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Surface Transport Costs & Charges

GREAT BRITAIN 1998

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Executive Summary

Efficiency and cost coverage perspectives on transport pricing

This report provides two sets of information that may be used in a complementary way for transport policy development in relation to charging, taxation and subsidy. The two types of information provide economic efficiency and cost coverage perspectives for the road and rail sectors. Results for 1998 are presented for Great Britain.

The **efficiency perspective** is given by the comparison of **marginal costs and revenues**. If prices are set at the cost of an additional passenger or freight tonne kilometre, journeys for which an individual or firm's benefit exceeds the cost imposed on the rest of society will not be deterred. Conversely, travel when the benefit to the individual or firm is less than the social cost imposed will be discouraged. Setting price equal to marginal cost thus maximises economic welfare for society as a whole.

The **cost coverage perspective** provides a different set of evidence based on the comparison of **fully allocated costs and revenues**. Policymakers have a legitimate interest in the comparison between economic costs and revenues associated with the road and rail sectors. The resource needs of these modes, or the resources that may be generated from them, need to be balanced with the resource requirements of other sectors of the economy. A comparison between the total social costs imposed by road and rail users as a whole on the rest of society and the revenues raised can support such considerations. Although many of the costs of the transport sector are joint costs, i.e. costs that cannot be uniquely attributed to any one vehicle class or train type, the fully allocated cost approach seeks to compare social costs and revenues for each vehicle class or train type.

Thus the marginal cost approach presents an efficiency perspective whilst the fully allocated cost approach provides a social cost coverage perspective. There are two ways in which the marginal cost and fully allocated cost approaches may be combined.

The first approach to combination is a **political approach**. Politicians may choose to set a cost coverage target for the road and rail sectors and then design a pricing system that maximises economic efficiency taking into account this constraint. One example of the outcome of such a system may be the use of two-part tariffs, as currently used for rail track access charges. This involves a variable component that reflects marginal costs for an additional train service and a lump sum payment for each individual train operator that, with the help of Government subsidy, achieves cost recovery for infrastructure provision at a national level.

The second approach to combination is a more comprehensive **economic welfare analysis**. This involves modelling the economy as a whole and the competing resource needs and resource generation potential of each individual sector. Depending upon the characteristics of the transport and other sectors, the outcome will also be a modified form of marginal cost pricing. In contrast to the political approach, however, the cost coverage target will be an output of the assessment process, rather than an input to it. The analysis will balance the resource needs of the

road and rail sectors at the same time as it considers the distortionary effects of raising revenues from other parts of the economy, in particular the labour market.

Determining the content of the analysis framework

The economic efficiency and cost coverage perspectives determine the social cost and revenue categories that should appear in the marginal cost and fully allocated cost analyses, and how each category should be defined. The main distinction between the two approaches in identifying the social costs of relevance is the unit of transport that is considered.

For the marginal cost analysis it is the additional cost not directly borne by the user in question that arises with an additional passenger or freight tonne kilometre. The private cost of an additional kilometre, e.g. the user's travel time, is of no interest for pricing.

For the fully allocated cost analysis the costs imposed by a group of users on the rest of society is of interest. The cost imposed by the individual user on users of the same mode, e.g. road congestion, is of no relevance. Such costs are both imposed by and borne by the group of users as a whole.

Based upon these distinctions, Table A shows the cost and revenue categories of relevance to the two approaches.

Table A: Summary of Relevant Cost and Revenue Categories

Categories	Short-run marginal cost analysis		Fully allocated cost analysis	
	Road	Rail	Road	Rail
Cost of capital	-	-	✓	✓
Infrastructure costs	✓	✓	✓	✓
Vehicle operating costs	PSV only	✓	PSV only	✓
Electricity costs	-	✓	-	✓
Congestion	✓	✓	-	-
Scarcity	-	✓	-	-
Mohring effect	PSV only	✓	-	-
Accidents	✓	✓	✓	✓
Air pollution	✓	✓	✓	✓
Noise	✓	✓	✓	✓
Global warming	✓	✓	✓	✓
VAT not paid	PSV only	passenger only	PSV only	passenger only
Fares and freight tariffs	PSV only	✓	PSV only	✓
Fuel duty	✓	-	✓	-
VAT on fuel duty	✓	-	✓	-
Vehicle excise duty	commercial vehicle only	-	✓	-

Key: ✓ = relevant for inclusion, although not necessarily included in the empirical work. PSV – public service vehicle, i.e. local buses and coaches.

Disaggregations included in the framework

Since the purpose of the output produced from the framework is to examine differences between social costs and revenues, it is clearly necessary to incorporate within the framework's disaggregations the main factors underlying variation in costs. These disaggregations relate to location of travel, road or rail infrastructure type, vehicle or train type and the time period of travel.

Issues of the potential to reflect such underlying cost drivers in existing and potential charging instruments and of data availability at a sufficiently detailed level also affect the disaggregations that are incorporated within the framework.

With existing charging instruments there is the possibility for highly differentiated infrastructure use charging in the rail sector but only limited variation in the road sector. Rail track access charges could vary for each individual train path. For road, existing instruments are limited to fuel duty and vehicle excise duty. There is the potential for variation of vehicle excise duty by vehicle class/ engine size/ fuel type but this is of limited use in reflecting social costs in a way that can strongly influence travel behaviour. More accurate reflection of costs would require additional instruments such as tolls or electronic road pricing in high cost locations.

The emphasis of this study is on exploiting pre-existing datasets in order to provide estimates of social costs and revenues for 1998. For this reason, data availability and confidentiality constrains the disaggregations that are embodied in the framework. The most notable constraint relates to cost and revenue information for passenger and freight train operators. This information is commercially confidential, so that analysis relies on the very limited disaggregations contained within published accounts.

The disaggregations for the road framework developed in the study are:

- 11 area types (3 for London, 2 for conurbations, 5 other urban, rural);
- 3 road types (motorway, trunk and principal, other);
- 5 vehicle types (car, light delivery vehicle, rigid heavy goods vehicle, articulated heavy goods vehicle, public service vehicle); and,
- 2 time periods (weekday peak from 0700-1000 and 1600-1900, other times)

For rail, the constraint on train operator data, and the confidentiality surrounding some of Railtrack's data, means that the framework developed is restricted to 3 disaggregations relating to passenger service type and 2 types of freight operation. These 5 disaggregations are:

- InterCity passenger services;
- Regional rail passenger services;
- London commuter catchment-based passenger services;
- Bulk freight; and,
- Other freight.

Issues the framework is designed to address

There are six major issues relating to transport charging that the framework is designed to address. These can be grouped under the marginal cost and fully allocated cost analysis headings:

Marginal cost analysis	Fully allocated cost analysis
• What is the direction of change if charges are to be based on marginal costs? • Does there appear to be a case for the introduction of new pricing instruments in the road sector? • Are current levels of subsidy justified on economic efficiency grounds? • How do weighted short run marginal costs compare to charges for the road and rail sectors as a whole?	• How do total social costs compare to revenues for the road and rail sectors as a whole? • How do fully allocated costs for each vehicle class/ train type compare to revenues?

As with any form of research, to prevent results being misinterpreted it is necessary to state the limitations of the analysis. For this reason, limitations are stated in the following results sections and the more important ones are explicitly addressed in the research priorities section.

Results for the road sector

The overall results for the road analysis for 1998 are shown in Table B. These are shown for a typical vehicle kilometre, derived by weighting disaggregate inputs according to relative vehicle kilometres by area type, road type, vehicle type and time period.

The results from the **marginal cost analysis** suggest that:

- Transport charges would need to rise if charges are to be set on economic efficiency grounds. Since the demand/ cost/ price change interactions that would result from changes in prices are not simulated in this study, the ratios of revenues to marginal costs of 2.0 and 2.6 cannot be directly interpreted as the magnitude of the price change necessary;
- When the disaggregate comparisons that are shown in the results section of this report are made there appears to be a need for a far higher degree of differentiation in charges than existing instruments allow for. Without assessing the implementation costs of new instruments, however, it is not asserted that such mechanisms are justified on cost-benefit grounds; and,
- Based on the analysis of public service vehicles contained in this report, subsidy to the bus industry is not fully justified on a purely economic efficiency basis.

Table B: Comparison of 1998 Road Sector Costs and Revenues

Pence per vehicle km, Great Britain, 1998 prices and values

Cost or revenue category	Fully allocated cost		Marginal cost	
	low	high	low	high
Costs:				
Cost of capital for infrastructure	0.78	1.34	n/a	n/a
Infrastructure operating costs and depreciation	0.75	0.97	0.42	0.54
Vehicle operating costs (PSV)	0.87	0.87	0.87	0.87
Congestion	n/a	n/a	9.71	11.16
Mohring effect (PSV)	n/a	n/a	-0.16	-0.16
External accident costs	0.06	0.78	0.82	1.40
Air pollution	0.34	1.70	0.34	1.70
Noise	0.24	0.78	0.02	0.78
Climate change	0.15	0.62	0.15	0.62
VAT not paid	0.15	0.15	0.15	0.15
Sub-total of costs	**3.34**	**7.20**	**12.32**	**17.05**
Revenues:				
Fares (PSV)	0.84	0.84	0.84	0.84
Vehicle excise duty	1.10	1.10	0.14	0.14
Fuel duty	4.42	4.42	4.42	4.42
VAT on fuel duty	0.77	0.77	0.77	0.77
Sub-total of revenues	**7.14**	**7.14**	**6.17**	**6.17**
Comparison of costs, revenues:				
Difference (cost-revenue)	**-3.79**	**0.07**	**6.15**	**10.88**
Ratio: revenues/costs	**2.13**	**0.99**	**0.50**	**0.36**

Notes: Road sector costs exclude costs attributable to pedestrians, bicycles and motorcycles;
Accident costs are reported net of insurance payments;
Vehicle excise duty in the marginal analysis relates to HGVs and PSVs;
n/a – not applicable.

The **fully allocated cost** analysis suggests that:

- For the road sector as a whole total social costs range between being broadly covered by revenues (high cost estimates) and are more than twice covered by revenues (low cost estimates). Since there is no reason to suppose that the degree of social cost coverage should automatically be one, however, these findings do not imply that charges and taxes are excessive; and,
- For the five main vehicle classes within the road sector, coverage of allocated costs occurs for all classes except public service vehicles with low cost estimates but only for cars with high cost estimates. As many of the costs in the road sector are joint costs and cannot be uniquely attributed to different vehicle classes, however, these findings should be treated with caution.

Results for the rail sector

The main results for the rail sector in 1998 are presented in Table C.

Table C: Comparison of 1998 Rail Sector Costs and Revenues

Cost or revenue category	Fully allocated cost		Marginal cost	
	Passenger	Freight	Passenger	Freight
Costs:				
Infrastructure	5.33	3.41	0.42	1.19
Vehicle operating costs	7.07	9.28	7.07	9.28
Electricity	-	-	0.23	-
Congestion	n/a	n/a	0.18	0.00
Mohring effect	n/a	n/a	-1.05	n/a
Air pollution	0.46	0.68	0.46	0.68
Noise	0.16	0.37	0.16	0.37
Climate change	0.10	0.33	0.10	0.33
VAT not paid	1.32	n/a	1.32	n/a
Sub-total costs	14.44	14.07	8.89	11.85
Revenues	7.52	13.41	7.52	13.41
Comparison of costs, revenues:				
Difference (cost-revenue)	6.92	0.66	1.37	-1.56
Ratio (revenue/cost)	0.52	0.95	0.85	1.13

Notes: n/a - not applicable; where electricity costs are not shown, these are included in infrastructure costs. Midpoint of low and high environmental cost estimates

Pence per train km, Great Britain, 1998 prices and values

The results from the **marginal cost analysis** suggest that:

- Transport charges would need to rise for passenger rail and fall for freight if charges are to be set on economic efficiency grounds; and,
- The case for the 1998 level of subsidy for passenger rail services is not fully justified on a pure economic efficiency basis (unless arguments based on the under-charging of road are invoked). The converse, however, applies for rail freight.

The **fully allocated cost** analysis suggests that:

- Rail freight almost covers its social costs, but passenger services only cover around half of social costs. As is the case with the road sector findings, there is no immediate implication from these findings for the level of taxes and charges.

Research priorities

There are five general areas in which the analysis developed in this study could be taken forward. These are:

- Enhancing the content of the existing framework;
- Extension of the framework to cover future years;
- Extension of the framework to enable the magnitude of marginal-cost based prices to be determined;
- Creation of a more disaggregate road framework; and,
- Development of a more comprehensive rail framework.

Of these areas, the highest priority for the road framework is to integrate demand responses to price changes, and subsequent feedback to changes in costs. This should be done for existing pricing instruments and for a year in the near future (e.g. 2003).

For the rail framework, the key priority is to elaborate a framework that works with changes in passenger demand, rather than train kilometres. Again, this should be carried out for a year in the near future.