forms of public transport, fuel consumed and greenhouse gas emissions. Table 1 summarises the results of emission changes (and other interesting statistics) in bus frequency with the introduction of minibuses in which we replace *all* large buses with mini-buses. This substitutes better fuel consumption (in litres per 100 kms) and changes the frequency of service. All changes commence in 1996. The cost items are calculated in constant dollars ($93), but are converted into present values at a real discount rate of 8% per annum

over 10 years for all dollar-based items. Minibuses average 15-20 litres per 100 kms in UK in the late eighties (White 1988), 16-18 litres/100km in Sydney, Australia in 1997 (Westbus Nepean Nippers), compared to a large bus of 38-42 litres per 100kms. The simulations undertaken are an improvement over the very aggregate partial analysis of the impact of minibuses undertaken by Banister and Banister (1995) which concludes that a minibus is 27% less fuel efficient on a per passenger basis than a large bus; and the study by White and Turner which estimates on balance, due to a partial shift to minibuses in Britain, less than 2% saving in fuel costs per bus kilometre (White and Turner 1990, Table III).

Table 1 The impact of Mini-bus Substitution in Perth, West Australia 1993-2003
notes: i = increase, d= decrease

	Mini-Bus Substitution		
Outputs Change in:	Bus freq 10%i	Bus freq 20%i	Bus freq 10%d
CO2 (mean % pa)	-0.16	-0.34	0.18
End user cost ($mpa)	-3.0	-4.8	3.1
Car vkm (mean%pa)	-0.23	-0.51	0.20
Auto Energy (mean%pa)	-0.24	-0.56	0.22
Govt auto rev (%pa)	-0.21	-0.47	0.20
Car commuting share (%)	-1.0	-1.8	0.85

The change in CO_2 with increased frequency is the net effect of: 1. changes in vehicle fuel efficiency (litres/100km) due to switching large buses for small buses, 2. changes in aggregate vehicle kilometres provided by buses with increased frequency, 3. modal switching from car to the improved bus service, and 4. possible changes in household automobile fleet size and composition and the location of work and residential activity. Although small as a percentage change, minibuses accompanied by increased service frequency decrease carbon dioxide emissions. This is primarily due to increased bus kilometres, offset by reduced car kilometres, which is highly correlated with emissions of CO_2.

The increase in service frequency (often linked to the introduction of mini-buses) has a noticeable impact on total end user costs (money and time costs), reducing them by up to $4.8m per annum for all travel for a 20% improvement in frequency compared to headways offered by large buses under current timetables. The impact on energy consumed, automobile kilometres, and revenue to government from automobile use is small, less than 1%.

FUEL EXCISE AND THE ENVIRONMENT

Another policy instrument with positive environmental outcomes is a fuel excise applied to all modes. The impact of reduced greenhouse gas emission is substantial as might be expected (Table 2). The net changes in CO_2 associated with a fuel excise tax are predominantly due to changes in vehicle use (and the mix of vehicle types in the car park), with very little associated with substitution between cars and large buses under existing timetables. Clearly a general policy instrument applied to all modes, especially the automobile, will have a greater impact on the environment than a policy applied to a public transport mode; and thus in evaluating the change in innovation attributed to the mini-bus we will never be able to establish a level of

environmental benefit which can match any level achievable with even a relatively modest fuel excise. Importantly however the real difference between the two policy instruments is that people are revealed to prefer minibuses and dislike taxes.

Table 2 The impact of Fuel Excise in Perth, West Australia 1993-2003
notes: FEX = fuel excise on cars and buses

	Fuel Excise	
Outputs Change in:	Fex 60c/l	Fex 80c/l
CO2 (mean % pa)	-9.0	-17.4
End user cost ($mpa)	68.9	125
Car vkm (mean%pa)	-9.07	-17.4
Auto Energy (mean%pa)	-8.80	-17.3
Govt auto rev (%pa)	18.3	32.4
Car commuting share (%)	-0.61	-1.23

As an environmentally attractive policy instrument, sizeable fuel excise increases achieve more impact than does adjustments in levels of frequency of buses. Although improvements in vehicle fuel efficiency reduce total end user cost substantially, the impact on energy and CO_2 is significantly less than a fuel excise. However, in terms of the political cost of policy changes, the pay-off to minibuses is highly likely to be superior; changes in tax levels associated with minibus deregulation are negligible. The example for greenhouse gas emissions should be extended to include other environmental impacts such as air quality, noise and safety.

DEREGULATION AND INNOVATION IN BUS OPERATIONS

To throw some light on the issue of innovations accompanying deregulation to complement the simulation undertaken in the previous section, we undertook a survey of a number of operators of route services in New Zealand and the United Kingdom who are operating under a deregulated regime. Information was also sought from some Sydney (Australia) operators who provide services under an area contract subject to minimum service levels and maximum fares. The survey instrument is reproduced in Appendix A together with responses. Counterfactual knowledge of the situation under regulation is not available. All that we have to rely on is the evidence offered by operators in the deregulated market. The findings suggest that there have been noticeable beneficial changes in vehicle kilometres delivered and patronage as well as innovative examples, especially under economic deregulation. Innovations attributed to the deregulated environment are the introduction of mini-buses, increased frequency, marketing by segments, more fuel efficient buses and more flexible route design.

What we find not only supports the position that relaxing constraints on the markets operations has a direct innovative effect on operators now in deregulated markets, but it appears to create spillover effects into restricted markets who see the benefits of such innovative activity. A good example is minibuses increasingly used on competitively tendered routes as well as on

operations where the incumbent remains protected by anti-competitive area franchises as is the case in the main throughout Australia.

Concern for the environment means a shift towards a larger number of modal opportunities for transport users as well as a recognition that environmental benefits may arise from many behavioural responses such as the endogenous set of location, vehicle and travel choices operating in the travel simulator applied to Perth. This leads to less reliance on mode outputs as proxies for the greater good, and increasing input or reliance on market driven means. This is consistent with a shift towards more indirect instruments of policy such as indirect taxes and competitive rules, rather than protection or enhancement of particular transport modes.

Furthermore, allowing markets to generate fresh opportunities for profit making is a means to encourage relevant charitable activities. Successful businessmen are able to pursue their own enthusiasms because of that profit. Indeed, the outstanding innovations have arisen in this way. Perhaps most notable in the UK were the pioneering efforts in housing and planning by the chocolate and soap entrepreneurs, Cadbury, Rowntree and Lever. Nowadays environmental innovation should be no exception, and successful transport operators are seen as a fertile ground. In the research for this paper, for example, we found minibus operators to be unaware of the possible connection between their operation and pollution reduction. Once it is pointed out via the indirect effects we have described, interest is stimulated by the perception that here is another reason for mini-bus operations to be preferred by policy makers, and is a case of promoting the public interest while making a profit. It is then quite conceivable that their interest will broaden into trade-offs which create more benefits even where this involves some increases in their outgoings, for example on an excise tax imposed on all vehicles of a given engine capacity.

Though we have shown that market processes in transport have been less beneficial in environmental terms, it remains true that in transport the principal effective instrument is a congestion tax. For businesses, as for many other interests, taxes are unpopular. This is however insufficient to account for its manifest failure over 30 years or more to be adopted by government, despite the approval of nearly all economists and most environmentalists. No doubt the line we have developed will do something to add to the case. But clearly, the problem of persuading politicians to take up the cause remains.

Some progress has recently been made on one of the traditional difficulties - the question of who in particular is to benefit from the yield from a greatly expanded tax base? The ërule of threeí being promoted in Britain is an appealing marketing strategy of political persuasion to demonstrate how the raised revenue can benefit the public transport community, the environmental lobby and car users. We think that political lobbying must become more subtle, in the way suggested in the next section.

THE ROLE OF GOVERNMENT AS A DELIVERER OF OUTCOMES

Political lobbying for a congestion tax has failed in large part because what would be achieved by this instrument is not very clearly articulated by governments in terms of intended outcomes. If governments are not encouraged more clearly to articulate intended outcomes (e.g. ‘we want to promote better access’ rather than ‘we want to build a light rail line’), it is difficult to measure performance (indeed to give political signals to innovation) and, more particularly, to measure and compare the performance of those who are competing to provide government

services. A more open and competitive economy relies on an outcome orientation. The General Manager Policy of New Zealand's Ministry of Transport has remarked on the centrality of defining outcomes in this respect:

> *" The key to structural reform is accountability. Each organisation has been developed to have clear and non conflicting goals and targets to achieve; to clearly understand the available resources, opportunities and risks involved in those tasks; and to be publicly judged against its performance" (Toleman, 1995: 13).*

The pursuit of outcomes rather than outputs is essential to better planning practice. A clear distinction between *means* (outputs) and *ends* (outcomes) is necessary. As difficult as it is, we need to seek agreement about the ends (or goals or results or outcomes) to be aimed for and debate the various possible means which may contribute towards achieving these outcomes.

Reporting back to management of performance outcomes (through a set of indicators) is not only important for feedback into the capitalist system (ie markets) to guide profitability but is also important in practice in meeting and moving political objectives. This distinction is important; the political agendas are never transport exclusive, with trading taking place in a different set of markets - the political markets. If it can be shown that there are political credits from innovations in the bus sector which are supportive of broad based environmental objectives of government, then this gets political attention. The generic application of cost-benefit analysis and the promotion of better cost-benefit analysis is marginal in impact and its return is probably negative in a political sense - at the margin CBA enhancements cannot be traded since other politically-competing sectors fail dismally in producing such sophistication in technique to evaluate projects.

CONCLUSION

The empirical evidence that economic deregulation in the UK has produced sizeable increases in vehicle kilometres but no noticeable increase in passenger kilometres might in a partial equilibrium setting lead to the conclusion that the broad set of environmental externalities which vary by vehicle kilometres have indeed increased per passenger kilometre. If the unchanged quantity of patronage is now travelling on more environmentally friendly bus systems in contrast to the pre-deregulated era, then the system wide environmental benefits are positive. That is, less air pollutants, greenhouse gas emissions and noise pollution are being generated in the delivery of an economic deregulated service.

The broadening of the debate to encompass a set of goals of urban management and associated performance indicators does not mean that we are heading for a return to the days of government dominance. Indeed government failure is a curse. Deregulation promotes more environmental friendly opportunities for innovation via the market for entrepreneurial interest which is not entirely confined to profit making. With respect to congestion taxes, we have suggested that government needs to do more to set out the impacts and means.

REFERENCES

BANISTER, D. AND BANISTER, C. (1995) Energy consumption in transport in Great Britain: macro level estimates, *Transportation Research*, **29A (1)**, 21-32.

BEESLEY, M.E. AND GLAISTER, S. (1985) Deregulating the bus industry in Britain - (C) a response, *Transport Reviews*, **5**, 105-132.

BERECHMAN, J. (1993) *Public Transit Economics and Deregulation Policy*, North Holland, Amsterdam.

BRINDLE, R.E. (1992) Transport and land use: a 'neo-modern' approach, *Proceedings 16th Australian road Research Board Conference*,**Part 6**, 111-136.

ELLIS, C.J. AND SILVA, E.C.D. (1996*) British bus deregulation, preemption and demand coordination*, Department of Economics, University of Oregon, Eugene (mimeo).

EVANS, A. (1990). Competition and the structure of local bus markets, *Journal of Transport Economics and Policy*, **XXXIV (3)**, September, 255-282.

GASTALDI, M., PRADAYROL, J-P, QUINET, E. AND REGA, M. (1996) Valuation of environmental externalities: from theory to decision-making, *Transportation Planning and Technology*, **19**, 207-219.

GOMEZ-IBANEZ, J.A. AND MEYER, J.R. (1997) Alternatives for urban bus services: an international perspective on the British reform, *Transport Reviews*, **17 (1)**, 17-30.

GOODWIN, P.B., HALLETT, S., KENNY, F. AND STOKES, G. (1991) *Transport: The New Realism*, Report to Rees Jeffrey Road Fund, Transport Studies Unit, University of Oxford.

GWILLIAM, K. M. AND VAN DE VELDE, D.M. (1990) The potential for regulatory change in European bus markets, *Journal of Transport Economics and Policy*, **XXIV (3)**, September, 333-350.

GWILLIAM, K. M., NASH, C.A. AND MACKIE, P.J. (1985) Deregulating the bus industry in Britain - (B) the case against, *Transport Reviews*, **5**, 105-132.

HENSHER, D.A. (1994) Transport planning, markets and government: challenges for the future, *International Journal of Transport Economics*, **XXI (2)**, 147-156.

HENSHER, D.A. (1996) An Integrated Approach to Modelling the Impact on Urban Travel Behaviour of Strategies to Reduce Enhanced Greenhouse Gas Emissions *World Transport Research*, Proceedings of the 7th World Conference on Transport Research, edited by Hensher, D.A., King, J. and Oum, T., Pergamon Press, Oxford, **Vol 1**, 271-286.

HENSHER, D.A., MILTHORPE, F.W. AND LOWE, M.(1995) *Greenhouse Gas Emissions and the Demand for Urban Passenger Transport: Final Report: Summary of Approach and Selective Results from Application of the ITS/BTCE Simulator*, Report 8, Institute of Transport Studies, The University of Sydney, November

HMSO (1966) Transport Policy, Cmnd. 3057, HMSO, London.

KENNEDY, D. (1996) London bus tendering: a welfare balance, *Transport Policy*, **2 (4)**, 243-250.

KLEIN, P.G. (ed.) (1993) *The Fortunes of Liberalism: Essays on Austrian Economics and the Ideal of Freedom*, The Collected Works of F.A. Hayek, Volume IV, Routledge, London.

MACKIE, P., PRESTON, J. AND NASH, C.A. (1995) Bus deregulation: ten years on, *Transport Reviews*, **15(3)**, 229-251

NASH, C.A. (1988) Integration of public transport: an economic assessment, in Dodgson, J.S. and Topham, N. (eds) *Bus Deregulation and Privatisation: An International Perspective*, Avebury, Aldershot, 97-118.

PORTER, M.E. AND VAN DER LINDE, C. (1995) Toward a new conception of environment-competitiveness relationship, *Journal of Economic Perspectives*, **9 (4)** 97-118.

SALOMON, I., BOVY, P. AND ORFEUIL, J.P. (EDS.) (1993)*A Billion Trips a Day: Tradition and Transition in European Travel Patterns*, Kluwer Academic Publishers, Dordrecht.

TOLEMAN, R. (1995) *Refocussing the role of government in transport: the New Zealand experience*, paper presented to 7th World Conference on Transport Research, July 16-21, Sydney.

TYSON, W.J. (1995) Bus deregulation - the planning dilemma, *Transport Reviews*, **15 (4)**, 307-314.

WHITE, P.R. (1997) What conclusions can be drawn about bus deregulation in Britain, *Transport Reviews* **17 (1)**, 1-16.

WHITE, P. R. (1988) An overview of urban minibus operations, paper presented at symposium on experiences of urban minibus operations in Britain, City University, London, 12 May.

WHITE, P. AND TURNER, R. (1991) Overall impacts of local bus deregulation in Britain, *Transportation Planning and Technology*, **15**, 203-229.

APPENDIX A

"...I am investigating the innovative opportunities that have arisen as a result of the change in the regulatory environment in which you operate your bus services. Please indicate what has been the impact of the changes in your ***route service***, in terms of past and present provision.

Can you list specific notable changes to the types of services provided:

Can you estimate the overall change (in terms of Route Services only) in:

		Please Circle	
1.	Total vehicle kilometres offered	INCREASE/DECREASE by	☐ %
2.	Total passengers	INCREASE/DECREASE by	☐ %
3.	Total passenger kilometres	INCREASE/DECREASE by	☐ %

4. Fare levels ..... INCREASE/DECREASE by [ ] %

Did you intentionally change your corporate strategy in response to the new regulatory environment? If yes, briefly describe your innovation.

What have you done under your current market environment that you could or would not contemplate doing under the previous market conditions?

Can you list up to three actions that you have taken to reduce the environmental impact of your operations on the environment?'

Table A1. Innovative opportunities and key changes in operations for 'Better-Practice' Operators

Monopoly Operations (threat of tendering only)
Specific notable changes: I. enhanced cross-regional services, improved off-peak services and introduced 'set-down' on request *Overall change in kilometres:* I. over period 92/93-95/96 increased by 12% *Overall change in passengers:* I. over period 92/93-95/96 increased by 3% *Overall change in fare levels:* I. over period 92/93-95/96, increased by 2% p.a. *Change in corporate strategy:* I.none *New opportunities under tendering:* I. nil *Actions to reduce environmental impacts:* I. CNG buses, Euro II engines, disability trials, all depot facilities conform to environmental standards, working with clean Air 2000 initiative in Australia

Deregulated Market	Competitive Tendering/Contracts
Specific notable changes: I.Large buses phased out, mini/midi buses introduced with increased frequency, urban mileage increased, interurban mileage increased, greater penetration of housing estates, 'hail-n-ride', rural mileage decreased II. higher frequency, minibuses and cross-town services III. concentrate marketing/product on high frequency key services	*Specific notable changes:* I.Better route structures - changed 80% of what we inherited; headways no more than 30 mins, better trained drivers, introduced mini-buses and major refurbishment of inherited buses, II. more flexibility in route design and scheduling, new buses
Overall change in kilometres: I. average of 10% pa increase II. 8%pa increase III. increase by 5%pa	*Overall change in kilometres:* I. over 30 mths increased by 23%, II.12% increase
Overall change in passengers: I.average increase of 8.6% over 3 years compared to ave national decline of 5% II. 20% pa increase III. increase by 15% over 3 yrs	*Overall change in passengers:* I. increased by 20%, II. 8% increase
Overall change in fare levels: I. 20% increase over 6 years compared to CPI increase of 30% II. no real fare change III. remained static	*Overall change in fare levels:* I. increased by 5% II. no increase
Change in corporate strategy: I. no cross-subsidisation between routes or times of day or week, no fare scales - market pricing route by route, never knowingly undersold by the competition II. emphasis on cost reduction, improved customer service and improved relationships with regulatory authority and wider community III. much more innovative and immediate in response	*Change in corporate strategy:* I. Frequencies revised significantly upwards especially off-peak and weekends; minibuses introduced into 70 new residential streets and 80% of existing routes changed II. compliance procedures in place
New opportunities under deregulation: I.market segmentation - high quality and low grade services on same route, experimented more with routes - frequencies, fares, special promotion; let the customer decide rather than a Local Authority II. reduce costs and increased customer service delivery III. improve frequencies, bold expts with fares	*New opportunities under tendering:* I.As a new private entrant able to make all changes above which were impossible under public monopoly II. quicker response to problems, clearer defined contract areas previously disputed wit neighbouring contractors
Actions to reduce environmental impacts: I. using low sulphur diesel, choose Euro1 or Euro2 specifications of vehicles, experimenting with gas vehicles II. refurbished trolley buses, extended use of trolley buses, introduced Euro I compatible diesel buses - now 30% of fleet, increased market share relatively to less environmentally friendly modes. III. emission controls through Euro I and II engines	*Actions to reduce environmental impacts:* I. Rebuilt 90 transmissions, 50 engines and introduced minibuses to give better fuel economy. II. none

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