Public Transport Pricing

Introduction

This record of evidence forms part of the work undertaken by UKERC's Technology and Policy Assessment team relating to its project on policy strategy for carbon emissions reduction in the passenger transport sector. The material was produced alongside the project's main report and since it supports that report, it was judged appropriate to make this material available to a wider audience. The main report itself '*What Policies are Effective at Reducing Carbon Emissions from Surface Passenger Transport*?', and the supporting evidence can be found at:

http://www.ukerc.ac.uk/ResearchProgrammes/TechnologyandPolicyAssessment/TPAProjects.aspx

Explanation of Content

Evidence on this policy measure has been collected by the TPA team on the basis that it has, or may have, the potential to result in carbon dioxide emissions reductions in the passenger transport sector. This evidence document begins with a summarised description of the policy measure. The evidence itself follows the summary and is presented in table form.

Each piece of evidence has been assigned a separate row and tabulated using four columns:

- Year of publication, arranged chronologically, beginning with the most recent year
- Name of author, including where applicable additional cited authors (and year); and a Reference ID number.
- Type of evidence:
  - Evidence containing quantitative information is denoted by the letter 'Q'
  - Qualitative evidence is denoted by the letter 'C' for 'comment'
- The evidence itself

The evidence was originally gathered and assessed using several sub-headings. The purpose of this was primarily internal i.e. to facilitate the handling of evidence and the production of the main report. These sub-headings have been retained here as follows:

- Policy Measures and Carbon Savings
- Other potential CO_2 Impacts i.e. outside of the immediate policy influence
- Other Benefits e.g. air quality improvement or traffic congestion reduction
- Policy Costs and/or Revenues i.e. to local or national government
- Business and Consumer Costs
- Unintended Consequences e.g. rebound effect
- Reasons/Arguments for Carbon Savings Achievement or Failure
- Policy Suitability for the UK

A list of references follows the evidence tables. Note that the Reference ID numbers are allocated by Reference Manager, the referencing software used by the TPA team.

Any charts, figures and tables referenced in the evidence are not reproduced here but can be found in the original publication or evidence material.

Where no relevant evidence was found for a particular sub-heading, this has been noted.

Policy Description

The evidence recorded here covers bus and rail pricing policies and the effect that fare changes may have on public transport patronage, modal shift, and CO_2 emissions.

Evidence Tables

Carbon Savings and Policy Measures

Year	Author	Type	Evidence
2008	Hensher (ref 11464)	Q	Reducing bus and train fares by 50% does attract patronage, but does very little to reduce CO2 associated with car kilometers (see Table 6).
2006	Noland (ref 11450)	Q	In Table 3 Noland (2006) shows fuel savings (useable as a proxy for CO2) for various policies. Percent reductions are relatively small for all the public transport policies.
2002	BTRE (ref 11429) citing Philipson and Willis, 1990	Q	An increase in patronage of public transport does not necessarily mean a reduction in fuel use. More fuel may be used carrying additional passengers who previously walked, or who were car passengers, than is saved by the number of car drivers attracted to use the bus. BTRE (2002) cites Philipson and Willis (1990) who found that, while free public transport for Adelaide (a 100 per cent reduction in fares) would probably result in a 30 per cent increase in patronage, only around half of riders are likely to come from cars and even less would have been drivers. Hence, it was estimated that car trips would decline by considerably less than two per cent.
2002	Glaister (ref 3521)	Q	"Long-term price responses (i.e. elasticities) for urban bus routes and commuter railways are generally of the order of a fall of 5 per cent for a 10-per-cent price rise, and for inter-city and rural services (where the car provides much stronger competition) the responses are typically substantially greater than a fall of 10 per cent for a 10-per-cent price rise".
2001 1999	IEA (ref 11354) European Commiss-ion (ref 11650)	Q	The European Auto-Oil II model for Athens showed a 1% reduction in emissions of CO2 resulting from a 30% drop in transit fares. A similar relationship is assumed to hold for most IEA cities, taking into account that the impact may not be as great in areas where many residents live outside the range of urban transit systems. If a national government provides (or increases) transit subsidies in all cities and towns so that fares can be cut by 30%, and the policy affects about half of the country, then national emissions of CO2 would decline by 0.5%. Given the uncertainties and country-by-country variations, however, reductions between zero and 1% appear reasonable through 2010, perhaps reaching 2% by 2020 after taking into account longer-term impacts on traffic and land use.
1996	Acutt (ref 11281)	Q	Modelling was done in 1996 to forecast the impact of reducing public transport fares on the CO2 emissions of cars in the UK and on the CO2 emissions of the UK transport

Year	Author	Type	Evidence
			sector. Figure 6 shows carbon emissions from the car fleet under constant public transport fares, and with the 50 per cent reduction (fuel prices held constant in real terms at their 1996 levels). The figure shows how reduced public transport fares reduce carbon emissions from cars compared with the base case simulation, though the effects are relatively modest. Carbon emissions are forecast to be 1.4 per cent lower in 2000 and in 2010. Forecasts of other greenhouse gas emissions from cars show NOx to be 1.3 per cent lower in 2000 and in 2010. VOC emissions are forecast to be 1.3 per cent lower in 2000 and 1.4 per cent lower in 2010. CO emissions are forecast at 1.2 per cent lower in 2000 and 1.4 per cent lower in 2010. Hence the halving of public transport fares is only forecast to cut car emissions by a little under 1½ per cent. The increase in demand for public transport services would increase emissions from public transport. Figure 7 shows total surface transport emissions (car plus public transport) of carbon on the assumption that average passenger loads on different types of bus and train do not change. Total emissions of carbon are forecast to rise, compared with the base case simulation, by 2.5 per cent in 2000 and by 2.9 per cent in 2010.

Other CO2 Impacts

Year	Author	Type	Evidence
			No specific evidence found.

Other Benefits

Year	Author	Type	Evidence
			No specific evidence found.

Policy Costs and/or Revenues

Year	Author	Type	Evidence
			No specific evidence found.

Business and Consumer Costs

Year	Author	Type	Evidence
2008	Hensher (ref 11464)	Q	Reducing bus and train fares by 50% does attract patronage. It does impact on parking station revenue (given that most of the added rail patronage is to and from CBD where parking is expensive. The consumer surplus gains overall are very small (0.054%) and indeed there is a reduction of

Year	Author	Type	Evidence
			13.34% when focusing on mode and departure time, holding residential and workplace location fixed. What this suggests is that the increased demand adds crowding delays that more than offset any financial gains. Clearly the fare reduction would require substantial investment in service levels to be able to recapture these lost benefits.
2002	Glaister (ref 3521)	Q	In the UK, rail fares are limited to increases 1 per cent less than inflation on those national railway fares that are regulated (by the SRA), and 1 per cent more than inflation on the London Underground.
2002	Glaister (ref 3521)	C	"Bus fares outside London have remained deregulated and thus determined in the market".

Unintended Consequences

Year	Author	Type	Evidence
			No specific evidence found.

Reasons/Arguments for Carbon Reduction Achievement and/or Failure

Year	Author	Type	Evidence
2008	White (ref 11605)	Q	White (2008) using published elasticities on the way people respond to real fare levels, concludes that the growth in public transport patronage in London is much greater than would be expected from the real fares and service level changes alone. Similarly, the fall in patronage on other metropolitan areas of the UK would have been greater if it were all a function of rising car ownership and higher fares/ lower services during the period 1999-2006 covered by the study. The report attributes the bulk of London's success to factors such as service stability, extensive bus priority, good passenger information, simplified fares and high quality interchange points. Only 5% of the growth can be attributed to the Congestion Charge since 2003. Outside London, the slower than expected decline in patronage is likely to be due to growth in the use of low floor buses, higher quality interchanges and marketing initiatives by operators and Passenger Transport Executives.
2006	Noland (ref 11450)	C	In general, there are two types of policy approaches for transport fuel consumption reduction. One is focused on providing people with more choices, e.g. better or *cheaper public transport*, carpooling options, or telecommuting. The other policy approach is prescriptive, essentially restricting or shifting behaviour. These include driving bans, mandatory carpooling, speed limit reductions, or mandatory changes in work schedules. Not surprisingly, the more prescriptive options tend to result in greater reductions in fuel consumption.
2006	Noland (ref 11450)	Q	The own-price elasticity of public transport patronage with respect to fare changes is generally about 0.3 from mostly

Year	Author	Type	Evidence
	citing Comm-ission for Integrated Transport, 2002		North American studies. In the UK since the 1990s local bus fares have increased by 24% and local bus use declined by 11%, which would imply an elasticity of -0.46.
2006	Robert (ref 4789)	Q	Modelling the transport system of Stockholm showed that free fare public transport did not cause a substantial impact on reduced private vehicle mileage and adherent CO2 emissions. Making public transport free of charge implied just a 4% reduction of CO2 emissions in comparison to state description B. The reason for this is that this policy mainly caused a shift from walking and cycling to public transport.
2005	Banister (ref 11507)	C	A significant price differential may contribute over time to the dominance of a particular mode and 'lock in' to patterns of land use and lifestyle choice that suit that mode.
2004	Begg (ref 3472) citing CfIT, 2003a	Q	Sustained economic growth and motoring costs that have remained constant in real terms has resulted in continuing growth in traffic. Motoring costs have fallen dramatically relative to the cost of travelling by public transport - between 1985–1986 and 2000–2001, motoring costs (adjusted for inflation) rose by 2% whereas local bus fares rose by 36% over the same period.

Policy suitability for UK

Year	Author	Type	Evidence
			No specific evidence found.

References

Acutt, M. & Dogson, J. 1996 – 11281 - Policy instruments and Greenhouse Gas Emissions from Transport in the UK, Fiscal Studies, vol. 17, no. 2, pp. 65-82.

Banister, D. 2005 – 11507 - Unsustainable Transport: City Transport in the 21st Century Routledge, London.

Begg, D. & Gray, D. 2004 – 3472 - Transport policy and vehicle emission objectives in the UK: is the marriage between transport and environment policy over?, Environmental Science & Policy, vol. 7, no. 3, pp. 155-163.

BTRE 2002 – 11429 – GREENHOUSE POLICY OPTIONS FOR TRANSPORT, Bureau of Transport and Regional Economics, Australia.

CfIT 2003 – 11655 - 10-Year Transport Plan Monitoring Strategy: Second Assessment Report, Commission for Integrated Transport, London.

European Commission 1999 – 11650 - The Auto Oil II Program, Working Group 5, Non-Technical Measures Final Report, EC Transport Directorate General, Brussels.

Glaister, S. 2002 – 3521 - UK Transport Policy 1997-2001, Oxford Review of Economic Policy, vol. 18, no. 2, pp. 154-186.

Hensher, D. A. 2008 - 11464 - Climate change, enhanced greenhouse gas emissions and passenger transport – What can we do to make a difference?, Transportation Research Board 86th Annual Meeting, vol. 13, no. 2, pp. 95-111.

IEA 2001 – 11354 - Saving Oil and Reducing CO2 Emissions in Transport: Options & Strategies, OECD/IEA, Paris.

Noland, R. B., Cowart, W. A., & Fulton, L. M. 2006 – 11450 - Travel demand policies for saving oil during a supply emergency, Energy Policy, vol. 34, no. 17, pp. 2994-3005.

Phillipson, M. & Willis, D. 1990 – 11654 - Free Public Transport for All?, in 15th Australasian Transport Research Forum, pp. 623-640

Robert, M. & Jonsson, R. D. 2006 – 4789 – Assessment of transport policies toward future emission targets: A backcasting approach for Stockholm 2030, Journal of Environmental Assessment Policy and Management, vol. 8, no. 4, pp. 451-478.

White, P. 2008 – 11605 - Factors affecting the decline of bus use in the metropolitan areas (Commissioned by PTEG), University of Westminster, London.