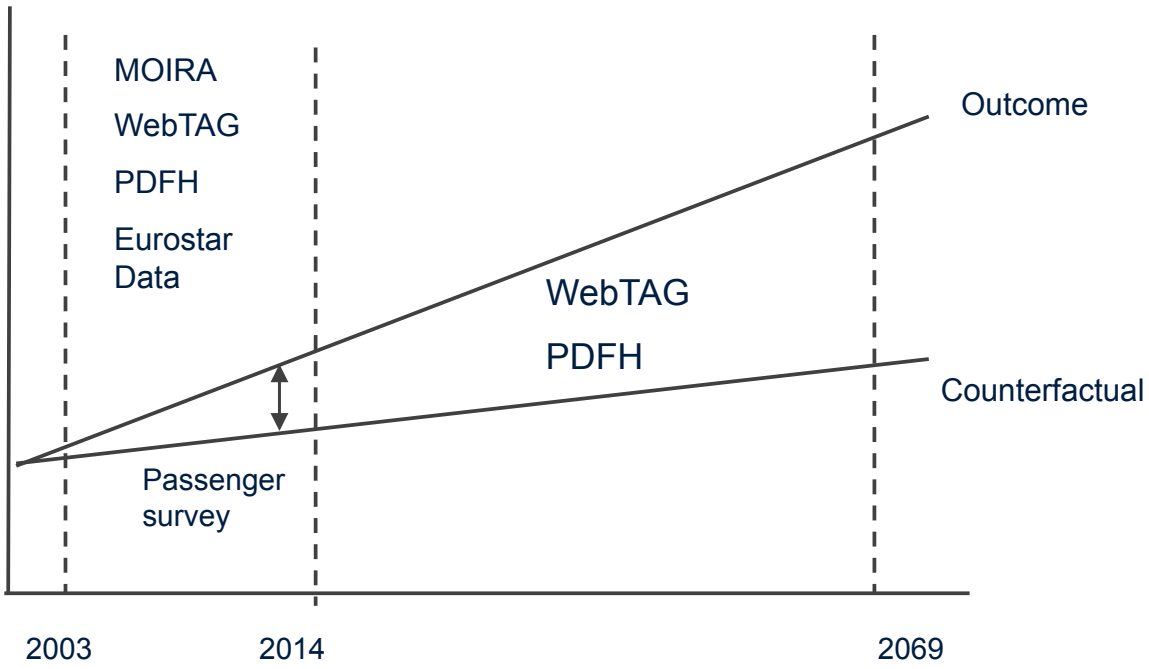
TEG TRANSPORT ECONOMISTS' GROUP

The Transport Economist

The Journal of the Transport Economists' Group



Editor Peter Gordon

Volume 43 Number 1
Spring 2016

The Transport Economist | Volume 43, Number 1
Spring 2016

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TEG TRANSPORT ECONOMISTS' GROUP

Building the Highways Monitor

David Hunt, Office of Road & Rail

Arup

27 January 2016

David began his talk with an overview of the Strategic Road Network and Highways England.

Strategic Road Network (SRN)

The SRN covers 4,300 miles of motorways and major A roads, which comprise just 2% of England's roads but carry one third of all national traffic. It also carries two thirds of all freight traffic in England. Four million people drive on the SRN every day.

Highways England

Highways England was converted on 1 April 2015 from the Highways Agency, formed on 30 March 1994. It is a government-owned company, an executive non-departmental public body sponsored by the Department for Transport. It is responsible only for the SRN in England: Welsh, Northern Irish and Scottish governments manage the strategic roads in Wales, Northern Ireland and Scotland respectively.

Highways England is responsible for managing the operations of the network, which includes traffic information, maintenance, renewal and network improvements, and is divided into 7 regions and 13 operational areas. Local roads are the responsibility of local authorities.

Office of Road and Rail

The Office of Road and Rail (ORR) previously monitored and regulated only the railways (as the Office of the Rail Regulator and then the Office of Rail Regulation) but is now responsible for regulation and monitoring of the road network that supports eight million journeys every day. ORR's responsibilities for road and rail now include:

- the Highways Monitor (see next section);
- health and safety for the rail network, including the Crown Prosecutor role;
- economic regulator for railway infrastructure;
- consumer and competition authority for rail, with the Competition and Markets Authority (CMA);
- track access regulation;
- development of European markets and regulation;
- performance monitoring and official statistics; and
- setting and enforcing UK technical standards and licensing for rail.

The Highways Monitor

The "Highways Monitor" is now a key part of ORR and has the following responsibilities for roads:

- performance, efficiency and delivery monitor of Highways England's Road Investment Strategy (RIS);
- escalation and enforcement;
- advice on future RIS deliverability; and
- client delivery (monitoring assurance arrangements in the framework documents).

The RIS, developed by the government, is providing a transformational level of investment in roads and is also providing long term funding certainty. The role of the Highways Monitor is:

- to support long term roads reform and to provide clear independent advice and commentary; and
- to provide an independent view on efficiency and deliverability of the RIS.

Infrastructure Act

The Infrastructure Act 2015 describes ORR's responsibilities as the Highways Monitor. ORR's role as Highways Monitor includes:

- carrying out activities to monitor how Highways England exercises its functions;
- investigating, publishing reports or giving advice to the Secretary of State on a range of issues including whether Highways England is meeting its obligations, objectives for a future RIS, licence and guidance issues; and
- exercising functions in a way most likely to promote the performance and efficiency of Highways England.

To support this role, Highways Monitor has powers to require information to be produced and to instruct Highways England to undertake certain actions.

Key documents

Key documents include:

- the Government's Roads Investment Strategy (RIS);
- Highways England's Strategic Business Plan (SBP); and
- Highways England's Delivery Plan.

Outcomes and KPIs

David then summarised outcomes and key performance indicators agreed by the Department for Transport and Highways England to 2020, including:

- making the network safer;
- improving user satisfaction;
- supporting the smooth flow of traffic;
- encouraging economic growth;
- delivering better environmental outcomes;
- helping vulnerable users;
- achieving real efficiency; and
- keeping the network in good condition.

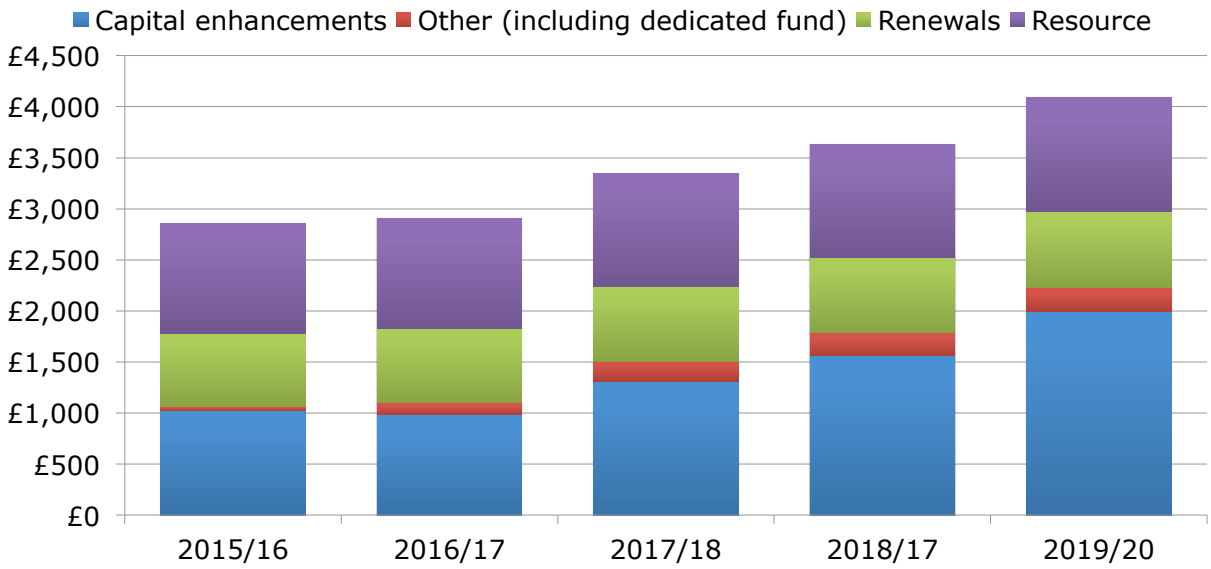
Highways Monitor holds Highways England to account for its performance in achieving the KPIs, and other indicators in the above areas, as well as for delivering its investment plan.

Where there are concerns with performance, Highways Monitor works with Highways England and other stakeholders to resolve them. Highways Monitor has enforcement powers as a backstop.

Future investment

ORR is monitoring future delivery and risks for the 112 major schemes, and will provide early warning of anything that is falling behind. Figure 1 shows funding for the 5 year period.

Figure 1: Road Investment Strategy (RIS) funding (million)



David concluded his presentation by acknowledging that work has already begun for the next Road Period for 2020-2025. He also noted the vital role that ORR has in working closely with the Department for Transport and Highways England to develop future plans.

Discussion

Given the issues with rail enhancements, are we putting enough resources into checking the project costings? David set out the role of the Highways Monitor team and where it differs from rail. They do not approve project costings, or set funding, but ORR would expect to have a role in challenging Highways England on a sample basis or where there are outliers.

How are future projects being selected for prioritisation for RIS2: for example, will all projects with a BCR above a certain

level be put into the RIS, and will the Department of Transport be "region blind" in how they do this? David said that the Department of Transport and Highways England are developing exactly how that works, but they would expect a transparent process to be adopted.

Can there be more public information on project benefits, at both the pre-approval and post construction stages? David mentioned Post Opening Project Evaluations (POPE) and five-year project evaluation, and said there had been publication of some statistics underlying benefits cases during this RIS.

Report by Margot Finlay

Economic Evaluation of High Speed 1?

Andrew Meaney, Oxera

Arup

24 February 2016

Introduction

Forecasts in 1985-1987 for international passengers on what is now Eurostar ranged from 12.6-16.5 million a year in 1993. In practice, Eurostar services, which opened in 1994, are now carrying around 10 million passengers in a year. Eurostar was joined in 2009 by the "Javelin" high speed domestic services.

Andrew began by setting out the context to his talk, including the Atkins/AECOM/Frontier Economics "First Interim Evaluation of the Impacts of High Speed 1" and the Department for Transport's (DfT's) increased interest in ex-post evaluation.

Background to the evaluation study

High Speed 1 (HS1, formerly the Channel Tunnel Rail Link):

- is 109 kilometres long and connects the Channel Tunnel with London St Pancras International;
- has intermediate stations at Ashford, Ebbsfleet and Stratford;
- opened in phases in September 2003 and November 2007;
- gained "Javelin" domestic services in 2009, with fixed track access charges paid by DfT and associated revision of the Southeastern timetable on the "classic" network;
- released capacity on existing lines, and provided capacity on the new line, for freight;
- offers open access to all passenger and freight operators;
- operates under a 30-year concession, owned by a consortium of Borealis Infrastructure and Ontario Teachers' Pension Plan; and

- subcontracts operations and maintenance to 2025 to Network Rail (High Speed) Ltd.

There was, however, no clear appraisal of the original project, although the National Audit Office (NAO) has suggested that its Benefit Cost Ratio (BCR) was around 1, or more with regeneration.

In 2012:

- The NAO published a report on the completion and sale, and noted that DfT performs poorly on the evaluation of major projects and does not understand the regeneration and economic impacts of transport projects.
- A Transport Select Committee discussed the sale of HS1.
- The Public Accounts Committee chair suggested that the lack of evaluation was "shocking", and should ideally have begun before 2003. Andrew noted that this would have required funding a long-term evaluation project, which by now might have been running for 15 years or more.

In 2013, DfT commissioned a First Interim Evaluation of HS1, which was eventually published in October 2015 with a peer review by Andrew, whose evaluation experience goes back as far as reviewing the Highways Agency's Post Opening Project Evaluation (POPE) programme in 2003.

Ex-ante economic appraisal in transport is much more developed than in other parts of government policy, but the availability of ex-post evaluation evidence in transport is low. One constraint is that there is no "upside" for politicians in announcing ex-post results:

- At best, a long-forgotten decision by the current government will be endorsed.
- At worst, a decision by another government, possibly opposed by the current one, will be endorsed, or a decision by the current government will be criticised.

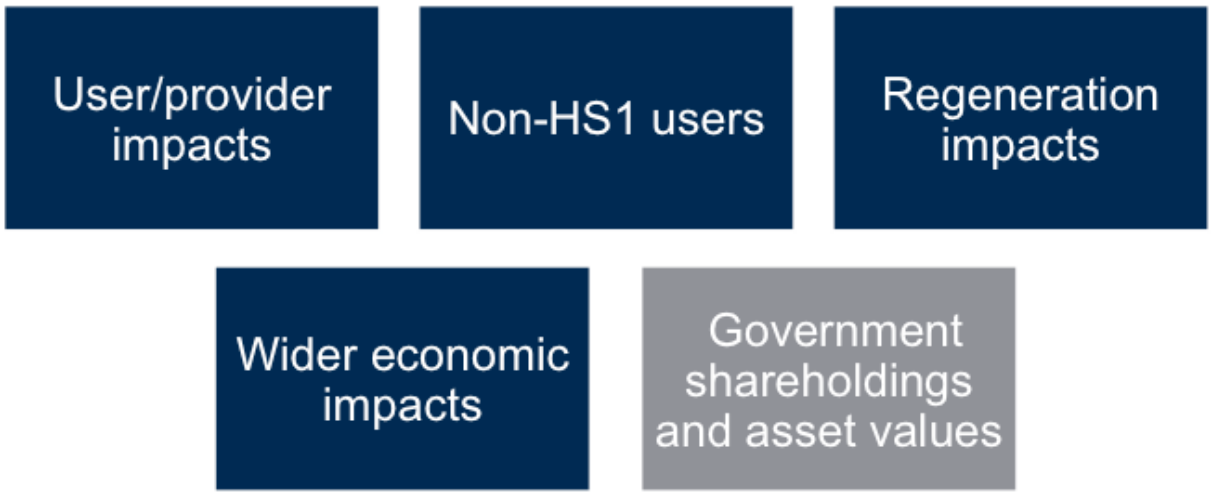
One example was the "What Works Centre" reviews by Henry Overman, which examined around 500 transport evaluations worldwide and concluded that only 29 were "up to scratch".

Two types of broader lessons can be learned, on the analytical approaches to larger projects, and on the ex-post evaluation of projects in general.

Scope of the evaluation study

Figure 1 shows the 2013 scope of the First Interim Evaluation.

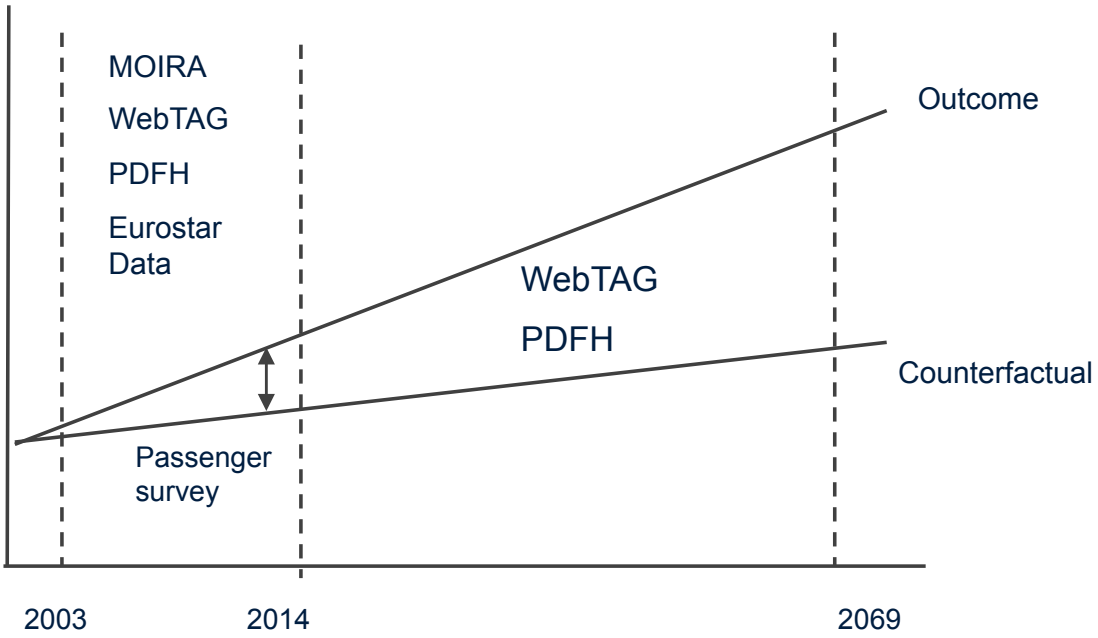
Figure 1: Scope of the evaluation



Approach to the study

Figure 2 summarises the approach to the study.

Figure 2: Approach to the study



The evaluation used a passenger survey ("What would you have done otherwise?") to estimate the counterfactual, and MOIRA outputs and Eurostar use had been used to estimate the net effects on revenue and Generalised Journey Time (GJT). For the remainder of the period they had used an updated ex-ante appraisal. (Atkins' modelling had in practice included the larger area after 2014 but not the small triangle before 2013.)

Andrew raised the issue of whether the objective of the study had been to learn lessons by testing the original appraisal against what has happened, or by re-appraising the project using today's appraisal techniques.

In the study:

- Actual and counterfactual demand was based on the passenger survey.
- Future domestic demand was based on forecasts in line with the Passenger Demand Forecasting Handbook (PDFH).
- Future international demand was based on the NAO report.

The assessment of user benefits included time savings, crowding and journey quality. Key issues had been:

- The capping of demand from 2033, which had a large effect on the modelled area shown in Figure 2, capping benefits from 2033 to 2069.
- An assumption of a constant average crowding benefit per trip, rather than detailed modelling of crowding in each past and future situation.
- The survey method.

Non-users

The main impacts to those who do not use HS1 were also assessed using WebTAG methodologies on:

- environmental externalities;
- the impact of HS1-related timetable changes on the "classic" network; and
- road user impacts from congestion relief.

One point to note is that the evaluation does not include the real option value of the HS1 network, through transformational benefits (that is, bringing more distant destinations within a reasonable journey time by train), or the creation of more opportunities to deploy high-speed rail technology in Britain.

Regeneration impacts

In the original appraisal of HS1, regeneration benefits move its BCR from "low" to "medium" value for money. The evaluation study's approach was to:

- Compare the HS1 study area with nearby areas before and after opening.
- Examine metrics such as data on labour and residential and commercial property markets and the leisure market.
- Carry out a series of 24 stakeholder interviews with representatives of public and private sectors, and 70 business surveys.

Andrew commented that a major issue for the evaluation was the "bad timing" of the recession from 2008, which inevitably depressed the regeneration impacts which could reasonably have been forecast and expected ex ante.

A key issue was that follow-up studies will need to consider the scope of regeneration benefits and establish the level of additionality in relation to Wider Economic Impacts (WEIs) and user benefits.

Wider economic impacts

The evaluation had examined:

- Agglomeration benefits, based on changes in effective density.
- Output changes in imperfectly competitive markets, estimated as an uplift to time savings benefits.
- Labour markets effects: the increase in labour supply had been included but, with limited evidence to do so, the move to more productive jobs had not been quantified.

Analysis of Monetised Costs and Benefits (AMCB)

Andrew compared monetised costs and benefits with the NAO's 2012 estimate of £7 billion Present Value of Benefits (PVB).

Table 1: Monetised costs and benefits

Impact	**Monetised benefit (million)**
User benefit, net of fares increases (but the original RPI+3% assumption was not applied)	£4,955
Provider impacts to Eurostar and Southeastern	£2,050
Crowding, reliability and punctuality	£475
Noise and local air quality	£10
Greenhouse gases	£35
Wider public finances	-£825
Wider economic impacts (WEIs)	£1,330
Present Value of Benefits (PVB)	**£8,030**

Source: Atkins

Table 2: Costs and Benefit Cost Ratio (BCR)

Cost	**(£million)**
Capital grants, guarantees, restructuring and other support and future debt liability	£9,915
Net concession proceeds	-£1,700
DfT support subsidy/lost revenue (depends heavily on the assumed demand cap)	£4,380
Present Value of Costs (PVC)	£12,595
Value for Money (VfM) metrics	
Present Value of Benefits (PVB, see Table 1)	£8,030
Net Present Value (NPV)	-£4,565
Benefit Cost Ratio (BCR)	**0.64**

Andrew noted that comparable analyses had been presented to TEG on:

- the Liverpool Overhead Railway (by John Dodgson); and
- Victorian railways and the British economy (by Tim Leunig).

Reaction to the evaluation study

In January 2016, the Public Accounts Committee (PAC) report "The Sale of Eurostar" noted the delay between its 2012 hearing and the publication of the evaluation three months earlier. Its report also noted that a shortfall of demand had led to a BCR of 0.64 and, on the methodology, was concerned that

"the Department's evidence suggests that its methodology is inadequate for some types of transport projects".

Broader lessons for evaluation studies

Andrew noted the potential tension between using evaluations to test appraisals and to re-appraise schemes shortly after opening.

First, on the use of surveys to establish the counterfactual, he suggested that:

- Information from previous behaviour was more tractable for respondents, but might deviate from the true counterfactual.
- Planning for an evaluation (which in this case might need to have started either before opening in 2003, or arguably from after the decision, around 1994, to proceed) should be undertaken at the point of scheme approval.

Second, he noted changes to appraisal techniques over time:

- There had been significant changes in appraisal since the 1998 HS1 business case: how do we treat schemes with this sort of lag?
- There is a trade-off between consistency and the use of current practice, raising the question of whether the purpose of the evaluation was to review the original decision or to identify what would have been decided now.

Third, how often should we evaluate? Larger studies may require multiple studies over a long time period.

Fourth, how could we capture the impact of large or transformational projects:

- Should we consider longer time periods?
- Was there scope for other impacts?
- What were the impacts on private sector decisions?

Conclusions

In conclusion, Andrew suggested that:

- The HS1 study presents some useful initial analysis, but it is not clear what more will be done.
- There is a need for an analytical treatment of large transport schemes.
- Evaluation is important to improving decision-making.

Discussion

Peter Gordon (Editor, The Transport Economist) asked what went wrong with the forecasts. **Andrew** suggested that there was a combination of bias and "group think". **Michael Schabas** suggested that the forecasts had been "fiddled" to make the case. **John Segal**, who had been involved in the early stages of the original forecasting, noted that SNCF were partners in the Eurostar project and had not only their own approach to forecasting and pricing but also their own political objectives.

Stephen Plowden said that he had helped objectors in the 1990s and recalled that there had been a cheaper scheme which would have saved 20 minutes for much less money. **Andrew** responded that the proposed "Amiens cut-off" in France could also have reduced journey times from Paris (but not Brussels) by around 15 minutes. **Stephen** also thought that the environmental appraisal had been poor. Why was consumer surplus of interest to the taxpayer? Was this really a "transformational" scheme? **Dick Dunmore** (Steer Davies Gleave) pointed out that Eurostar usage had risen in 2003 after Stage 1 had opened, and risen by almost 25% in the last few

months of 2007, after Stage 2 had opened, but that it was a matter of opinion whether this counted as "transformational".

John Dodgson (retired) thought that surely we could at least get operating costs, fares and revenues right. Were these compared with the forecasts? There was also a need for an "ex ante evaluation report" (including a "Record of Assumptions") and a clear evaluation plan. He had been part of a team asked to evaluate John Prescott's Ten Year Plan but work was discontinued when they found that it was not working. **Andrew** said that POPE has feedback from the evaluation findings to the appraisal process, but was predominantly designed for much smaller schemes.

John Segal (Independent Consultant) asked what had happened to land values, particularly at Ebbsfleet and Stratford. **Andrew** pointed out that the recession had meant that these had only just lifted off, and that there might now be change of the scale originally envisaged.

Lynne Miles (Arup) had worked on the "What Works Centre for Local Economic Growth" sift of 500 evaluations down to 29, and was concerned about the over-reliance on primary data collection. Why had standard econometric techniques not been used, and would this not have been cheaper and quicker? **Andrew** noted that there is now an increasing focus on econometrics in evaluation, but this does require robust data collection from project start.

Dick Dunmore (Steer Davies Gleave) has worked on the original forecasting and had also prepared a proposal for the evaluation, which had emphasised the definition of the counterfactual. The decision to proceed with HS1 had been made around 1994, before rail franchising, which had led to a doubling of rail demand over the following 20 years. It could be argued that, without HS1, we might by now have relieved the south eastern approaches to London, in the same way that HS2 is intended to relieve the north western approaches to London, perhaps with a wholly new route, perhaps also offering high speed, perhaps to a node such as Ashford. Had we not built HS1, would current demand fit on the classic network, and what additional costs would have we occurred in the counterfactual? **Andrew** thought this analysis had been done

(but "not put as nicely as that") and that the analysis had got reasonably close to answering the question.

David Starkie (Case Associates) noted that in the Victorian era it was investors, not taxpayers, who took the risk on rail projects, whereas Andrew had identified subsidy of £4,380 million to Southeastern services. The IEA had looked at unemployment in east Kent, and reported around 18 months ago that HS1 had made little impact. **Andrew** said that there had been more commuting, but his "gut feel" is that the recession had knocked things off course. **Stephen Plowden** wondered whether pricing locals out of the east Kent housing market was a benefit.

Mark Sullivan had asked whether the study had distinguished the evaluation of international and domestic services, and about regeneration at Ebbsfleet. Andrew said that there had been no separate analysis, and that Eurostar's decisions on services, stopping patterns and pricing were relevant. **Dick Dunmore** pointed out that we tend to appraise projects on the assumption that fares will remain the same, and that quality improvements create consumer surplus, attract further demand, and add positive externalities, but then let commercial operators price up to take the benefits as a yield, rather than a volume, effect, with no externalities.

Chris Foster (former Non-Executive Director of BR) said that the feeling had been that the project was a bad idea - the domestic benefits were minor and the benefits of freight using HS1 were "an illusion" - but that it was wanted politically. Had it been built within budget? **Andrew** thought that the scheme had broadly been delivered to budget.

John Preston noted that Arup, TEG's hosts, had proposed the route which had been adopted, partly as a vehicle for regeneration. Had this occurred? Should we evaluate not only the scheme but also the processes, such as complementary planning? **Andrew** agreed that the latter was an issue, and that the planning system had reacted later than it should have done.

Pedro Abrantes (Urban Transport Group) noted that some infrastructure was very old and yet we were still benefitting from it. Were these benefits taken into account, and how

should we look at the very long term, whether by fixed multiples (of first year benefits), discounting or with a demand cut-off? **Andrew** agreed that HS1 would bring benefits well after 2069, the end of the appraisal period, but added "beware of survivorship bias". **David Starkie** agreed, and pointed out that pre-HS1 assets at North Pole depot, Stewarts Lane flyover and Waterloo International station all ceased to produce benefits after only 13 years' use.

Tom Worsley (ITS Leeds) asked whether the Kings Cross redevelopment was included in the evaluation: if so, the BCR of around 0.7 was "worrying". **Andrew** said this had been looked at, but it was hard to capture the benefits, and smaller schemes might have had a better collective effect.

Robin Morphet (UCL) asked if European funding had been treated differently in the evaluation. **Andrew** said that the EIB and KfW had provided loans, not grant, and that these had been repaid in full at the point of the sell-off.

Report by Dick Dunmore

Provision of market research for Values of Time Savings and Reliability

Professor Richard Batley, ITS, Leeds

Arup

23 March 2016

Introduction

The value of travel time (VTT) continues to occupy a prominent role in transport appraisal, but in recent years has been increasingly challenged. The current values for VTT in WebTAG were based on Stated Preference data collected in 1994. Since then there have been evident changes in socio-economic characteristics, travel behaviour, the quality and comfort of vehicles, technology, especially in respect of mobile communications, working practices and the ways in which people perceive travel time.

Since 2009, the Department for Transport (DfT) has taken steps to review the theoretical, methodological and evidential basis of its VTT guidance. In April 2014, it invited tenders for a new national VTT study. The contract was awarded to a consortium of Arup, ITS Leeds and Accent.

It should be borne in mind that travel time savings can account for up to 80% of the benefits of a major road scheme.

The objectives of the 2014/15 study were:

- To provide recommended, up-to-date national average values of in-vehicle travel time savings, covering business and non-work travel, and based on primary research using modern, innovative methods using willingness-to-pay using Stated Preference (SP) and Revealed Preference (RP).
- To investigate the factors which cause variation in the values – such as mode, purpose, income, trip distance or duration, and productive use of travel time - and to use these to inform recommended segmentation of the values.

- To improve our understanding of the uncertainties in these values, including estimating confidence intervals around the recommended values.
- To estimate consistently values for other trip characteristics for which values are derived from the values of in-vehicle time savings.

The scope of the study and method used as shown in Table 1.

Table 1: Study scope and method

Status	Mode	Journey purpose			
		Commute	Other non-work	Employee business	Employer business
Required	Car	SP	SP	SP	SP
	Bus	SP	SP		
	Rail	SP RP	SP RP	SP RP	SP
Optional	Walk and cycle	SP	SP		
	Other public transport	SP	SP	SP	SP

The rationale for the methodology was to focus primarily upon SP, but also to draw upon Revealed Preference (RP) data as a "validation' device.

In addition, a separate report was commissioned for Walking & Cycling.

The study was directed to use "willingness to pay" techniques for all journey purposes. It was noted that the use of willingness to pay for business entailed a potential shift from the "cost saving approach" (CSA) presently used by DfT for this purpose.

The draft final report was submitted on time, to a challenging work schedule of 11 months.

Methodology

Qualitative research was conducted in certain areas of the brief that were considered to involve particular challenges. The prior

qualitative research informed the design of the SP and RP experiments, while cognitive depth interviews tested the flow, comprehensibility and wording of the questionnaires. Pilot surveys were administered in two waves, involving testing of all data collection and analysis methods. The field survey involved a full "roll-out" of the data collection and analysis methods. All participants were offered a £10 incentive (an Amazon or Boots voucher, or a donation to a charity).

Generally speaking, there were three SP games:

- SP1 examined time versus cost.
- SP2 looked at time v cost v reliability.
- SP3 for car had time in different conditions v cost.
- SP3 for other modes had time v cost v crowding.

In addition a second SP3 game was used for non-car modes:

- Rail used operator choice based on time v cost v headway.
- Bus and "other public transport" used time in different conditions v cost v headway.

An example of SP1 for car would be respondents having to choose one of the following.

Table 2: SP1: time v cost

	Option A	**Option B**
One way fuel cost	£33.30	£35.00
One was travel time by car	4 hrs 23 mins	3 hrs 30 mins

For SP2 (time v cost v reliability for car) the user would be presented with a distribution of five travel times:

*Imagine that one five occasions you make the car journey **departing at the same time and on the same day of the week**. The actual journey time varies for the reasons suggested previously. We want you to think about the car journey and look at the two options below, each of which show five possible travel times that could arise.*

Table 3: SP2: time v cost v reliability

	Option A	**Option B**
One way cost	£28.00	£42.00
Usual journey time	3:46	3:20
Actual journey time	3:12	3:17
	3:30	3:18
	3:29	3:18
	4:19	4:22
	4:28	4:22

Table 4: SP3: time in different conditions v cost (car)

	Option A	**Option B**
One way fuel cost	£37.60	£42.00
Traffic conditions	1:45 in heavy traffic 0:11 in light traffic 2:53 in free flow	2:11 in heavy traffic 2:36 in light traffic 0:57 in free flow

Table 5: SP3a: time v cost v frequency (rail)

	East Coast	**First Capital Connect**
One way fare	£27.50	£13.50
One way time	0:45	1:23
Frequency	Every 15 minutes	Every 60 minutes

Table 6: SP3b: Time v cost v crowding (rail)

	Option A	**Option B**
One way time	3 hrs 54 mins	3 hrs 18 mins
One way fare	£18.00	£24.00
Crowding level when you board	Seated, 100% of seats occupied, eight people stood around each door	Standing, 100% of seats occupied, one person stood around each door

The SP designs were based upon the concept of Bayesian D-efficiency which, if used correctly, would give an unbiased value of time. Different games SP1-3 needed different designs, optimised for the specific values of attributes and priors of interest, with separate designs produced for non-work and business, and SP options "pivoted" around a recent "reference" trip, especially in relation to current travel time and cost.

Each game presented a respondent with five separate choice scenarios. In total, 315 different designs were produced for the study.

For the General Public SP survey, 80% of respondents were recruited by intercept (which tends to pick up relatively long journeys) and 20% by telephone (which tends to pick up relatively short journeys. The intercept locations were designed to cover all modes and purposes of interest, and were mainly in England but with some coverage of Wales and Scotland.

The RP survey intercepted rail travellers from Birmingham, Stoke, Stafford, Rugby and Peterborough to London. It covered all purposes, but in practice was skewed towards business.

The employers' business SP survey was a telephone survey of persons responsible for travel policy and/or planning within a company, subject to quotas on company size, industry grouping and region. The SP itself focused upon "briefcase" business travel, that is office-based for meetings rather than trade activities by the company's employees, and included car, bus and "other PT".

There were 8,623 responses to the general public SP survey, as shown in Table 7.

Table 7: Responses to the general public SP survey

	Employees' business	**Commute**	**Other non-work**	**Total**
Car	956	1,032	1,037	3,025
Bus		371	672	1,043
Rail	1,010	998	1,128	3,136
Other PT	265	614	540	1,419
Total	**2,231**	**3,015**	**3,377**	**8,623**

There were also over 2,500 responses to the RP survey and 400 responses to the employers' business survey, giving 11,500 responses in total. The response rate was 37% for the intercept-recruited respondents and 61% for the CATI-recruited respondents who were in-scope and recruited.

Stated Preference Modelling Approach

The data quality was checking prior to modelling.

A multiplicative (rather than additive) utility function estimated in "willingness-to-pay" space, that is

Utility = willingness to pay x random error

where willingness to pay is a function of the traveller, journey, design and other factors.

There was detailed covariate analysis where, all else being equal, time use, geography, current travel conditions and current road types were found to have little or no impact on VTT.

There was evidence of "size" and "sign" effects, although these varied in their nature and strength across modes, games and attributes (i.e. time and cost).

An integrated model of the three games was used.

Random heterogeneity was incorporated with a log-uniform distribution with no censoring.

The SP sample was not intended to be nationally representative. While estimated VTTs are not expected to be biased, a SP sample is not an appropriate basis for aggregating up to the population. To resolve this issue, the study employed a sample enumeration process, as follows:

- Calculation of appropriate valuations (of travel time, etc.) for each trip in the NTS sample, making use of the relevant covariates.
- Calculation of weighted averages (either distance or trip based) over the sample to ensure national representativeness against NTS 2010-12.
- The process was automated through development of an R-based "Implementation Tool".

Results

Table 8: Results

Distance	Commute by all modes	Other non-work by all modes	Employee's business				
			All modes	Car	Bus	Other PT	Rail
WebTAG							
All	7.62	6.77	25.47	24.43	15.64	24.72	30.07
Re-surveyed values							
All	11.21	5.12	18.23	16.74		8.33	27.61
<20 miles	8.27	3.62	8.31	8.21		8.33	10.11
20-100 miles	12.15	6.48	16.05	15.85		8.33	28.99
>100 miles	12.15	9.27	28.62	25.74		8.33	28.99

Notes: all figures are 2014 perceived prices in £/hour, distance weighted, "all distance" values based on income option 1, for distance-banded values non-work based on income option 2 (household income = £49,684) and business on income option 1, VTT imputed for PT trips with zero cost, SP1 VTTs, Δt=10, employers paying for EB trips, Tool version 1.1.

The "headline" VTTs in the table above are based on the valuations from the SP1 game.

Variations in these valuations, for different time-related travel conditions (such as reliability, crowding and traffic level) can be represented as "multipliers" of the VTT. Selected multipliers (for car and rail), given in the table below, are based on valuations from the SP2 and SP3 games.

Figure 1 overleaf summarises Table 8 in chart form.

Figure 1: Results

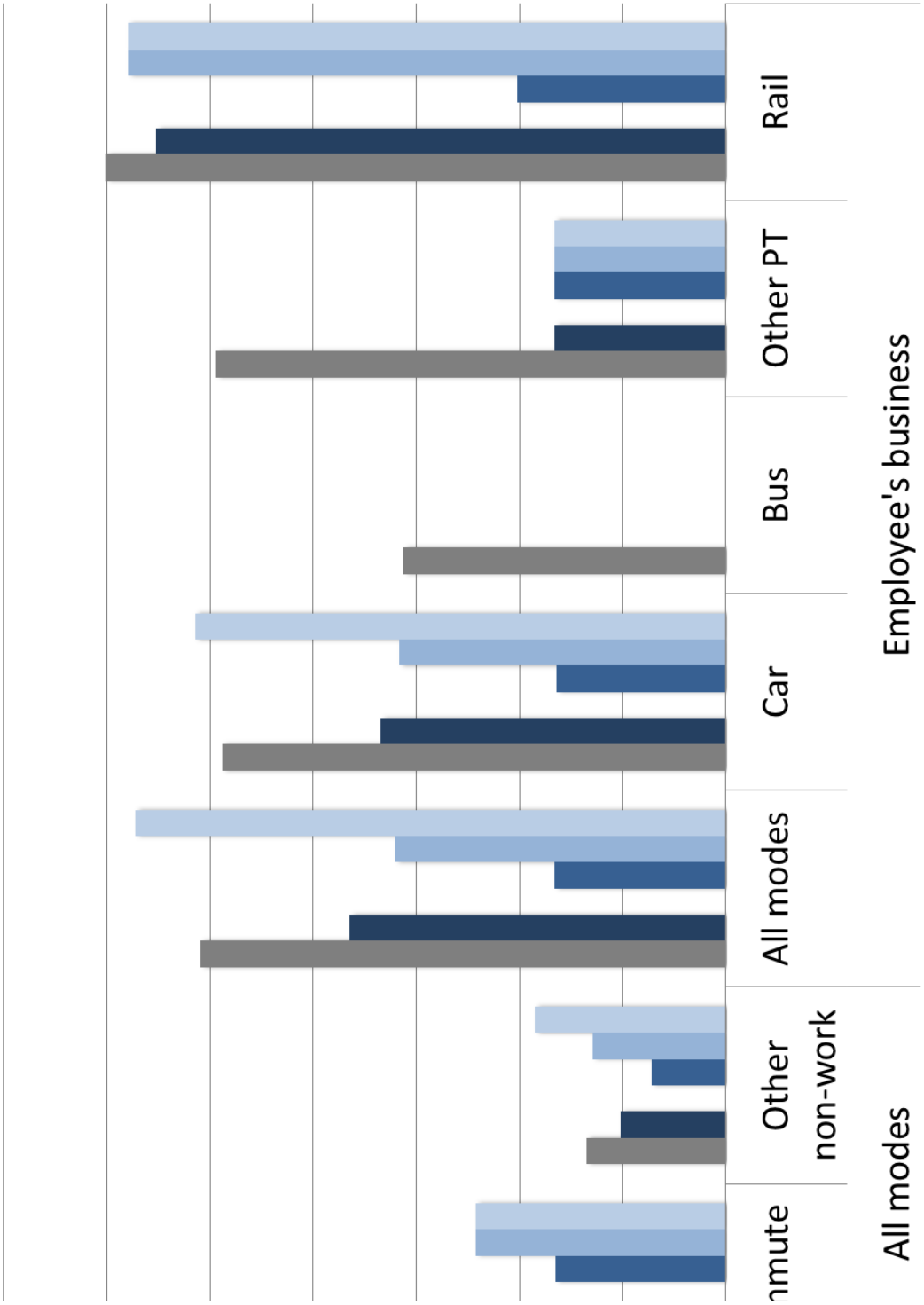


Table 9: Selected multipliers for reliability and crowding

Mode	Multiplier	Commute	Other non-work	Employee
Car	Reliability ratio	0.33	0.35	0.42
	Free-flow	0.51	0.47	0.42
	Light traffic	0.72	0.83	0.68
	Heavy traffic	1.37	1.89	1.26
Rail	Value of Early	-1.77	-2.34	-1.55
	Value of Late	2.86	3.21	2.76
	seated 50% load	0.73	0.72	0.75
	seated 75% load	0.79	0.72	0.76
	Seated 100% load	1.00	1.00	1.00
	seated 1 passenger/m^2	1.09	1.14	1.13
	seated 3 passenger/m^2	1.31	1.39	1.36
	standing 0.5 passenger/m^2	1.16	1.21	1.29
	standing 1 passenger/m^2	1.19	1.27	1.38
	standing 2 passenger/m^2	1.32	1.57	1.56
	standing 3 passenger/m^2	1.57	1.79	1.61
	standing 4 passenger/m^2	1.86	2.17	2.03

The Implementation Tool was developed in such a way that it outputs not only the mean VTT, but also the standard error of the mean and confidence intervals. It takes account of both estimation error and sample error.

95% confidence intervals were calculated based on distance-weighting. Broadly speaking, the models and associated VTTs were well-estimated. Confidence intervals for the VTT from SP1 were just below ±30% of the mean.

Figure 2 overleaf summarises Table 9 in chart form.

Figure 2: Selected multipliers for reliability and crowding

Note: Values of Early and Late have been excluded: see Table 9.

Results

General comments

SP1 provides the closest comparator to the 2003 game, and most readily lends itself to implementation in appraisal.

The empirical divergence between distance and trip weighted values was found to be modest, but distance is conceptually more attractive.

Income option (1) (averaging VTTs over income, but not segmenting by income) is generally recommended.

Income option (2) (calculating VTTs at "average" income) is applicable for non-work where VTT is distance-weighted.

Household income should be used for non-work travel and personal income for business travel.

The behavioural model accommodates size effects within its specification, so it is necessary to calculate appraisal values for a given "size".

There is a strong distance effect in VTTs, since longer trips are associated with higher reference times and costs.

There is clear evidence of values of reliability and of variation in VTT with traffic conditions and crowding.

There are significant differences between the VTT of different trip purposes, even after controlling for the characteristics of the trip and traveller.

Car VTTs are treated as representative of each occupant, not the vehicle as a whole.

The study reviewed arguments for the treatment of VTT over time.

Comments on non-work

For non-work trip purposes, the evidence is that the average VTT for "other" non-work is significantly lower than the average commuting value, all else being equal.

Differences in values across modes cannot be explained solely by comfort differentials.

Comments on business

For business users, professional drivers were outside the scope of the present study.

For briefcase travellers, there is a fair degree of correspondence between the employers SP survey and the much larger employees SP survey.

Employee values, when controlled to NTS incomes and trip lengths, are on average around 60% of the values in the CSA. This rises to 72% if this is restricted to travellers who are reimbursed for their trip.

Longer distance trips yield VTT close to the CSA, while short distance trips yield VTT well below it.

VTTs for car and rail from the employees' business survey are quite different.

Business values cover a wide range, and are sensitive to certain assumptions concerning the classification of business trips/travellers.

Postscript

In October 2015, DfT published the final report(s) at https://www.gov.uk/government/publications/values-of-travel-time-savings-and-reliability-final-reports

In October 2015, DfT published their own report assimilating the findings and proposing changes to WebTAG at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/470998/Understanding_and_Valuing_Impacts_of_Transport_Investment.pdf

In October 2015 to January 2016, DfT consulted stakeholders on the proposed changes to WebTAG.

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Discussion

Steve Lowe asked if the values were for appraisal or forecasting. **Richard** said that they were for the former, as specified in the remit.

David Starkie (Case Associates) asked about RP. The M6 toll road gives an insight into the reliability of SP. The terms of reference require an average value of time, but would this have a normal distribution or, as he suspected, a long tail? **Richard** replied that care is required with RP, and that much time had been spent on determining good survey locations. The study team had deliberately avoided toll roads, but noted that a DfT study of the M6 toll road had been published several years ago. Much thought had been given to finding appropriate routes for the RP, and the study team had undertaken exploratory research on various rail routes using Lennon data and pilot surveys. For the RP to be meaningful, it is necessary to know the times and costs for the non-chosen alternative (in this case, alternative rail operators). Ultimately, the use of RP was not entirely successful, as there were strong operator effects and consequent non-trading. As regards the VTT distribution, the decision was made not to censor the distribution: this is discussed more fully in the final report.

Peter White (University of Westminster) asked how multimodal trips were modelled, particularly feeder trips for rail. Had any work been done on this? **Richard** replied that the SP work focused on the mode/stage that a respondent was using when intercepted. **Peter** said that using a simple (unweighted) average may give the wrong answer. **Richard** commented that WebTAG specifies use of the value of time for the "predominant" mode, and this convention was adhered to when scaling up to national average values.

Nigel Harris (The Railway Consultancy) asked if the different images of the various train operators could have had an effect, and if there was a difference between corporate account users and those who were self-employed and paid their own fares. **Richard** replied that the work distinguished employed and self-employed, and that the latter had a much lower value of time. There is also the question of reimbursement, which was accounted for in the survey: it is important that the employee

acts rationally as an agent for his or her business. As for train operators, this was found to have a strong effect in the specific SP and RP exercises dealing with operator choice.

Pedro Abrantes (Urban Transport Group) commented that it was a well-written report, particularly given the time constraints that the study team faced. It asked many new questions. The effect of distance was interesting. There is also the question of the equity value of time: is there a correlation between the distance of a trip and the social demographic of those making it, and does this take us away from the equity value of time? **Richard** replied that the study did not specifically set out to discover distance effects, rather they came out of the survey, and yes, there was a strong correlation with socio-demographics such as income. He also noted that DfT had since refined the distance bands being used. On the issue of equity values, the study team had considered a range of income-weighting options including Green Book distributional weights, although these had not ultimately been implemented.

Jeremy Drew (independent consultant) said that many things change over 20 years, such as the way that people work. Was a decision made that the value of time was what people are paid? People now work differently, and someone may make up the time when they get home. **Richard** replied that there was a whole debate on this, and that DfT wanted the study to have a good look at the issue. How do people use their time, how does it affect productivity, and how would time saved be used? However, the study team did not detect a strong influence of these factors on the estimated VTT.

Jeremy also asked why the study did not exploit the estimated RP values. **Richard** said that, for the reasons mentioned above, the RP survey hadn't worked as well as the SP, and less confidence could therefore be invested in the RP values.

John Smith said that the speaker had noted changes in travel behaviour and conditions but that the results did not always show these: is this counter-intuitive, as can be seen the HS2 debate? **Richard** said that, relative to their respective WebTAG values, the value of time for the "briefcase" user was lower than for blue-collar: this may be indicative of the productive use of travel time. **John** also asked about how congestion and

reliability affect behaviour. **Richard** said that the SP2 and SP3 games were designed to capture these as separate effects, although the study team devoted some attention to the question of whether there was some overlap between these effects. There is discussion of this issue in the final report, but the key issues to note are that:

- The behavioural model estimated values from SP1-3 simultaneously.
- All multipliers were found to be significantly different from one.

This suggests that there are separate effects on the VTT arising from SP2 and SP3.

Dick Dunmore (Steer Davies Gleave) wondered if there was a different perception of reliability going to a meeting, or a flight at an airport, and travelling back after one. Has consideration been given to having two sets of values? **Richard** replied that the survey asked various background questions about the nature of the journey taking place, and this formed the basis of detailed analysis of variations in VTTs. This is discussed in the final report. With specific reference to airport access, this was excluded from the study scope at the outset.

Report by Peter Gordon

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The Transport Economists' Group, formed in 1973, provides a forum for people involved in transport economics to meet regularly and discuss matters of mutual interest. Membership is open to economists working in transport and others whose work is connected with transport economics.

The aim of the Group is to improve the quality of transport management, planning and decision-making by promoting lectures, discussions and publications related to the economics of transport and of the environment within which the industry functions.

Meetings, held at Arup's Central London HQ at 13 Fitzroy Street from September to June (except December), consist of short papers presented by speakers, drawn from both within the Group's membership and elsewhere, followed by discussion.

The Group's Journal, "The Transport Economist", is published three times a year reporting on meetings and other activities of the Group. It reviews recent publications of interest and contains papers or short articles from members. The Editor welcomes contributions for inclusion in the journal, and can be contacted at **petersgordon@blueyonder.co.uk**.

The current membership of over 150 covers a wide range of transport modes and types of organisation. Members are drawn from transport operators, consultants, universities, local and central government and manufacturing industry. All members are provided with a full membership list, updated annually, which serves as a useful source of contacts within the profession. Applications from people in all sectors are welcome.

Applications for membership should be made on a form which can be downloaded from the Group's website at **www.transecongroup.org**.

The Transport Economist | Volume 43, Number 1
Spring 2016

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