

Institute for Transport Studies, University of Leeds Experience in Rail Economics and Policy

The Institute for Transport Studies (ITS) at the University of Leeds is the largest of the UK academic groups involved in teaching and research related to transport. ITS enjoys a worldwide reputation as a centre of excellence and was awarded the top rating (5*) in the University Funding Council's most recent national research assessment exercise.

For more than two decades, one of the key areas of research of ITS has been the economics of rail transport. Our involvement with the rail industry was fostered by close links with British Rail and subsequently with successor organisations. For many years, British Rail sponsored a lecturer in rail transport and a rail research fellow at ITS. Since rail privatisation we have undertaken projects on rail transport for SRA and OPRAF, ORR, the rail subscription service, Railtrack, individual rail operators, the British research councils and private sector consultants, as well as work for international bodies including ECMT, UIC, CER and the European Commission. We are members of the Universities' rail research centre, Rail Research UK.

Key research activities encompass travel behaviour analysis and demand forecasting; the economics of pricing and multi-modal issues; transport policy analysis; decision support; project appraisal techniques and methodology; traffic and transport modelling; environmental impact assessment and pollution monitoring; and transport safety, although many other fields are under study within the current workload. In many of these areas, ITS has contributed to the European research effort through its involvement in projects funded by the European Commission. Other major sources of funding are the Engineering and Physical Sciences Research Council, Economic and Social Research Council and the Department of Environment, Transport and the Regions.

ITS has particular experience in successfully managing call-off contracts. For three years, we held a major call-off contract with the HETA division of DETR in which we undertook 20 different pieces of work. This contract was re-tendered and has recently been renewed for a further three years. We also have a call-off contract with the Highways Agency, and are members of the Economics and Strategic Planning panels of SRA.

In what follows we outline the experience of ITS under three headings – project appraisal, demand forecasting and pricing and regulation.

1. Project Appraisal

ITS Project Appraisal experience is extensive, and we have always believed in applying our research and the methodologies involved to practical decision making contexts. Professor Peter Mackie has served for many years as a member of the Standing Advisory Committee on Trunk Road Assessment; his appraisal experience has included acting as a specialist advisor to W S Atkins on the economic evaluation of the Second Severn Crossing and to JMP Consultants Ltd on the East London River Crossing, and as a leading author of the Standing Advisory Committee on Trunk Road Assessment reports on Generated Traffic, Transport and Economic Development and Urban Roads Appraisal. Professor Mackie has also had a key role in European research into evaluation methods for roads, rail, air and combined transport with the EURET, APAS, EUNET and MAESTRO projects.

Professor Chris Nash has for many years led ITS research into public transport, including pioneering work on cost-benefit analysis (on which Professor Nash is the co-author of one of the main texts). He has led many appraisals of specific projects both for local passenger services (for

instance new stations or services in West Yorkshire, Leicester-Burton, Nottingham-Mansfield) and for freight facilities grants (both for British Rail and the British Waterways Board).

ITS has been involved in many studies which have estimated the valuation of travel attributes and is familiar with a large number of studies conducted by others. In many instances, we have acted as advisors to transport consultancy organisations.

Recent studies include the estimation of the valuation of different types of rolling stock and of specific rolling stock attributes, and the valuation of interchange and integration attributes, both conducted for SRA. A novel feature of the rolling stock study was the successful estimation of valuations based around rail travellers' actual (RP) choices between different types of rolling stock. These turned out to be far lower than the SP based valuations commonly obtained. Similarly, our study of interchange avoided sole reliance on SP methods and successfully developed RP models in four different choice contexts. These showed that SP models tend to provide higher interchange penalties than RP models.

We were among the first to estimate the valuation of crowding on trains and the values of interchange and changes to departure time. Other pioneering valuation studies have involved the use of SP techniques for the valuation of noise and air quality and to estimate option values.

A recent strand of valuation work has involved the review of values of time and other service quality attributes and the estimation of models to over 1000 valuations to explain how they vary across different circumstances. These models can be used to provide estimates of the values of a number of attributes, such as time, walk time, wait time, headway, departure time variations and interchange for wide range of circumstances. Indeed, previous research of this type forms the recommended values of time in the Passenger Demand Forecasting Handbook. Current work is being used in a study for DTLR which will provide new recommendations for the official values of in-vehicle time for public transport users and values of walk and wait time for all users.

ITS has had considerable involvement over many years in the development of the methodology of economic appraisal of transport schemes. ITS undertook work for OPRAF and subsequently SRA on appraisal criteria which led to the publication of the existing appraisal guidelines and completed further work on the research requirements to value interchange, facilities for disabled passengers and option values. The appraisal guidelines cover a wide variety of circumstances, ranging from minor adjustments to required service levels up to major investment projects, where SRA might be involved as a direct sponsor or might be required to underwrite provision of services. The guidelines were to be based on existing best practice within the industry, and to take account of the implications of the new organisational structure. For both of these reasons, interviews of leading players in the industry were undertaken. The approach selected was based on social cost-benefit analysis, but set in the context of a broader framework within which other indicators, for instance of the accessibility or environmental effects of projects, could be taken into account.

Significant pieces of work have been conducted for DfT and its successors in this area of appraisal. ITS made significant contributions to the development of the New Approach to Appraisal and the Assessment Summary Table for the 1998 Roads Review. Subsequently we also created a model to replicate the pattern of decisions in that Review and reveal the implicit values of decision-takers. This work was followed up by the provision of guidance on methodology for the multi-modal studies (GOMMS). ITS led the input to the economic appraisal guidance for these studies. The multi-modal cost-benefit framework was defined in detail, incorporating new developments in the treatment of taxation and resolving various issues relating to the balanced presentation of CBA results and comparability across modes. Work included auditing the framework for TUBA, DETR's new software for transport appraisal.

ITS has conducted a study of alternatives to the rule-of-a-half in matrix-based appraisal for DETR. This involved research into innovative approaches to benefit estimation in circumstances where the conventional 'rule-of-a-half' breaks down, including new modes (LRT, high speed rail), large cost changes and new trip generators/attractors.

ITS has undertaken an economic and environmental appraisal for route management strategies for the Highways Agency. As part of a project developing the Route Management Strategies approach, ITS provided advice on the development of a new, objectives-led appraisal methodology using multi-criteria methods and presentation. The method had to be capable of being used either for fully worked-up projects or for those at an early, conceptual stage of development when data is likely to be scarce. The method which was developed featured non-additive scoring and an explicit treatment of the wider environmental, accessibility and development effects of alternative (and complementary) strategies. The method was taken on in large part by the DETR for the assessment of Trunk Road schemes under the Roads Review, and has influenced the development of the New Approach to Appraisal in the UK.

At the European level, ITS was involved in EUNET Decision as part of the EC's Fourth Framework programme. The overall objective of this study was to develop a comprehensive innovative methodology for the assessment of the impacts of transport initiatives. The methodology covers all modes and the form of the assessment method combines aspects of both multicriteria and cost-benefit analysis. A recommended approach to the definition, measurement and valuation of direct, environmental and other socio-economic impacts has been developed as part of the evaluation methodology. One of the main outputs was a demonstrator tool which uses data on transport, socio-economic and environmental characteristics from the study area and allows the decision maker to explore the relative merits of alternative transport schemes.

ITS provided cost-benefit analysis guidance for transport investment in Eastern Europe (TINA) under the ongoing ISPA intervention. The guidance was prepared in consultation with and is endorsed by the relevant international financial institutions (World Bank, European Investment Bank and European Bank for Reconstruction and Development).

In a study dealing with cost-benefit and multi-criteria analysis for new transport infrastructure in the field of railways for the European Commission, ITS reviewed railway evaluation techniques in the European Economic Area. A survey of 50 European rail operators and Government bodies was undertaken and a database of 70 references compiled. The range of impacts that should be included in an evaluation framework and the methods that should be used to measure these impacts have been determined. A common but flexible method of economic appraisal for investment in new European railway infrastructure was proposed.

Two other European Fourth Framework projects in the appraisal area dealt with appraisal of packages of measures including financing methods. The objectives of FATIMA (Financial Assistance for Transport Integration in Metropolitan Areas) were: to identify the benefits to the private sector of optimal urban transport strategies and the potential for obtaining private sector funding to reflect those benefits; to determine the differences between strategies optimised using public funds and those optimised within the constraints imposed by private funding initiatives; to propose mechanisms by which private sector funding can be provided so as to achieve appropriately optimal transport strategies while maintaining quality of operation; and to use the results to provide more general guidance on the role of private sector funding for urban transport in the EU. The OPTIMA (Optimisation of Policies for Transport Integration in Metropolitan Areas) project identified optimal transport strategies with respect to economic efficiency and sustainability

objectives for a range of urban areas within the EU. Optimal economic efficiency policies can be summarised as: low cost road capacity improvements; reduction in public transport fares; increased parking charges and/or road pricing; and increased public transport frequency. Optimal strategies for sustainability generally included all of these policies as well as investment in public transport infrastructure.

FANTASIE (Forecasting and Assessment of New Technologies and Transport Systems and their Impacts on the Environment) is a major project to identify new transport technologies, to develop and to apply methods of assessment to the new technologies in terms of their safety, efficiency, environmental, socio-economic and market effects and to predict the implications for the Common Transport Policy. ITS' main contributions to the project have been the development and application of assessment frameworks.

2. Demand Forecasting

ITS has a long and distinguished history of railway demand forecasting. ITS research has made a major contribution to the recommendations and procedures contained in the Passenger Demand Forecasting Handbook, including the chapters on new stations and services, value of time and the impacts of service quality on rail demand. Indeed, the 'Leeds Model' has for many years underpinned the forecasting of the effects of external factors on rail demand.

Dr Wardman was for many years an advisor to the Passenger Demand Forum and the Passenger Demand Forecasting Subscription Service, and he is currently responsible for advising on updating of the Passenger Demand Forecasting Council's Handbook. ITS recently undertook a major revision of the Passenger Demand Forecasting Handbook for ATOC, under the editorship of Professor Nash. Dr Wardman and Dr Toner undertook fresh empirical work relating to fare elasticities split by ticket type, cross-elasticities between ticket type and disentangling the effects on rail demand of various external factors such as GDP, time trend, car ownership, fuel prices and road congestion

ITS has extensive experience of econometric analysis based on CAPRI ticket sales data. Studies have had the specific objectives of examining: the effects of GDP, car ownership levels, unemployment and other external factors; fare; the various service quality components of time, frequency and interchange; competition from other modes; the demand for local rail services and stations; station catchment areas, population and access to and egress from stations; and rail access to airports.

Particularly novel applications include: analysis of how demand elasticities vary with the strength of competition from car and coach; the exploration of non-constant elasticities, such as fare and GT elasticities varying with the level they take and with distance; the analysis of the effects of changing accessibility to and from stations even though ticket sales data only relate to station-to-station movements; the use of outside evidence on the effect of car ownership levels on rail demand in order to disentangle the effects of the latter on rail demand from the effects of GDP, and the estimation of demand models to disentangle the separate effects of Hatfield, flooding, the petrol crisis and the disruptions due to the Leeds 1st development.

In addition, ITS have used disaggregate methods based on individuals' discrete choices to examine rail travel behaviour and forecast demand. These have been applied to examine a wide range of issues, and have been estimated to RP data, SP data and a combination of the two. Both suburban and inter-urban contexts have been examined. Relevant studies include: the analysis of choice of mode, including between rail and air, for Eurostar, Railtrack and ESRC,

between rail and car in studies for ESRC and Railtrack, and between local train/LRT and car and bus for many clients; the analysis of choice between different ticket types and class of travel, for ESRC and Eurostar; the choice between different stations and access modes to stations for ESRC; and the choice between different train departures, for ESRC and SRA.

We have extensive experience in the design, conduct and analysis of travel surveys. These include travel diaries, focus groups, in-depth interviewing, attitudinal research and questionnaires collecting information for RP and SP analysis. ITS offers short courses in essential statistics, which has been provided for the Highways Agency and London Transport, whilst our SP short course has been provided 10 times in the past two years to over 200 participants. As a major transport teaching institution, a number of our courses cover a broad range of quantitative skills.

ITS is also heavily involved in work on rail freight demand forecasting, having been responsible for the 'flat logit' formulation in the Great Britain Freight Model. It is currently advising both SRA and DfT on rail freight modelling.

3. Pricing and Regulation

ITS has long experience of pricing and regulation issues in the transport sector. We were heavily involved in research on the regulation and privatisation of the bus industry, and subsequently on rail privatisation; in each area we held grants from the Economic and Social Research Council to investigate the consequences. These studies led on to major projects for the European Commission; in particular, ITS co-ordinated the SORT-IT project, which considered alternative organisational and regulatory environments for rail services throughout Europe. In addition, Professor Nash has acted as Specialist Advisor to both the Transport Committee of the House of Commons and the European Committee of the House of Lords in investigations of rail privatisation. ITS also advised the Monopolies and Mergers Commission regarding the merger between Midland Main Line and National Express.

Specifically in the area of rail competition, we developed models of both the franchising process and of on-track competition. On franchising, we developed an SP exercise which indicated how franchise bids would vary with the length of the franchise, the degree of control imposed and the extent of competition permitted. Regarding on-track competition, the PRAISE model simulates the behaviour of competing firms and predicts the costs and benefits of competition. This model has been used in several pieces of work for SRA and has been applied in Sweden in a study for SJ Rail to examine on-track competition on three different routes.

On rail infrastructure pricing issues, Professor Nash was an Advisor to the Commission's High Level Group on Infrastructure Pricing, and Chaired the Economics Expert Group on infrastructure charges of UIC. He was co-ordinator of two major 4th framework EC funded projects - PETS (Pricing European Transport Systems) and CAPRI (Concerted Action on Pricing).

The objectives of the PETS project were to inform the EC of the current situation regarding the pricing of transport modes in member countries; to examine the degree to which this provides appropriate price signals in the light of all relevant internal and external costs; and to forecast the consequences of moving to a more appropriate price structure for road, rail, air and short sea shipping, taking account of other likely developments affecting transport prices, in particular further deregulation. The forecasting was based on four case studies reflecting a variety of circumstances, ranging from acute congestion and environmental problems, to appropriate pricing

policies for new infrastructure at the periphery of the Union. A key task was the estimation of the external costs of competing modes.

The overall objective of CAPRI was to review and synthesise current European research into the pricing of transport in order to disseminate the results of the research and to build a consensus on the policy implications. Key issues addressed were: relevant costs and appropriate prices; options for implementation of different types of prices, charges and taxes and user acceptance. The main forum for developing the policy consensus will be a committee of European national government representatives.

ITS is involved in a number of key projects in the area of regulatory economics. ITS led a very large EU project (UNITE - unification of accounts and marginal costs for transport efficiency) designed to produce transport accounts for the whole of Europe and marginal social cost estimation case studies for all modes. All aspects of external costs (environmental, accidents, congestion) are included. ITS is also leading the case study of rail infrastructure costs, drawing on Europe-wide experience. A study of Surface Transport Costs and Charges for DETR uses the methodologies developed in UNITE to produce estimates of all aspects of marginal and average social costs for road and rail transport in Great Britain and compares them with charges. Advice has already been provided to SRA on freight appraisal methodologies based on this work.

Other EC funded research in the regulatory area includes SORT-IT (Strategic Organisation and Regulation in Transport – Inter-urban Travel) and ISOTOPE (Improved Structure and Organisation for urban Transport Operations of Passengers in Europe). SORT-IT developed policy measures that address the organisational and regulatory problems of the European transport system. Consideration was given to those measures that promote interoperability and interconnection, economic efficiency and spatial co-ordination. Particular emphasis was placed on assessing the impact of deregulation and privatisation of transport infrastructure and operations. A series of national reports have been produced, following over 200 interviews with decision-makers in the air, rail, road, inland navigation and maritime sectors. ISOTOPE conducted a survey of public transport operators and authorities in over 100 cities in the EU. Empirical analysis has developed indices of productivity, cost, financial efficiency and quality of service, as well as econometric models of demand, costs and bidding for tendered services. Theoretical analysis has identified an important role for microeconomic models and principal-agent analysis. The research indicates that deregulated systems have theoretical and empirical advantages in terms of efficiency in production whilst regulated systems have theoretical and empirical advantages in terms of efficiency in consumption.

ITS has conducted several pieces of recent research into the costs and benefits of new entrants in the passenger market. We conducted a study into modelling fares competition for OPRAF and ORR. It was concerned with reviewing the methods that could be used to appraise the effects of allowing greater competition in the provision of train services. After reviewing the theoretical framework, actual studies and the suitability of existing transport models, demonstration models of competition based on both a spreadsheet and a standard transport planning package were developed. The study concluded with various recommendations as to how OPRAF and ORR might forecast the impact of allowing greater competition.

An ESRC funded project dealing with analysis and monitoring of the privatisation of passenger rail services considered the issues arising from rail privatisation in Britain with particular reference to 'off-the-track' competition for franchises and 'on-the-track' competition from open access. A bidding model was developed using the responses to an SP bidding game of 38 senior managers.

This was used to forecast the impact of off-the-track competition and was validated with data on actual bids.

RP and SP choice data was used to develop a rail operations model to assess the potential impacts of on-track competition. This model (PRAISE) examines choice of ticket type and departure (operator) and allows the market to grow in response to entry. It has been used in several further projects to assess the potential for on-track competition in Britain and on three inter-urban routes in Sweden.

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