Assisting Decisions

Modelling the Impacts of Increased On-rail Competition Through Open Access Operation

Final Report - Redacted

Report for Office of Rail Regulation (ORR)

In Association With The Institute for Transport Studies, University of Leeds

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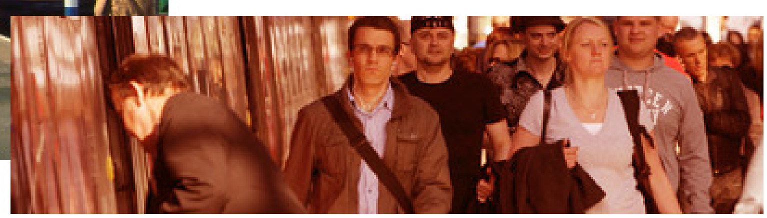

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Overview

This study assesses the likely impact that increasing the level of on-rail competition through Open Access operation on key routes could have for delivering passenger benefits and on the budget of funders, notably the Secretary of State (SoS).

The case for more competition in the rail passenger industry comes down to three questions:

- does on-rail competition lead to improvements, the benefits of which justify any increased costs?
- is on-rail competition more effective than competitive tendering in driving down industry costs?
- if further Open Access is deemed desirable, given that services will continue to be provided by competitive tendering, what is the most effective way to implement it?

In particular, our modelling sought to answer the first two bullets by testing the hypotheses that increased on-rail competition, through transfer of Franchise Operator (FO) paths to Open Access Operators (OAO), could deliver benefits to both users and non users, through reduced fares on competitive routes, decongestion both on the rail and highway networks, and deliver savings in cost to Government (CtG).

Experience of Public Transport competition in the UK

Our review of experience outside the rail sector, mainly in other public transport services (bus, coach and air), suggests there is evidence that competition "in the market" has worked well in long distance public transport, leading to lower fares, lower costs, better services and innovatory business models. However, it has been less successful in the local bus market, where there remains an argument that competition "for the market" has achieved similar cost reductions and better outcomes in terms of services. Whilst it may be argued that intercity rail services have more in common with air transport and express coach, parts of the market (shorter journeys, connecting passengers and passengers using walk-on fares) may have similarities with the local bus market.

Experience outside the UK of competition in the rail sector

A recent study for the EU (Everis Consulting, 2010) found evidence that railways which had liberalised access to passenger markets and where government control of the passenger market was limited, performed better in terms of patronage and subsidies than those where this was not the case. It concluded the best approach to be comprehensive competitive tendering of passenger services, with Open Access competition subject to regulatory control. Whatever approach to competition is taken, strong regulation, non discriminatory access to facilities, suitable arrangements for through ticketing and passenger information and low infrastructure charges were found to be important ingredients for success.

The rail industry in Britain

In Britain, virtually all rail passenger services were franchised by means of competitive tendering over the period 1996-7. While passenger demand and revenues was to outstrip all expectations, after an initial decline, the cost of train operations started to rise from the time of the Hatfield accident (October 2000). Despite there being ample evidence that increased competition tends to lead to lower prices and better services, competition for the market did not produce lasting reductions in costs per train km in passenger rail in Britain. There appear to be three possible explanations for this:

- rail was already efficient
- gains from increased competition were offset by other factors, such as loss of economies of scale, density and scope as a result of industry break-up
- the particular characteristics of the franchising process in Britain meant that the potential cost savings were not realised.

Whilst the disruption following the Hatfield accident may be part of the initial cause, it cannot explain the long run trend. Part of the reason for this rise appears to lie in the costs of new, high-specification rolling stock and other measures to improve customer service, for instance regarding reliability, punctuality and information, and externally determined causes such as fuel prices and insurance. Partly it was associated with the bailing out of FOs. FOs on management contracts or a negotiated franchise experienced an average 33% rise in costs per train km compared with 20% for other FOs.

A major issue seems to be the labour market, where wages rose above the national average, conditions were improved, and the impact of the requirement under TUPE that whoever wins the franchise takes over the existing company and staff.

Current Open Access operations

Currently OAOs are allowed to enter the market only if they are generating new traffic, rather than simply abstracting traffic from existing operators. To date only a small number of OAOs have entered the market, typified by offering differentiated products, with through services between London and cities not previously served by regular through trains, via core routes. On average, OAO walk-up fares are 10-30% lower than FO fares, often to compensate for the much lower frequency of operation. With regards to cost, the literature suggests that while OAOs may have scope to reduce elements of costs compared with FOs, this will be offset in part or whole by a loss of economies of density.

Study Approach

This study sought to answer the first two questions set out in the opening section of this summary. A model was developed to test on-rail competition scenarios that would allow conclusions to be drawn on the possible impacts on the WCML and ECML routes.

In order to test the hypotheses, we assessed the impact of increased on-rail competition under the following headings:

- alternative destinations
- journey times
- service quality
- fares
- improved service frequency
- crowding
- customer and market focus
- marketing.

Through serving new markets and encouraging mode shift from car and air, the effects of increased competition were also modelled to test the impact on a number of non-user benefits:

- safety and highway decongestion
- environmental
- reduced rail heading.

Our modelling of cost scenarios broke assumptions down into four key elements:

- as rail services become less dense costs tend to increase
- OAOs may be more efficient than FOs leading to lower costs
- in addition to being more efficient, OAOs might also have lower wages
- increased flexibility of the OAOs may allow costs to be lowered further by utilising shorter trains.

The Model

The model used to test our hypotheses was divided into the following modules:

- economic appraisal and output sheet
- demand and revenue, including crowding
- costs
- operator profit.

Services on the West Coast Main Line (WCML) and East Coast Main Line (ECML) were used as case studies. For both, various levels of competition were tested that sought to examine the impacts of transferring train paths from the FO to an OAO. The modelling was carried out in the following ordered steps to ensure consistency:

- selection of FO paths transferred to an OAO (paths to be given up by the FO were identified as those with the greatest CtG)

- selection of OAO destinations served
- fare competition
- FO fare sensitivity
- alternative Fixed Track Access Charge (FTAC) mechanisms.

Building on the options defined in the Terms of Reference (ToR), the following options were tested on the WCML**:**

- **Option 1:** Two fast train paths per hour transferred from the FO to an OAO
- **Option 2:** Four fast train paths per hour transferred from the FO to an OAO
- **Option 3:** Variations on Option 2, such as alternative destinations
- **Option 4**: for comparison, all train paths continue to be held by the FO, but the four paths with the greatest CtG are recast to maximise franchise value.

Using the results of the WCML options as a basis, tests on the ECML were altered to more specifically test the impact of OAO size and density:

- **Option 1:** Transfer of existing (December 2010) OAO paths from current destinations to new OAO destinations
- **Option 2:** As Option 1, with one additional fast train path per hour transferred from FO to OAO
- **Option 3:** Existing FO services split into two equally sized franchises
- **Option 4:** As Option 3, but with an OAO operating instead of the second FO.

Conclusions

This was a research study. It should be noted that the options tested as part of this study represent significant changes to the structure of the rail industry. The purpose of the study was not to derive a specific policy solution, but to explore different aspects of on-rail competition that move the debate forward.

Our key findings were that:

- on-rail competition, through increased OAO operation, could deliver benefits to passengers, mainly through lower fares
- on-rail competition is itself not necessarily a driver of reductions in industry cost
- recasting franchises could lead to savings in CtG through better differentiation of ‘commercial’ and ‘socially necessary’ services, but savings come at the cost of reduced user and non-user benefits
- significant reductions in industry costs could be achieved through re-specification of FO services which allow FOs and OAOs to operate at significant scale on specific parts of the network, and thereby receive economies of density
- FTAC mechanisms could be used to ensure excessive OAO profits are returned to Government to compensate for value removed from the franchise.

1 Introduction

1.1 Outline

1.1.1 The current franchising model has been grounded on the notion that competition for the market provides the best incentives for the delivery of high quality and efficient passenger train services in the UK. The limited application of on-rail competition suggests that it could have the potential to deliver cost savings as well as benefits to passengers.

1.1.2 The background to this study is the 'strong' evidence[1] to support the proposition that competition delivers benefits:

- more frequent, faster journey times for passengers
- higher passenger growth
- lower fares
- increases to passenger catchment areas for direct services to London.

1.1.3 However, these need to be set against the potential additional draw on Government funds, primarily through abstraction of franchise revenue, but also through the effect on Network Rail receipts of the current policy of Open Access Operators (OAO) not paying Fixed Track Access Charges (FTAC).

1.2 This commission

1.2.1 Using the East Coast Main Line (ECML) and West Coast Main Line (WCML) as case studies, the Office of Rail Regulation (ORR) commissioned this study to assess the impact that different scenarios of increased on-rail competition might have on the budget of funders, on passenger benefits and in socio-economic terms.

1.2.2 This was a research study. It should be noted that the options tested as part of this study represent significant changes to the structure of the rail industry. In particular, the following points have not been considered as part of this study:

- ease of implementation of each option both operationally and politically
- impacts on the franchising process
- roles of Government departments.

1.2.3 The purpose of the study was not to derive a specific policy solution but to explore different aspects of on-rail competition that move the debate forward. The study explored these aspects to enable decision makers to decide whether further resource should be allocated to consider possible implementation which was not within scope.

1.2.4 The study began by exploring the impact of competition in case studies within and outside the rail industry, which concludes by providing on-rail competition scenarios to be modelled.

[1] On Rail Competition Analysis, ARUP December 2009

A model was developed to test scenarios and allow conclusions to be drawn on the possible impacts on the WCML and ECML routes.

1.3 This report

1.3.1 This report is structured as follows:

- Section 2: Literature Review
- Section 3: Study Approach
- Section 4: Model
- Section 5: Methodology
- Section 6: Results
- Section 7: Conclusions.

2 Literature Review

2.1 Introduction

2.1.1 The aim of this review is to learn what we can from existing evidence on the effects of extending on-rail competition in the rail sector. In the next section we:

- present a brief review of relevant theoretical considerations
- consider relevant experience outside the rail industry, mainly in the bus and coach and air sectors
- consider the limited actual experience of on-rail competition both in Britain and elsewhere in Europe, and attempts to model on-rail competition and rail costs
- look at relevant literature on different approaches to Track Access Charging
- present our conclusions.

2.2 Theoretical background

2.2.1 Basic economic theory (such as that outlined in Motta, M 2004) suggests that competition will lead to a desirable outcome in which consumers wants are satisfied in the most efficient way possible. However, this outcome depends on a number of assumptions:

- that large firms do not have advantages in terms of lower unit costs than small
- that there are enough independent competitors that they cannot agree amongst themselves to push up prices
- that there are no effects of their decisions on third parties, for instance as a result of changes in levels of congestion or pollution.

2.2.2 Of course the failure of any of these assumptions does not prove that restricting competition is desirable, but does make its desirability a case-specific, potentially empirical, issue rather than one that can be settled on the basis of theory alone.

2.2.3 Very significant economies of scale can preclude the possibility of sustainable competition between many firms. Economies of scale are conducive to monopoly, or at least oligopoly. The analysis of situations of oligopoly, where there is a small number of interdependent sellers, has always been difficult, and a wide variety of game theory models with different assumptions about the reaction functions of the participants have been developed. Traditional theory has tended to conclude that the more sellers there are, the more likely the outcome is to approximate to that of a competitive market. More recently, emphasis has also been placed on the ease of entry and exit. If there are few barriers to entry and low sunk costs, then the threat of hit and run entry will ensure that even monopolists act as though there were effective competition or, in the presence of economies of scale, achieve second best optima subject to a breakeven constraint (Baumol and Panzar, 1982). It is this theory that has led to the view that in the public utilities, it is the infrastructure that is a natural monopoly, and needs ongoing regulation, whilst provision of services may be left up to a competitive market.

2.2.4 Is this true of public transport? Public transport has further characteristics which make this more problematic. Firstly, public transport – and rail operations in particular – are subject to economies of density. That is to say that, other things being equal, a particular level of output on a certain route is achieved more cheaply by a single operator than by two or more (Caves et al, 1987). Confusingly, the rail cost literature tends to refer to this phenomenon as economies of density, but in the usual textbook sense it is an economy of scale, as it refers to what happens to costs as more of the same output – seat kilometres between particular origins and destinations - is produced. In what follows we will follow the usual convention of the literature, which is to regard economies of scale as resulting from a larger overall size of company and economies of density as resulting from increased output on a particular route. The simple explanation for this is that a single operator can achieve higher load factors and/or operate larger vehicles or longer trains. However, even if this is not the case, and the operator simply operates more frequent services, then a second form of economy of scale comes into play, the so-called Mohring effect (Mohring, 1972). This reflects the fact that as more services are operated, passengers on high frequency routes have to wait less time at the station or bus stop; on lower frequency services where passengers plan their journeys, they are more likely to be able to get a service when they want it, or in other words schedule delay is reduced. Thus the economies of scale are experienced by users facing a lower generalised cost of travel (and therefore included in the valuation of passenger benefits) rather than by the operator facing lower unit costs. Now the Mohring effect can still hold when services are provided by a variety of operators in markets where users either book for a specific service (as with air services and advance purchase tickets on-rail) or can buy inter-available tickets valid on all operators. However, even in these circumstances the fact that services are spread between operators may mean that an optimal timetable from the point of view of the passenger is not provided. Indeed there is reason to suppose that operators may indulge in 'schedule – matching': clustering services at particular departure times rather than achieving an ideal spread (Hotelling, 1929). There is evidence that a well planned and integrated timetable offering regular interval services and good connections can considerably enhance traffic, revenue and benefits (Johnson et al, 2006). This study suggests that the services of existing franchises are not well co-ordinated, and it is likely that OAOs will have more incentive to seek prime slots rather than pursue overall timetable quality.

2.2.5 As noted above, economies of scale do not necessarily create a problem in terms of leaving services up to a free market, provided the market is contestable, or in other words there are minimal entry and exit barriers. To what extent factors such as track capacity constraints, lack of appropriate rolling stock and shortages of skilled staff impose such constraints is open to debate: clearly these constraints are more significant in rail than in road transport, but perhaps are more comparable to the situation regarding air transport (although as will be seen below, new entrants into the air transport sector have been able to get round capacity constraints by using secondary airports. There are severe limits in terms of the quality and capacity of track and station capacity on secondary routes in the rail sector).

2.2.6 There is a form of competition which it is argued may preserve the benefits of economies of scale whilst driving out inefficiency and – depending on how this is achieved – give incentives to improve service quality, namely competition for the market in the form of competitive tendering for franchises (Demsetz, 1968). The big advantage of this approach is that it is consistent with maintaining unprofitable but socially desirable services, either by direct subsidy or by cross subsidy within a franchise. Even inter city rail services play a significant role in terms of commuting into large cities and providing the only service between some smaller towns (including via connecting services). Given that this form of competition is already in place for virtually all British rail passenger services, the case for more competition in the rail passenger industry comes down to three questions:

- does on-rail competition lead to improvements, the benefits of which justify any increased costs they involve?
- is on-rail competition more effective than competitive tendering in driving down industry costs?
- if further Open Access is deemed desirable, given that services will continue to be provided by competitive tendering, what is the most effective way to implement it?

2.2.7 This study contributes further to the debate by assessing the impact that different scenarios of increased on-rail competition brought about by increased Open Access operation might have on:

- user and non-user benefits
- total industry revenues and costs
- cost to Government (CtG).

2.3 Experience from outside the rail sector

2.3.1 The next section contains a brief review of experience outside the rail sector, mainly in other public transport services (bus, coach and air).

2.3.2 During the 1980s, in Britain most utilities – including telecommunications, gas and electricity – were liberalised. The result was generally the emergence of a number of competitors, reductions in costs and reductions in prices for consumers (see for instance Domah and Pollitt, 2001). However, this process was associated with privatisation, and with stronger regulation of the remaining monopoly elements of the industries, so it is not clear that these outcomes were simply the result of increased competition. Moreover, these industries do not necessarily have the specific characteristics of public transport (economies of density and the importance of the timetable) referred to above. In this section we will therefore concentrate on other modes of public transport, notably the bus and coach, and air transport sectors.

Bus and coach services

2.3.3 Until 1980, bus and coach services in Great Britain needed a route licence, and generally these were limited to one operator per route. For express services, the dominant operator was part of the state-owned National Bus Company. But in that year long distance coach services were completely deregulated. There was an immediate entry by a consortium of private coach operators, British Coachways, offering much lower fares on key routes, but National Express retaliated with similar measures, and remained dominant in the market (Robbins and White, 1986). It was concluded that there were major barriers to entry, particularly in the form of the National Express network of coach stations and ticketing outlets. Despite the continuing dominance by a single operator, the continuing threat of competition was strong enough to change radically its behaviour. The outcome for passengers was better services with lower fares on trunk routes, but reduced frequencies, higher fares and in some cases complete loss of service on less well used routes. The

National Express dominance remained until the last ten years, when a major new entrant emerged in the form of a Stagecoach subsidiary, Megabus. Megabus modelled itself on low cost airlines, relying on operation from on street stops and the use of yield management systems and internet booking. (Robbins, 2007).

2.3.4 In 1986, local bus services were also deregulated outside London, and the publically owned bus companies were largely broken up and privatised. Within London, London Transport's buses were similarly broken up and privatised, but in London all routes were contracted out by means of competitive tendering, whereas outside London operators were free to decide which services they would provide commercially (i.e. without direct subsidy), leaving local authorities to secure socially desirable "missing links" through tendering.

2.3.5 Thus both UK local bus market sectors were exposed to competition, albeit in two contrasting forms. In London and on subsidised services elsewhere competition was for the market through competitive tendering. For most services outside London there was at least the threat of competition in the market, although the proportion of the route network over which competition actually took place was never large. A key change between the last financial year before deregulation (1985/6) and the last year of the Conservative government (1996/7) is that the majority of services, which in 1985/6 were subsidised became operated on a purely commercial basis, and fares therefore had to rise. Even where different operators served the same route, fares competition was limited and often shortlived (as indeed was on-road competition itself, most often culminating in a takeover or withdrawal of one of the competitors). Given that most passengers would take the first bus to reach their stop, bus companies regarded high frequencies as a better competitive weapon than fares, and schedule matching (where two rivals schedule their buses to depart at the same time), was common. It has been argued that on-road bus competition will have a natural tendency to lead to a combination of too high fares and too high service levels (Evans, 1987). Nevertheless, evidence that fares were not raised to profit maximising levels given the known price elasticities of demand suggests that the threat of competition did have some moderating influence on fares.

2.3.6 In Table 2.1 (Nash, 2008), it will be seen that both forms of competition succeeded in driving down costs very substantially. Although the figure quoted here may be somewhat exaggerated by the fact that some functions – e.g. provision of bus stations and bus stops and information – often remained with local authority organisations including Passenger Transport Executives in the big cities, by the exclusion of the costs of the tendering process itself and by the spread of minibuses in the new regime, there is no doubt that the cost reduction was substantial and was achieved by a mixture of reduced wages and conditions and genuine productivity improvements (Heseltine and Silcock, 1990). However, this was at a time of recession, when driving down labour costs – which account for two-thirds of bus operating costs – was not as difficult as in later years. By the time of rail privatisation the economy was booming, and in any case labour costs are a much smaller proportion of the total for rail than for bus.

Table 2.1 Changes 1985/6 to 1996/7 in real terms

	London	Rest of GB
Cost per bus km	-45%	-46%
Bus km run	+25%	+26%
Fares	+38%	+27%
Passengers	+8%	-31%
Subsidy*	-£275m	-£484m

Source: Transport Statistics GB, Department for Transport, London quoted in Nash (2008)
*2004/5 prices

2.3.7 In terms of their impact on passengers, both forms of competition were accompanied by big real fares increases and big increases in bus kilometres run. In London this was a deliberate decision of the public authority, but elsewhere it was the product of the market. Thus although costs per bus mile were greatly reduced, the increase in bus miles led to a fall in load factors which left cost per passenger mile little changed. Given the simultaneous withdrawal of subsidies from the majority of services, which became operated on a purely commercial basis, fares therefore had to rise. Even where different operators served the same route, fares competition was limited and often shortlived (as indeed was on-road competition itself, most often culminating in a takeover or withdrawal of one of the competitors). Given that most passengers would take the first bus to reach their stop, bus companies regarded high frequencies as a better competitive weapon than fares, and schedule-matching, was common. It has been argued that on-road bus competition will have a natural tendency to lead to a combination of too high fares and too high service levels (Evans, 1987). Nevertheless, evidence that fares were not raised to profit maximising levels given the known price elasticities of demand suggests that the threat of competition did have some moderating influence on fares.

2.3.8 However, the big difference is that, whilst in London there was a modest growth in the number of passengers, elsewhere it continued its rapid decline. A number of reasons for the different demand trends have been put forward. London enjoyed a buoyant economy, a low increase in car ownership, introduction of multimodal travelcards, free fares for elderly and disabled and of course in terms of density, levels of congestion and difficulty, and cost of parking might be thought to provide much more favourable territory to run buses even than other cities, let alone more rural areas. However, the most thorough statistical analysis of the data, by Fairhurst and Edwards (1996) concludes that while the trend in demand in London is explicable by the combination of external factors, fares and levels of service, demand in the rest of the country fell well below that expected from these factors. The most obvious explanation was that this was due to the lack of integrated planning of services, meaning that the increase in bus kilometres was uncoordinated, accompanied by extensive duplication (copying of specific bus routes by competitors), and did not work to improve services to the same extent as the increases in London.

2.3.9 By the time Labour took over government, in 1997, the situation had already changed from that immediately post deregulation. Immediately post deregulation, the break up and sale of the National Bus Company (and the Scottish Bus Group in Scotland) meant that there were no large companies in the business, although there could still be dominant operators at the local level. By 1997, a succession of takeovers had led to the industry being dominated again by a small number of large companies (in 2005 three companies provided more than 50% of bus kilometres –Table 2.2). Five operators provided 90% of mileage in PTE areas and there was little competition between them (NERA, 2006); and in many areas there was a virtual monopoly (i.e. market concentration in a UK context is less relevant – you could have a less concentrated UK market but still have local monopolies). Secondly, in order to reverse the decline in patronage, a number of local authorities and bus operators had formed voluntary 'quality bus partnerships'.

Table 2.2 Bus Industry Market Shares (2005)

Operator	Bus Industry Market Share
First Group	20.9%
Stagecoach	16.3%
Arriva	14.3%
Top Three Groups	**51.6%**
Go-Ahead	9.8%
National Express	6.0%
Smaller Groups	6.2%
Employee Owned	0.0%
Management Owned	4.9%
Publicly Owned	6.2%
Other	14.5%

Quoted in Nash (2008)

2.3.10 What has happened over the period since 1997? Table 2.3 shows that outside London the lower level of costs has been sustained. In London they have risen, but given the scale of the increase in services perhaps this is not surprising. In London fares have been held almost constant in real terms. Elsewhere fares have continued to rise and services to decline: nonetheless the loss of passengers has greatly slowed. In London however passengers have grown by nearly 50%, albeit at the cost of a much greater growth in subsidies than elsewhere.

Table 2.3 Changes 1996/7 to 2005/6 in real terms

	London	Rest of GB
cost per bus km	+18%	+2%
Bus km run	+36%	-8%
Fares	+5%	+21%
Passengers	+47%	-10%
Subsidy*	+£557m	+£156m

Source Transport Statistics GB, Department for Transport, London

*to 2004/5; 2004/5 prices quoted in Nash (2008)

2.3.11 Why the changes in trends? Outside London, the growth of Quality Bus Partnerships and more public and private investment have certainly been factors. There have been some success stories in the deregulated market (Oxford, York, Brighton etc) where the combination of a local authority prepared to give strong bus priorities and to control car parking with operators willing to invest in good services has led to growing traffic. Within London, there has been continued economic prosperity, strong action on bus priorities and the introduction of road pricing in Central London. However, White (2008) analyses the period up to 2005/6 and suggests that these factors by no means explain all the difference between London and elsewhere: again the integrated planning of the network, providing a stable network of high frequency services in London seems to have won over the market approach elsewhere. Since, 2005/6, revisions to concessionary fares have led to growth in patronage in all areas, whilst fares in London have increased faster than elsewhere. With service levels little changed, and a further rapid rise in subsidies, patronage has still increased faster in London than elsewhere.

2.3.12 Thus experience of the bus and coach industry does suggest that competition may have a dramatic effect on costs, but that in this regard competition for the market is as effective as competition in the market. In the coach sector, competition had dramatic effects on fares and services, with most passengers gaining, but some on lesser used parts of the network losing out. The bus sector shows more evidence of the lack of integrated network planning leading to poorer performance of on-road competition than competitive tendering, although this finding remains controversial.

2.3.13 The other industry which shares many of the characteristics of rail transport is air.

Air industry

2.3.14 The air industry was deregulated in the US in 1978, with the result that there was a major reduction in fares and increases in frequencies on trunk routes: some less used routes lost services (except where they were explicitly subsidised) but generally these were still served via hubs, as hub and spoke networks were developed (Button, 1991).

2.3.15 Air deregulation was not completed in Europe until 1997. According to Coles (2004), the effect was also a major reduction in fares, but in general, the number of routes and choice of carrier increased. A particular feature of air deregulation has been the emergence of low cost airlines. Their growth was rapid and the impact on passengers significant. By 2003, low cost airlines had taken 24% of the UK international market and 32% of the domestic market. They had led to an average reduction of 75% in cheaper fares, in which traditional airlines had been forced largely to match them, and contributed to an increase in number of flights of 78%. Air, like long distance rail and coach, but unlike local bus services, is a market which is highly sensitive to price, so the effect of these changes was undoubtedly a large increase in passenger numbers and also revenue.

2.3.16 The key to the success of the low cost airlines was of course their lower costs. They generally started with minimal unionisation and offered lower wages and longer working hours than conventional airlines. They also cut costs by undertaking ticket sales and issuing boarding passes on the internet, by not providing free food and drink, by fast turnarounds at airports and by serving smaller cheaper airports. It was reported at the time they were first set up that their costs were only half those of traditional airlines, although traditional airlines have since themselves cut costs by adopting many of the practices of the low cost airlines. Whilst not all of these cost saving measures are available to OAOs in the rail industry (for instance, free on board refreshments have never been the norm in the rail industry, FOs already make extensive use of the internet and the availability of cheaper stations and routes is limited), a key issue for later consideration is the possibility that Open Access entrants in the rail industry have significantly lower costs than FOs.

2.3.17 Low cost airlines particularly target point to point (as opposed to connecting) trips in the intra European leisure market (Castillo-Manzano, 2010) and operate with high load factors and low frequencies (in 2006, 97% of Ryanair services operated once per day or less in each direction – Malighetti et al, 2009).

2.3.18 Thus there is evidence that competition has worked well in long distance public transport, leading to lower fares, lower costs, better services and innovatory business models. However, it has been less successful in the local bus market, where there remains an argument that competitive tendering has achieved similar cost reductions and better outcomes in terms of services. Whilst it may be argued that intercity rail services have more in common with air transport and express coach, parts of the market (shorter journeys, connecting passengers and passengers using walk on fares) may have similarities with the local bus market.

2.4 On-rail competition in practice

2.4.1 This section will review on-rail competition in three sections. Firstly we consider the role of Open Access competition in Britain. We then turn to competition in Britain between overlapping franchises. Finally we will look at the very limited examples of on-rail competition elsewhere in Europe.

2.4.2 In Britain, OAOs are allowed to enter the market only if they are generating new traffic rather than simply abstracting traffic from existing operators. Generally the regulator expects generation to be at least 30% of the level of revenue abstracted from existing operators. Thus the small number of OAOs to come into the market offer differentiated products, with through services between London and cities not previously served by regular through trains, via core routes. The two OAOs currently providing competing services with FO services within Great Britain are Hull Trains which operates from Hull to London and Grand Central operating from Sunderland and Bradford to London. They provide a small share of long distance train services, although they are important in serving specific origin/destination pairs. These OAO services compete with the FO, East Coast Trains, at a number of stations including York, although they are not permitted to call at some stations such as Peterborough and (in the case of Grand Central) Doncaster. Wrexham and Shropshire Railway operated direct trains between Wrexham and London Marylebone from 2008 until recently, but have now ceased operating due to persistent losses.

2.4.3 Griffiths (2009) considers the impact of Open Access competition of Hull Trains and Grand Central. He finds that on average, OAO walk-up fares are 10-30% lower than FO fares (Table 2.4), and some evidence to suggest that where there is Open Access competition, FO's average fares have grown at a slower rate. Passengers also benefit by through services to destinations otherwise requiring a change of train, and there is a high level of satisfaction (Hull Trains, 93%, Autumn 2010) with OAOs amongst passengers, suggesting that they perform well in other areas such as on board services (for instance, they sell a full range of tickets on board, whereas franchisees typically only sell full fare tickets on board).

Table 2.4 Comparison of OAO and FO fares (£ September 2009)

Fares to/from London	FO (based on super off peak return)	OAO (based on off peak return)	OAO reduction
Hull Trains			
Hull	85	69	18%
Doncaster	72	59	18%
Grantham	44	39	11%
Grand Central			
Sunderland	105	71	32%
York	84	61	27%

(Source: Griffiths, 2009)

2.4.4 OA services have a large impact on demand at the stations that they serve. Since the introduction of Hull Trains, the market between London and Hull has grown by more than 60%, the market between London and Borough has more than doubled and the market between London and Selby has also grown. However in Grimsby and Lincoln which are of similar distances from the ECML, demand has grown by only 10%. ORR believe that Grand Central's entry, providing three return services to Sunderland, led to revenue abstraction of around £4-6 million per year (2003-04 prices). This would have had a direct impact on the profitability of the FO and will at least in the long run, impact on government through its effect on the level of franchise bids. Economic appraisal showed substantial economic benefits for Hull Trains (£47.3m in 5 years and £96.9m in 10 years) and slightly lower but still large benefits for Grand Central services (£18.4m in 5 years and £38.2m in 10 years). These benefits include user benefits from improved services and lower fares, reduced overcrowding as a result of the provision of additional capacity, and reduced external costs from road and air transport as passengers are diverted to rail. Thus, there appears to be a strong economic case for both Hull Trains and Grand Central services as the ten year benefit cost ratio is in excess of 1.5 for both services (MVA, 2009). By contrast, other applications for services to Harrogate and Scotland showed negative social returns. More recent work shows a similar pattern for the West Coast Main Line, with some proposed OA services providing good value for money and others not (MVA, 2011).

2.4.5 Competition can also arise through overlapping franchises – for instance, competition between London and Birmingham takes the form of three FOs providing differentiated products in terms of speeds, fares and quality of service. Virgin is the main operator, running high frequency tilting trains between London and Birmingham with few intermediate stops. London Midland offer slower stopping services, but compete with Virgin on southern parts of the West Coast Mainline. Chiltern also operate slower services but by a different route. Another example is Cross Country and East Coast Trains, which offer direct competing services between Doncaster and Edinburgh. On the southern part of the East Coast Main Line, First Capital Connect run stopping services to London from Peterborough, also calling at Stevenage which compete with those operated by East Coast Trains.

2.4.6 Comparing the change in service frequencies and fares for a sample of competitive flows since privatisation, Jones (2000) also found that the presence of on-rail competition led to lower than average increase in nominal fares and higher than average increase in train service frequencies. Arup (2009) confirmed this result with more recent data. It is perhaps surprising that competition between such small numbers of players (two, or at the most three, per route) should have such a pronounced effect on fares: this may suggest that the entrants have significantly lower unit costs than the incumbent, or that they see themselves as predominantly in niche markets where they can cut fares without leading to an outright price war.

2.4.7 Glass (2004) also describes the case of vertical product differentiation between Ipswich and London. Before Great Eastern and Anglia FOs merged with West Anglia services to form the Greater Anglia franchise, competition existed on the Ipswich-London route between Anglia and First Great Eastern. Anglia was lead operator on Ipswich-London flow, whilst First Great Eastern was lead operator on Colchester-London and Chelmsford-London flows. It was reported that there had been some 'tit for tat' game playing as when First Great Eastern increased its off-peak Ipswich-London service frequency, Anglia responded aggressively on the Chelmsford-London flow in order to abstract some revenue back. Passengers benefitted from competition on this route as service levels had increased and cheap dedicated tickets were sold. Anglia and First Great Eastern used different rolling stock (loco-hauled carriages as opposed to electric multiple units) therefore they were also competing on quality. Arup (2009) argue that passengers lost out as a result of merger of these franchises, although the new franchisee did rearrange service patterns to provide through trains to London from points which did not have them during the competitive regime.

2.4.8 As commented above, other than Britain, only Germany has real experience of Open Access competition. Germany was the first country in Europe to completely open up the market for new entry of commercial services in 1994, although would-be entrants were faced with a strong incumbent in the form of Deutsche Bahn (DB), which provided all long distance train services, stations, depots and infrastructure. Seguret (2009) reports that Open Access competitors' market shares are only 0.6% of train kilometres and 0.2% of passenger kilometres. No train operators launched their own services until 2000. Out of the 10 Open Access competitors that set up services for long distance travel, only 4 are still in operation today. Some reasons for the failure of those train operators were reported to be low load factors, slow speeds and the high cost of rolling stock. It is also the case that track access charges for entrants in Germany are higher than in Britain. The Open Access competitors currently in operation are all in the eastern part of Germany, and mostly share resources with franchised regional operations. Seguret reported that except for the night train (Berlin-Malmo) as it could only be compared with day trains, the incumbent DB's competitors were always cheaper, generally half the price as illustrated in Table 2.5. It was found that even customers with an incumbent discount card (50% off normal price) would pay around the same price as the competitor's most expensive ticket. The travel times of the entrants are typically a lot slower than those of the incumbent.

Table 2.5 Comparison of services operated by the current DB competitors (2009)

Product	Line	Km	Travel time		Cheapest / normal price*		Price difference with DB
			Competitors	DB	Competitors	DB	
Inter Connex	Leipzig – Berlin	169	1h25	1h20	12€ / 20€	21€ / 42€ ICE	-50%
	Berlin – Rostock	226	2h30	2h18	12€ / 20€	24,50€ / 49€ ICE	-55%
Vogtland - Express	Plauen – Berlin	326	4h30	3h15	24,7€ / 29€	23€ / 56€ ICE/RE	+5 to -50%
	Chemnitz – Berlin	229	3h10	2h35	21,3€ / 25€	26,5€ / 53€ ICE/RE	-20 to -50%
Harz-Berlin-Express	Vienenburg - Berlin	252	3h41	2h30	9,50€ / 15€	26 / 57€ ICE/RB	-70%
	Thale - Berlin	232	3h35	3h00	9,50€ / 15€	23,5€ / 47€ ICE/RE	-65%
Berlin Night express	Berlin – Malmo	277 DE + 105 Ferry + 35 SE	8h50 (night train)	7h35 ICE/RE (Day train)	88€ / 250€	71€ / 141€	+25 to +75%

*2nd class, adult alone over 27. DB cheapest price with BahnCard 50 (discount card costs 225€) Source: Seguret (2009)

2.4.9 In October 2009, a new entrant Hamburg - Köln Express GmbH (HKX) announced they would operate intercity services between Hamburg and Köln (Cologne) with three daily services each direction, but this was postponed due to the difficulty of securing paths: it is now expected to start running in the summer of 2011.

2.4.10 Van de Velde (2005) reports on the unsuccessful case of the Lovers Rail competitor, which applied in 1996 for permission to operate between Amsterdam and Haarlem, adding 2 services per hour to the 6 services per hour already run by the incumbent operator NS Reizigers. Even though Lovers Rail made some service innovations, a major disadvantage was the lack of integrated ticketing with NS Reizigers, as most passengers had some form of NS Reizigers travelcard which meant that in effect using NS services on this route cost them nothing extra. Therefore they had no incentive to use the new service. Lovers rail made heavy losses and ceased operation in early 1999. There has also been some niche market entry into international night services operating from the Netherlands, but these do not directly compete with other operators.

2.4.11 With the liberalisation of international rail passenger services in January 2010, competition is threatened on a number of routes (e.g. Amsterdam/Frankfurt – Brussels – London, and Milan – Lyon – Paris), but has not started operating yet. There is a limited amount of competition already (for instance, DB operates four trains per day each way between Frankfurt and Brussels which compete with Thalys between Brussels and Cologne) and there are some small scale entrants operating now in Italy, but the most dramatic development there will be the entry of a new high speed operator competing head-on with Tren Italia with similar frequencies between the major cities next year.

2.4.12 A recent study for the EU reported on a range of options including complete Open Access competition, complete competitive tendering and various mixtures of the two (Everis Consulting, 2010). It found evidence that railways which had liberalized access to passenger markets (by means either of franchising or Open Access, but in practice there was little Open Access competition and the main competition was via franchising), and where government control of the passenger market was limited, performed better in terms of patronage and subsidies than those where this was not the case. It concluded the best option to be comprehensive competitive tendering of passenger services, with Open Access competition subject to regulatory control, as in Britain, although it did not find strong evidence for preferring one approach to passenger market liberalization over another. Whatever approach to competition is taken, strong regulation, non discriminatory access to facilities, suitable arrangements for through ticketing and passenger information and low infrastructure charges were found to be important ingredients for success.

2.5 Modelling on-rail competition

2.5.1 Much of the work modelling on-rail competition has used the PRAISE model. PRAISE is a model designed to simulate the effect of competition between operators. It predicts the impact of changes in fares and services on the overall volume of rail travel and on its share between operators, by simulating the decisions of a sample of individuals choosing between combinations of individual trains and ticket types, in the light of their preferences regarding departure time, values of time and levels of crowding.

2.5.2 Preston et al (1999) first used PRAISE to address the issue of competition in the market through OAOs, based on a case study of a busy inter city route in Britain, linking two major cities with substantial commuting at either end. They looked at four possible scenarios for duopolistic on-rail competition, including:

- **Cream Skimming**: Here it is assumed that the entrant is able to "cherry pick" peak services without the obligation to operate possible loss-making services in the off-peak
- **Head-on Competition**: In this scenario it is assumed that the entrant matches the service frequency of the incumbent. Each operator is assumed to operate alternate trains throughout the day
- **Price War:** A natural development to head-on competition and it is assumed the entrant is the price leader
- **Service Quality:** Finally, they examine quality competition by examining the prospects for a slow but cheap service running on a parallel route.

2.5.3 They conclude that entry based on cream skimming and fare reductions is profitable, but does not increase overall welfare. In practice, it is to be expected that such cream skimming would be forestalled by the incumbent who would provide its own additional services. In their case study they estimate that the FO can broadly double its service frequency and still break even.

2.5.4 They find that head-on competition is not always feasible for the entrant. Exceptions to this are where the entrant is only charged for the marginal cost of infrastructure provision and where the entrant discounts fares in the short run - both of which result in a reduction of economic welfare in the case study examined. By contrast competition in terms of service quality, by providing a lower quality lower price alternative in the peaks, is feasible. In these circumstances, the entrant could capture a significant market niche, namely early morning non-business travellers. With fares at 50% of those of the FO, the parallel entrant could capture 25% of the rail market. They also find that there are likely to be commercial incentives for the introduction of non inter-available tickets leading to a loss of network benefits. There may also be scope for quality competition in the form of slower but cheaper services.

2.5.5 Overall the work suggests that on-rail competition can increase benefits to users but may reduce welfare because of reductions in producer surpluses. The work does not consider costs in detail assuming entrant and incumbent have the same variable costs, and also does not consider overcrowding.

2.5.6 Similar work in Sweden (Preston et al, 2002) modelled the effect of competitive scenarios for two lines, one a high frequency intercity service and one a low frequency intercity service. Two service options were examined – where an entrant matches the services of the incumbent (head-on competition) or only runs one train in each direction in peak periods (fringe competition). The modelling assumed tickets were not inter-available, and options were tested where either the OAO matched the FO's fares, or sought to undercut them. In the latter case the FO might either keep its original fares or match the lower OAO fares.

2.5.7 This work found that with lower Track Access Charges (TAC), head-on competition was commercially feasible on the busiest routes although it might be capacity constrained. Such competition was not desirable as it led to too much service at too high fares. On less busy routes, welfare was maximised when there were substantial fare reductions and modest service reductions. Any scenarios involving profitable fringe competition on the less busy lines were on peak periods and reduced welfare.

2.5.8 Whelan (2002) presented a meta-analysis of model runs undertaken to determine reaction functions. The results of this work indicated that, under the current access regimes, head-on competition was not commercially feasible, even with available capacity. Cream skimming based on peak times and directions of travel or niche entry through various forms of product differentiation could be commercially feasible. Preston (2009) concludes that based on these model results, competition is likely to take the form of oligopolistic competition, with too much service at too high fares, but also spatial and temporal bunching.

2.6 Train operating costs

2.6.1 On-rail competition may affect train operating costs in two ways. Firstly, the increase in competition may lead to greater efficiency. Indeed, in other contexts, even the threat of competition has had an impact on restraining the incumbent (see for example Nash, 1993 and Domberger et. al., 1987). The key issue here is the extent to which competitive tendering for franchises has already led to cost minimisation on behalf of existing train operators. Secondly, more on-rail competition is likely to lead to the presence of smaller operators, and to the division of services on particular routes between a larger number of different operators. The issue here is whether this will lead to a loss of economies of scale or density. We consider each of these issues in turn.

2.6.2 In Britain, virtually all rail passenger services were franchised by means of competitive tendering over the period 1996-7. The outcome was that, after an initial decline, the cost of train operations started to rise from the time of the Hatfield accident (see Table 2.6) both in absolute terms and per train-km (see also Affuso et. al, 2003). This is in contrast to the experience of other European countries, where it appears that substantial cost reductions have been sustained (Alexandersson 2009). Whilst the disruption following that accident may be part of the initial cause, it cannot explain the long run trend (Smith et. al., 2010). Part of the reason for this rise appears to lie in the costs of new, high-specification rolling stock and other measures to improve customer service, for instance regarding reliability and information, and externally determined causes such as fuel prices and insurance (diesel prices doubled between 2000 and 2006, though these represent only about 5% of FO costs). Partly it was associated with the bailing out of FOs who had put in bids that proved to be too ambitious. By 2001 around half of all FOs had been placed on management contracts, which typically continued for a few years or had their franchises renegotiated.

Table 2.6 Changes in FO costs

(£m, 2005/06 prices)	1996/7	1999/2000	2005/06	2007/08
All FOs				
Staff costs	[]	[]	[]	[]
Rolling stock leasing costs	[]	[]	[]	[]
Other*	[]	[]	[]	[]
All	[]	[]	[]	[]
Average salary £	[]	[]	[]	[]
Headcount	[]	[]	[]	[]
Passenger train-km (m)	[]	[]	[]	[]
Passenger-km (bn)	[]	[]	[]	[]

* Note: A comparable breakdown for 2007/08 is not available. Note also that, as discussed in Smith et. al. (2010), the post-2005/06 data is less reliable. However, whilst the scale of the cost reduction may therefore be in doubt, the direction of costs (downward) is still clear. Sources: FO Annual Accounts; National Rail Trends; Network Rail

2.6.3 Smith et al. (2009) and Smith and Wheat (2011) find strong evidence that this process weakened cost control, leading to a sharp deterioration in efficiency. Over the period 1999/2000 to 2003/4, FOs on management contracts or a renegotiated franchise experienced an average 33% rise in costs per train km compared with 20% for other FOs. Smith and Wheat (2009) found that FO sector total factor productivity fell sharply after 2000 (following some initial improvements) and ended up in 2006 at roughly the same level as in 1997. More recent work (Smith and Wheat, 2011) paints a more pessimistic picture, with even the best performing operators (the efficiency frontier) seeing a cost rise due to falling productivity of 14% over the period 1997 to 2006. It was also found that by 2005/06, the bulk of the inefficiency resulting from the management contracts had been driven out by competitive re-franchising. Even so, on average, FOs in 2005/06 were 14% away from the frontier, and West Coast in particular, 18% away from frontier (bearing in mind that the frontier itself had deteriorated since privatisation). Though the data is less clear cut after 2005/06, the evidence suggests that FO costs have stabilised, though not reduced since 2005/06 (see Smith et. al., 2010) and ORR (2010)[2].

2.6.4 However, a major issue seems to be the labour market, where wages rose fast, above the national average, and conditions were improved, including the widespread adoption of a 35 hour week (Smith et. al., 2010). Between 2000 and 2008, FO staff wages grew in real terms by 23%, as compared with the real economy wide average earnings increase of only 9% over that period (see AECOM, FCP and ITS, 2010). At the time of privatisation, many training schemes were wound down, and the new private companies relied more on recruiting staff from their competitors than on training their own. It appears that the combination of rapidly rising output, shortages of skilled staff and relatively short franchises (combined with the performance penalties resulting from disruption) led to a situation in

[2] Presentation to the Transport Economists' Group (TEG) by the Value for Money Team, November 2010.

which the trade unions were able to achieve substantial gains by negotiating improvements with the more profitable FOs, which the less profitable then had to match if they were to retain sufficient staff to meet their obligations. Labour productivity also fell over this period (2000 to 2008), although in 2008 it was still higher than at privatisation, in part reflecting increased traffic levels rather than necessarily improvements in working practices (see AECOM, FCP and ITS, 2010).

2.6.5 Nash and Smith (2010) also note that under TUPE, whoever wins the franchise takes over the existing company and staff (with the exception of senior management) at their existing wages and conditions, so – unlike in other European countries, where staff had the opportunity to remain with the incumbent, and new entrants were responsible for recruiting their own staff - there is no scope for a new entrant coming in with lower labour costs except for OAOs. Glaister (2006) points out the difference between the experience of franchising in rail and bus de-regulation in Britain, with wage rates falling sharply in the bus industry, in contrast to the passenger rail case. He argues that downward pressure on wages in the rail sector is reduced by the stronger commitment by government to the maintenance of rail service volumes and performance compared with bus, and also by the relative ease with which new bus drivers can be trained, relative to train drivers.

2.6.6 With respect to economies of scale and density, the general rail literature emphasises the importance of economies of density in the rail sector. Specifically, in the FO sector, Smith and Wheat (2009), Wheat and Smith (2010) Smith and Wheat (2011) all find cost elasticities with respect to train density (train-km per route-km), holding load factors and route-km constant, of less than unity (0.75, 0.89 and 0.78 respectively). These papers also found broadly constant returns to scale.

2.6.7 The following chart, taken from the model used in Smith and Wheat (2011), indicates that the economies of density are not exhausted over the range of train-densities in the sample of FOs used to estimate the model (which was all franchised FOs excluding Island Line). This chart is constructed by holding the values of all variables in the model at the sample mean and allowing only train density to vary within the ranges of the actual data. The way in which this relationship has been used in the modelling work is described in section 2.9.

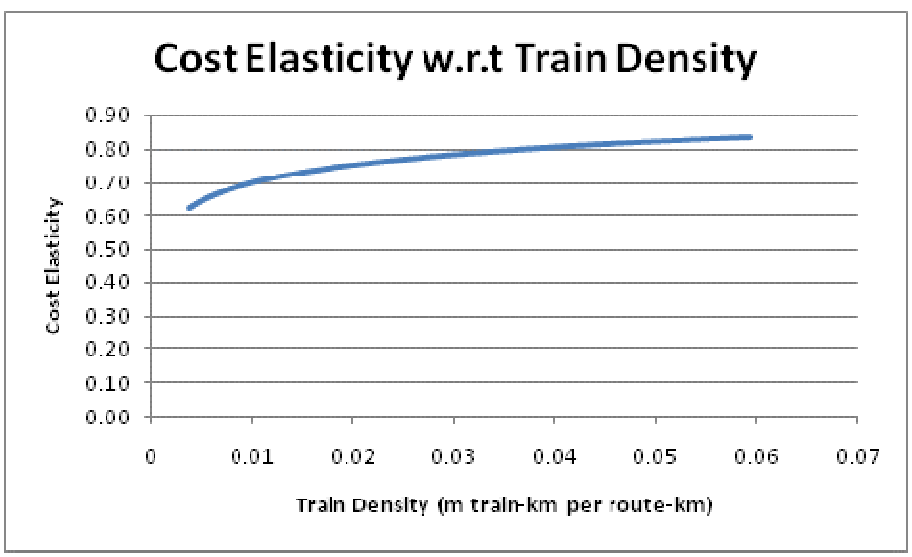


Figure 2.1 Cost elasticity with respect to Train Density

2.6.8 The policy implication here is that having fewer, larger companies would not reduce unit costs (or conversely, unit costs would not rise in the case of having more, smaller companies). However the strong returns to density suggest that dividing the services on a particular route between different companies may raise costs, for instance, by requiring some duplication of facilities, by reducing opportunities to schedule rolling stock and staff in the most efficient way and by requiring additional reserves. The more different operators work together to share resources the less of a problem this is likely to be (it is noted that the only OAO in Britain to date to show a profit, Hull Trains, started life sharing resources with Anglia, and then became part of First Group). Of course, the extent to which economies of density can be gained (and thus lost) will depend on the extent to which inputs can be shared across services. This will be location and service specific.

Evidence from the costs of existing OAOs

2.6.9 Table 2.7 compares the costs of the existing West Coast franchisee with those of three OAOs – Hull Trains, Grand Central and Wrexham and Shropshire. It will be seen that of these only Wrexham and Shropshire achieves costs per train kilometre substantially less than those of the existing FO, but this is with trains only half as long. Simply halving the rolling stock costs of West Coast would bring its costs down to of the order of £11.5 per train km; allowing for the other costs of operating longer trains might therefore make the costs similar. In terms of costs per vehicle km, the shorter trains of the OAOs lead to higher costs in all cases. Given higher load factors, OAOs might look more favourable in terms of cost per passenger kilometre, but it is our concern here to consider how Open Access competition influences the cost of providing a given train service: the modelling work will itself model patronage and hence load factors. It should be noted that the OAOs are much smaller than franchised operators and have much less dense services. Even the smallest franchisees (Merseyrail and C2C) operate at least 6m train km per annum, compared with the range of 0.8 to 1.4m for the OAOs, and they are suburban operators with much higher density operations.

Table 2.7 Unit Costs by Operator 2009/10

Unit costs	West Coast Trains	Hull Trains	Grand Central	WSMR	Chiltern Railways	East Coast
FO own costs (excluding access charges) (£ millions)	[]	[]	[]	[]	[]	[]
Train-km (millions)	[]	[]	[]	[]	[]	[]
Vehicle-km (millions)	[]	[]	[]	[]	[]	[]
FO own costs per train-km	[]	[]	[]	[]	[]	[]
FO own costs per vehicle-km	[]	[]	[]	[]	[]	[]
Train-length (vehicles)	[]	[]	[]	[]	[]	[]
Route-km	[]	[]	[]	[]	[]	[]

Figure 2.2 HT and ECT Costs per vehicle mile (excluding Track access)

2.6.10 Figure 2.2 also shows how Hull Trains and East Coast Trains costs per vehicle km have changed over time. These higher costs per vehicle km are not simply a product of shorter trains, but also of lower density. The Smith and Wheat (2011) model finds economies of density of the order of 0.8 at the sample mean, so taken at face value this might mean that going from 5 trains per day to, say, 24 trains per day might reduce unit costs by 25%, and to 240 trains per day by more than 50%. However, we are not comfortable with applying these elasticities to OAO costs in this way, as OAOs lie way outside the range of the data on which the elasticity was estimated, (moreover we are not sure how far Wrexham and Shropshire gains economies of density by its relations with Chiltern Railways). However, this does illustrate the point that any cost economies they achieve could easily be outweighed by the costs of running at low densities.

2.6.11 One other point from the data is interesting. Average salaries of OAOs are lower than those of the franchisee by 6-18%. Whilst the mix of staff employed by OAOs may differ from that of FOs, we would suspect that the larger numbers of station staff employed by the latter would tend to depress average salaries, so this may be an under estimate. Reducing West Coast staff costs by 18% would lead to a 5% reduction in its total costs. This tends to suggest that any gains from freeing operators from the constraints of existing salaries might be rather modest. There might be additional benefits from reduced staffing levels or hours of work. On the other hand, it may be doubted whether a major expansion in Open Access operation could be achieved without increased salaries to attract the necessary staff.

2.6.12 As noted above, previous econometric work of FO costs carried out by ITS has indicated significant economies of density (carried out on FO costs as whole, excluding access charges; see Smith and Wheat, 2011). In separate work done by ITS for the Department for Transport (DfT)[3], significant economies were also reported for a sub-set of FO costs, namely

3 Smith, A.S.J. and Wheat. P.E. (2011), DfT NMF TOC Econometrics: Final Results, Report for the Department for Transport, February 2011.

other costs, defined as total FO costs, less access charges, less rolling stock capital lease charges. It can thus be viewed as other costs, including non-capital lease costs. The model related the measure of costs against a range of cost drivers, including train hours, train length, train speed, passenger load and variables reflecting different types of rolling stock. The elasticity on the key output measure, in this case, train hours, was 0.78, indicating that costs rise less than proportionately in line with train-hours.

2.6.13 In summary then, we would expect OAOs to be able to achieve some economies not achieved by FOs on issues such as wages and conditions of staff, although this might be limited by the shortage of staff with appropriate skills. However, this might be offset by a loss of economies of density where services on a particular route are divided between different operators.

2.7 Infrastructure charges and on-rail competition

2.7.1 Currently, in Britain, TACs comprise a usage charge per vehicle km differentiated by the type of rolling stock and designed to cover wear and tear on the track and a congestion charge which varies by time of day and location. FOs also pay a fixed charge, but given that they are awarded the franchise on the bid level of Franchise Payment, it is reasonable to conclude that this fixed charge simply passes straight through to the taxpayer in the form of a reduced premium or an increased subsidy. Where a premium is paid, this cannot be taken to be a sign of excess profits, as about half the costs of the infrastructure manager are paid by government grant. This premium may therefore be seen as a contribution to the fixed costs of the system, over and above those fixed costs actually allocated to individual FO.

2.7.2 If an Open Access entrant reduced the profitability of a franchise, then one would expect that in the long run the taxpayer will bear the cost through changes to Franchise Payments; and indeed if that entry is foreseen at the time of franchising (for instance as a result of a change in policy on Open Access) then that will happen at the time of franchising. To the extent that the threat of Open Access entry adds uncertainty to franchise bidders, it may also increase the complexity of the bidding process, discourage bidding and lead those who do bid to increase the risk margin associated with their revenue line to their bids thereby reducing premia or increasing subsidy.

2.7.3 Thus it may be reasonable to consider that an OAO should make a contribution to the costs of the infrastructure, replacing in part or whole the lost contribution from Franchise Payments. There is a variety of ways in which this may be done. The simplest would be to divide the relevant cost in proportion to the number of paths each operator is allocated. But this fails to reflect the fact that the value of a path varies by time of day. Inevitably peak paths will be more valuable than off peak paths, so the number of peak paths used should be given higher weight than off peak paths in the allocation. But is it possible to say how these weights should be determined? The literature offers several different approaches.

2.7.4 One often advocated way of finding the value of paths to different operators is simply to auction them (Cave and Wright, 2010). Presumably incumbents would bid in terms of the value to the franchise of retaining paths (including any loss of revenue should they fall into the hands of competitors), and entrants would only gain them if they paid more than this. However, note that auctioning will not necessarily achieve a socially efficient outcome because the value of a path to an operator is not a good measure of its social value (including benefits to users and externalities). It is also complex, as the value of a particular path to an operator depends on what other paths that operator has, and what paths its competitors have. There is some experience of auctioning of slots at the margin in aviation, although most slots are allocated by grandfather rights. Nilsson (2002) argues that a feasible approach would be to ask operators to bid on the basis of their willingness to pay for their preferred paths, and the discount they would want per minute of adjustment earlier or later, and to allow them to change their bids when they see the outcome. However, this would remain a complex process, potentially subject to many iterations, and is perhaps more feasible for allocation of a small number of paths left after a franchising process than as a way of designing the complete timetable.

2.7.5 Nilsson advocates second price auctions, essentially on two grounds. Firstly a second price auction gives incentives for bidders to reveal their true valuation, whereas in a first price auction bidders have an incentive to bid strategically according to what they think the competition will be, in order to reduce the amount they actually pay. Secondly, a second price auction results in the successful bidder paying effectively the opportunity cost of the path to the next highest bidder. However, if the aim were to achieve a maximum contribution to infrastructure costs, then a first price auction might be preferred: indeed selling slots at less than what private companies bid for them might lay the government open to severe criticism.

2.7.6 A second approach in the literature is through the introduction of scarcity prices. It has been advocated that these might sensibly be based on the opportunity cost in terms of loss of franchise value produced when the paths are taken away from the franchisee.

2.7.7 Charging for paths according to the opportunity cost of paths being used by the FO would mean that entrants would only provide new services if the benefits to them exceeded the loss in franchise value, but note again that there may be a big difference between the profitability of services and their net social benefits, so this will not of itself necessarily achieve a socially optimal use of slots. Johnson and Nash (2008) used PRAISE to examine the feasibility of identifying an appropriate charge which would make operators pay for their use of rail capacity in line with the opportunity cost of the use of these slots. Whilst this work was constrained to looking at a handful of services due to the prohibitively large run times involved, recent developments in the software implementation of the PRAISE model using MATLAB now means the model runs much faster. This allows estimation of the value of paths throughout the day. In Johnson et al (2009), this is done by separately removing eleven individual southbound services from Leeds to London to the FO and an additional four services from Hull to London. The improved PRAISE model also facilitates the accurate implementation of the impact of overcrowding on the network. The results found that the opportunity cost of slot varies as would be expected from negative during the daytime inter peak period to £1,500 in the shoulders of the peak and £3,500 in the peak. This could form the basis of a tariff of reservation charges by time of day. A more serious issue is that the revenue to the train operator substantially understates the social benefits of the services. For capacity charges to have the correct incentive effects, subsidies would need to be given to operators to reflect these benefits.

2.7.8 However, scarcity charges would not produce a contribution to infrastructure costs where there is not a shortage of capacity. If it is desired that the entrant should completely make up for any loss of contribution to infrastructure costs, then what is really needed is a charge based on the estimated loss of profits to the incumbent (or in this case loss of franchise value), in accordance with the efficient component pricing principle (Baumol, 1983). This is not easy to estimate, but should be possible to achieve with the information available to the regulator.

2.7.9 Thus we end up with the following list of mechanisms:

- As now, with the OAO paying nothing towards fixed infrastructure costs
- OAO paying a share of total FTAC in accordance with their share of paths
- OAO paying a share of fixed costs in accordance with their share of weighted paths, with additional weight attached to peak paths. As an extreme case, all the weight could be attached to peak paths, so that their share of fixed costs was based simply on their share of peak paths
- OAO paying according to their willingness to pay for the path(s), in terms of revenue minus operating costs minus variable track access charges minus a normal profit margin
- OAO paying the loss of franchise value resulting from their taking the path(s).

2.8 Conclusions and scenarios for testing

2.8.1 There is ample evidence that increased competition tends to lead to lower prices and better services, and this conclusion applies to rail passenger services. Typically both OAO and FO cut price when competition emerges, frequencies improve, direct services are offered to a greater range of destinations, and on board services may improve. The result is not just user benefits but also external benefits as passengers are attracted from car and air. The only major counter example to this favourable outcome is the local bus sector, where deregulation went hand in hand with continued increases in real fares as cost reductions were offset by reduced subsidies, increased services and lower load factors. Moreover, there is evidence that in local buses, lack of coordinated timetables and fares led to increases in services being less effective under free competition than under franchising. While intercity rail has some flows of traffic (particularly shorter distance traffic, passengers connecting with other services and passengers who do not book in advance) which may be comparable to local bus services, arguably it is more like air and express coach, where the usual pattern of competition leading to lower fares and improved services (at least on trunk routes) was found.

2.8.2 There is some evidence from coach and air that competition drives out cross subsidy and leads to cuts in less profitable services. To the extent that this is prevented from happening in the rail sector due to Franchise Agreements, another consideration kicks in. Existing FOs pay FTAC and a premium for the franchise or receive a subsidy (the Franchise Payment). Further, to the extent that increased competition makes them less profitable, in the long run increased on-rail competition will lead to changes in the Franchise Payment. Thus there is a trade off between the benefits to passengers and society at large of increased competition and the costs to taxpayers. Whilst previous studies suggest that existing OA services enjoy benefit cost ratios of at least 1.5, other proposed OAOs which were more abstractive and less generative would have yielded negative returns. This provides some justification for the existing ORR policy.

2.8.3 On the other hand, the existing policy may lead to conflicts between ORR and DfT. Whilst it may be argued that the current Open Access provisions do provide for the possibility of operators coming up with ideas DfT had never thought of, they also provide the possibility of ORR accepting services that DfT had rejected already. Thus they may be said to involve the ORR in 'second-guessing' decisions of DfT about services and effectively spending the taxpayers' money, which is not usually seen as an appropriate role for an independent regulator.

2.8.4 Regarding costs, there is evidence from other sectors that entrants usually have lower costs, and that this may in turn force the incumbent to cut costs. Most of this evidence arises from situations where a former public sector monopolist is replaced by private competitors. The British rail passenger sector is already in the hands of private companies who have won franchise competitions by means of competitive tendering. It might be expected that this process would already have driven out inefficiencies in train operations, and there is evidence from the bus sector that competitive tendering has achieved as much in reduced costs as on-road competition.

2.8.5 But in Britain, unlike in other European countries, having reduced in the early years of competitive tendering, train operating costs are now higher than under British Rail. Various explanations for this have been given, but a significant factor seems to be the form of franchising, in which franchises are relatively short, and winners take over an existing company with its staffing, wages and conditions. Thus FOs have little incentive to stand up to the demands of the unions: they make losses in the short run and do not gain from lower costs in subsequent franchising competitions. Only if the government undertakes to bear the costs of the dispute (as certainly happened on one occasion during the time of the Strategic Rail Authority) is resistance likely to be stronger. By contrast, in other countries, franchisees are free to recruit their own staff at their own wages and conditions (although an agreement in Germany will impose minimum salary levels from Feb 2011 and thus reduce this cost saving). Whether this problem with the British approach to franchising will be overcome by the current reforms in the franchising process, including longer franchises, remains to be seen. If not it may be concluded that Open Access entrants, who are not tied to existing wages and conditions for staff, may have lower costs, but this will be limited by shortages of appropriately skilled staff, and may be offset by loss of economies of density (there is good evidence that having two or more operators over a particular route adds to costs compared with a single operator).

2.8.6 If it is desired to avoid Open Access competition reducing the profitability of FOs (and therefore increasing the cost of the rail system to the government), there are a number of ways of going about this. These include the introduction of scarcity charges or the auctioning of slots (but these measures are only effective where capacity is scarce, and do not necessarily lead to a socially optimum use of capacity), or requiring the entrant to pay a share of the FTAC. Theoretically, the optimal solution is to implement the efficient component pricing rule, whereby the entrant would compensate the incumbent for loss of profits: to do this accurately is very demanding in terms of information, but should be possible in the context of British rail passenger services given the information on demand and costs available to the regulator.

Operating cost scenarios

2.8.7 The purpose of this section is to put forward alternative train operating costs scenarios, based on the evidence of the literature, a fresh examination of the costs of existing OAOs and the Smith and Wheat (2011) train operating cost model.

2.8.8 There is ample evidence from other sectors that competition promotes efficiency (e.g. OFT, 2007) both in terms of a once for all improvement and by means of an increased trend to efficiency improvements over time. Cave and Wright (2010) also point to this same evidence in their discussion of the impact of greater competition in the rail sector. However, it is not clear from this evidence that competition in the market has any greater impact than competition for the market, which of course is highly relevant to the debate here. The evidence from the transport sector quoted in the literature review shows cost reductions of up to 46% in the bus industry and 50% in airlines, although these generally combine the effects of deregulation and privatisation. Also, in both cases these reductions include the effects of fundamental changes to the business model (e.g. the switch to minibuses and reductions in responsibility for bus stations, bus stops and information in the bus sector, and the switch to low cost airports and online ticket sales in air) which we do not think have equivalents, to the same extent, for UK rail. For bus, it has also been noted that conditions were favourable for reducing labour costs because of recession, and that these comprise a much greater share of total costs than for rail.

2.8.9 In the case of the bus industry, the change was from publicly owned monopolies to privately owned competitive industries. In air transport, although some countries including Britain had private operators, before deregulation most routes were essentially operated as a cartel: there was limited competition and there is ample evidence that even private operators become more efficient when faced with competition.

2.8.10 Moreover, the experience of the bus industry was that competition for the market in the form of competitive tendering gave similar cost savings to competition in the market. Since passenger rail is already privatised and subject to competition for the market, one might therefore expect that potential cost savings have already been achieved.

2.8.11 As we have shown, competition for the market did not produce lasting reductions in costs per train km in passenger rail in Britain. There appear to be three possible explanations for this:

a) rail was already efficient

Unlike the bus industry, British Rail had already been subject to strong downward pressure on costs in the 1980s, although to a degree costs rose again in the early 1990s. Some studies (e.g. Oum and Yu, 1994) showed British Rail to be on the efficiency frontier at the end of the 1980s, although of course this was a frontier composed of state owned monopoly rail companies, and other railways on the frontier, such as Sweden, have since achieved substantial efficiency gains. Typical savings from competitive tendering in Sweden and Germany are of the order of 20-30% (Alexandersson, 2009), and this matches the experience of other sectors such as health and refuse collection (e.g. Domberger et al, 1986; Domberger et al, 1987). It may thus reasonably be thought that scope for further cost savings should have been possible, perhaps of the order of 20-30%.

b) gains from increased competition were offset by other factors, such as loss of economies of scale, density and scope as a result of industry break-up

As noted in the literature review, there is little evidence of economies of scale in rail operations, but strong evidence of economies of density, suggesting that there would be some penalties from franchising passenger services as a number of separate franchises, but given limited degree of overlap, it would not seem likely that this would be a major explanation. A number of studies have also found costs involved in separating infrastructure from operations resulting from a loss of economies of scope (e.g. Bitzan, 2003; Ivaldi and McCullough, 2001). However, most of these relate to the US, and the sample therefore only includes vertically integrated railroads, so in part the result may be because where these railroads are carrying out low levels of infrastructure maintenance and renewal, infrastructure is being neglected rather than, as in Britain, maintained by a third party. Growitsch and Wetzel (2009) find significant diseconomies from separation of infrastructure and operations in Europe, but their study presents a static cross section comparison and does not allow for the impact of differences in geography or rail policy, and consequently in the volume and nature of the traffic on costs. Whilst it has often been concluded that transaction costs would be a major disadvantage from vertical separation, Merkert (2009) concludes that whilst these are higher in vertically separated railways, the difference would only account for around 1% of rail system costs. By contrast, the most recent study (Cantos et al, 2010) does fully allow for differences in the nature of the traffic by introducing traffic density and mean train loads into a second stage regression of the efficiency scores, and finds productivity growth to be faster when vertical separation is combined with increased competition. Thus we would dismiss the view that costs arising from the restructuring process were a major factor in explaining the failure to reduce train operating costs.

c) the particular characteristics of the franchising process in Britain meant that the potential cost savings were not realised

We have already given reasons in the literature review for thinking that this might be the case, and that therefore OAOs might be able to achieve lower costs than FOs, particularly in terms of wages and conditions of staff. Broadly this is because, with relatively short franchises, and with successor franchisees committed to taking over the company with its existing wages and conditions under TUPE, there is no scope for entry into the franchise market by a company with poorer wages and conditions. The situation has been made worse by the number of negotiated management contracts and renegotiated franchise, and with competitive rebidding, on longer franchises, some of these inefficiencies should be driven out. At the same time, there have been shortages of skilled staff. The result is that wages have risen in the rail industry faster than in the economy as a whole, and at the same time output per member of staff has fallen, partly due to the spread of the 35 hours week. AECOM et. al. (2010) also found rail salaries to be around 20% higher in Britain than in Germany and Sweden (though 25% lower than in the Netherlands). However, when looking only at passenger train operating companies, there was very little difference. There was some, albeit weak, evidence to suggest that rail industry salaries are higher comparable occupations in other sectors of the economy. Large scale Open Access entry might impact also on the costs of FOs, since they would presumably wish to compete for the slots available on the Open Access market as well. On the other hand new entrants certainly will suffer from diseconomies from lower train density, and may be forced to pay higher salaries to obtain the staff to expand. The best test of these two effects comes from the examination of the costs of existing OAOs in the next section. It is also interesting that whilst Hull Trains and Wrexham and Shropshire may benefit from shared resources as a result being part of a larger group, they also come under pressure towards standardisation of wages and conditions: this is not true of Grand Central. Comparisons within the set of OAOs may therefore also be of interest, although we realise that we are now dealing with a sample of one in each category.

2.8.12 Thus we conclude from the literature review that OAOs may have scope to reduce elements of costs compared with FOs, but that this will be offset in part or whole by a loss of economies of density.

2.9 Modelling scenarios: costs

2.9.1 In this section we explain how the literature review informs our modelling scenarios. For transparency we break down our scenario assumptions into four elements:

- the impact of (loss of) economies of density following open-access competition
- the extent to which OAOs are more efficient than franchised operators, thus impacting on open-access operator costs and, in turn, franchised operators (indirectly via competition)
- the extent to which, in addition to being more efficient, open-access operators might also have lower wages (and the introduction of new entrants with lower wages may also impact on franchised operator wages)
- the extent to which OAOs may bring lower costs by utilising shorter trains (recognising that franchised operators are currently restricted in this regard by their franchise agreements and that shorter trains might not necessarily be the right solution, particularly where there is a shortage of capacity). In some circumstances, however, this greater flexibility amongst OAOs could bring additional savings to those resulting from the other categories noted above.

Modelling assumptions on economies of density

2.9.2 The general railway literature for vertically-integrated railways tends to suggest strong economies of density in rail operations. For the FO sector, Smith and Wheat (2011) estimate the elasticity of cost with respect to train-km, holding the route structure constant, to be 0.78 (evaluated at the sample mean). This elasticity is similar across other studies done by the same authors, including analysis carried out for the DfT for individual cost categories[4], with the maximum elasticity being found in work done by Wheat and Smith (2010) of 0.890. An elasticity of around 0.80 appears therefore to be a consistent finding across this literature. Further the evidence does not suggest that these economies are exhausted at the sorts of densities achieved within the kind of variation observed within the British FO sample. It is thus reasonable to expect costs to rise, other things equal, when services currently run by one operator are divided up between multiple operators.

2.9.3 Of course the extent to which economies of density can be gained (and thus lost) will depend on the extent to which inputs can be shared across services. This will be location specific. A

4 Smith, A.S.J. and Wheat. P.E. (2011), DfT NMF TOC Econometrics: Final Results, Report for the Department for Transport, February 2011.

detailed diagramming model may therefore reveal different levels of economies of density depending on the nature of the services run / transferring to other operators. The extent of economies of density will depend on whether services are to the same or different destinations.

2.9.4 The scenario in the model assumes economies of density are of the order indicated by the literature (elasticity of costs with respect to train-km, other things equal, of 0.8). These are applied to all FO costs except track access. For OAOs an estimate of rolling stock required is made, with the elasticity 0.8 applying to all other costs excluding track access. However, given the caveat stated in the paragraph above, it should be noted that the ultimate cost savings could therefore differ for different service specifications (see results chapter).

Modelling assumptions on efficiency

2.9.5 The literature review considered a wide body of evidence on the impact of competition in rail and a number of other sectors. The separate impact of ownership and competition was discussed as well as the different forms of competition (for and in the market). The complicating factor here is that the passenger train operating companies have been in the private sector and subject to competition for the market for fifteen years. It might thus have been expected that any inefficiencies at the time of privatisation, as with other privatised industries, would have been driven out by now.

2.9.6 However, it is clear from the literature that far from seeing productivity improvements and cost falls, FO costs have risen and productivity has fallen since privatisation. Smith and Wheat (2009) found that FO sector total factor productivity fell sharply after 2000 (following some initial improvements) and ended up in 2006 at roughly the same level as in 1997. More recent work (Smith and Wheat, 2011) paints a more pessimistic picture, with even the best performing operators (the efficiency frontier) seeing a cost rise due to falling productivity of 14% over the period 1997 to 2006.

2.9.7 In addition, firms subject to re-negotiated or management contracts saw a further deterioration in efficiency, though where operators came off these arrangements, and experienced re-franchising, costs quickly fell back in line with other operators. There is also evidence that after an initial cost rise following the introduction of these temporary contract arrangements, costs did begin to fall even whilst on the management contracts (so over time it appears that the franchising body was able to gradually put pressure on operators to get costs down, albeit from very high levels). Of course, West Coast, one of the franchises under analysis as part of this project, is now no longer on its management contract arrangements, but it has not yet been subject to competitive tendering.

2.9.8 From the above discussion we may conclude that franchising in rail in Britain has failed to deliver the expected productivity gains, thus suggesting that major savings could be made. One benchmark then, for the extent of possible future savings, would be to look at the evidence from Smith and Wheat (2011) concerning the relative efficiency of West Coast compared to other operators. In 2005/06, West Coast was 18% less efficient than other operators according to the model. In that year, the average efficiency gap between inefficient firms and the efficient firms was 13%.

2.9.9 If we assume that there have been no further changes since then (and the evidence suggests that costs have stabilised but not fallen substantially since 2005/06), this would indicate an efficiency gap to be closed of 13-18%. As noted earlier, even the frontier firms in 2005/06 were assumed to have costs that were 14% higher in 2005/06 than at privatisation. This calculation puts the potential cost reductions in the range 27% to 32% (eliminating both inefficiency within the sample and assuming the frontier firms also generate productivity gains). It should be noted, however, that factors such as rising diesel prices and improved rolling stock, not adequately reflected in the Smith and Wheat (2011) model may explain some of the gap.

2.9.10 A second benchmark would be the kinds of savings resulting from competitive tendering in Sweden and Germany (in the order of 20-30%). Similar savings have been achieved in a range of other sectors, such as health and refuse collection (e.g. Domberger et al, 1986; Domberger et al, 1987).

2.9.11 Another, benchmark includes the experience of bus and airline de-regulation, which saw higher savings (in the order of 40-50%), though for the reasons outlined earlier we consider these to be unrealistic as estimates of what might be achieved in the rail industry.

2.9.12 A fourth benchmark might be to look at actual open-access operator cost data. However, this data is hard to interpret as these operators are operating very small operations (in terms of train density) as compared to franchised operators. Thus whilst their unit costs are higher than franchised operators, this is to be expected, given the presence of economies of density. Indeed a simple application of the density elasticity to these operators would suggest that were they to expand to the scale of the franchises operators they might achieve 50% lower costs. However, we do not consider it safe to extrapolate OAO costs using elasticities from a model which does not include OAOs, since their density is well outside the range on which the model was estimated. Thus we do not consider it appropriate to use actual OAO costs to inform our efficiency scenarios.

2.9.13 Before concluding on our scenarios in respect of efficiency savings we note that at present a clear view does not exist, from a bottom-up basis, regarding the sources of inefficiency in the FO sector, and how exactly costs can be reduced. Thus there should be some caution here, as we are seeking to draw conclusions based on top-down evidence.

2.9.14 Overall, our view is that a reasonable central range for the scenarios for efficiency savings (other things equal) is 20-30%, and that this would be spread across staff, rolling stock and other costs. This is applied on top of any cost changes due to changes in density. The basis for this view is essentially that franchising has not achieved what would have been expected and that direct competition, via Open Access, could drive out the savings not yet achieved. It should be recognised though that improvements to the franchising process might be expected to achieve some or all of these savings. It is also not clear from the literature that competition in the market is necessarily more effective than competition for the market, either in rail or other markets. Given the lack of bottom-up evidence at present, however, we should also consider the possibility that savings could be lower (say only 10%). Thus our scenarios are as follows:

- Central scenario assuming 20% savings
- High scenario assuming 30% savings
- Low scenario assuming 10% savings.

Modelling assumptions on labour costs

2.9.15 As noted above, the average salaries for OAOs are between 6% and 18% lower than FOs. Since FOs also have more, less well paid station staff, this will depress their average salary levels compared to open-access operators further, thus suggesting that OAOs could be more than 18% cheaper. On the other hand it should be noted that a major expansion of services by OAOs would likely bring with it pressures for higher wages. It should also be noted that AECOM, FCP and ITS, 2010 found that British train operating company average wages were in line with those in Sweden and Germany.

2.9.16 A further factor to consider is whether there is double counting between the efficiency savings assumptions set out above, and the savings possible from lower wages. The efficiency figures taken from the study by Smith and Wheat (2011) are in addition to any variation in average salaries, since an average salary measure was included as a separate variable in the regression model. The same is true of the evidence quoted from other sectors (Domberger et. al. 1986 and 1987). However, the savings reported from competitive tendering in Sweden and Germany are unit cost reductions which include reductions in wages.

2.9.17 On balance, we consider that it makes sense to assume a central figure of 12% cost saving resulting from lower wages for all efficiency savings scenarios, given the uncertainty concerning the extent of possible savings. Thus for each of the scenarios for efficiency savings of (10%, 20% and 30%) a 12% additional reduction in staff costs resulting from lower wages might be reasonable (12% being the centre of the range of 6% to 18% from current OAOs). However, this does assume that OAOs would be able to expand substantially without increasing wages, and that TUPE legislation would not apply even in those circumstances where they expanded at the expense of FOs.

Modelling assumptions on train length

2.9.18 As noted above, one additional means by which open-access operators may bring lower costs is by utilising shorter trains. Franchised operators are currently restricted in this regard by their franchise agreements and availability of rolling stock, although Virgin West Coast already uses shorter diesel trains (Voyagers) on some of its workings and undoubtedly would do, at least pending electrification, if services to Blackpool were to be included in the new franchise, as proposed by DfT. There are also plans to build the new IEP trains with a greater variety of lengths including many 5 car units. Of course, shorter trains might not necessarily be the right solution, particularly where there is a shortage of capacity, and that is addressed in the demand side of the model.

2.9.19 We have therefore introduced a hypothetical scenario where the OAO runs (5/9 length) Pendolino-type trains, that reduce capacity by (one-third) where demand does not require longer trains. This then gives an indication of OAOs' ability to lease and operate less-expensive rolling-stock, but also applies a crowding (and in some cases quality) penalty in the calculation of passenger benefits. Scenarios assuming full length trains are also considered. The cost model explicitly considers the number of vehicles employed and the cost per vehicle, and thus allows costs to fall where shorter trains are used.

2.10 References

2.10.1 The references for the literature review are provided in Appendix B.

3 Study Approach

3.1 Background

3.1.1 Experience and previous modelling suggest that the following forms of increased competition should be considered likely:

- Cream skimming: entrants run a limited number of trains at the most profitable times (maybe associated with product differentiation in terms of quality of service and lower fares). In the context of the West Coast Main Line, this might take the form of, say, two or three additional Manchester – London services in the morning peak, with balancing return evening services and additional services to utilise the stock in the middle of the day, and fares perhaps 20% lower than existing fares
- Head-on competition: day long competition on the most profitable route at lower fares (possibly with emphasis on low costs rather than quality). In this case the entrant might operate a day long half hourly service between London and Manchester at fares 20% lower than at present
- Niche market entry (through services to destinations not currently so served; sleeper services etc). On the West Coast Main Line, this might take the form of hourly or two hourly services on routes such as London – Preston – Blackpool and London – Manchester – Bolton – Blackburn, with selected stops at intermediate stations poorly served by existing services.

3.1.2 Response to these by the incumbent could include:

- selective cuts in fares including matching the fare of entrants
- looking for additional quality improvements to forestall/compete with entrant.

3.1.3 In this context, the key task of the study is to test the impact of increased on-rail competition on the budget of funders, on passenger benefits and in socio-economic terms. Analysis therefore requires the following cost-benefit analysis:

$$\text{BCR} = \frac{\text{Benefits}}{\text{CtG}}$$

This can be expanded to the following formula:

$$\text{BCR} = \frac{\text{User + Non-user Benefits + FO profit + OAO profit}^{5}}{\text{Change in (FO OpEx (incl variable TAC) – FO revenue - FTAC}}$$

[5] Our calculations treat all potential cost savings as economic benefits, in line with currently published guidance. Other appraisal methodologies could produce different results. In particular, savings resulting from lower wages might result in reduced employee surplus, and may not properly be considered an economic benefit. In the absence of updated guidance, OAO producer benefits reported in Chapter 6 include reductions in operator costs which are a result of savings in wage rates achieved by the OAO relative to the FO. We concluded however, that it would not be appropriate for this study to depart from published guidelines. Also, since wage savings comprise a relatively small portion of our OAO producer benefits, sensitivities conducted on the effect of their inclusion/exclusion showed changes in the BCR to be insignificant (+/- 0.1:1).

The above formula assumes that in change in FO OpEx and revenue is passed back to the government in the form of changes in franchise payments.

Given the current economic situation, it is important that the change in CtG is also shown separately from the BCR calculation.

3.1.4 Following the Literature Review, and applying a similar logic to that used by Arup in their report into on-rail competition[6], we set out below possible drivers to change in each of these key variables.

3.2 User benefits and Revenue

3.2.1 The general perception is that increased on-rail competition will benefit the passenger, and hence result in additional revenue. However, lower fares could result in a reduction in revenue with a compensating increase in user benefits. In order to test this general theory, we assessed the impact of increased competition under the following headings:

- **Alternative destinations**: OAOs may offer new through journey opportunities, especially new journeys offered to towns and cities not directly served by trains to London
- **Journey times**: OAOs may offer improved journey times
- **Service quality**: OAOs may deliver 'softer' benefits through improved customer service by delivering initiatives such as on board sale of the full range of tickets (NB conversely this could be a disbenefit if OAOs when operating older less attractive rolling stock)
- **Fares**: OAOs may offer lower fares and the FO may decide to lower their fares to compete (or in the context of yield management offer larger quotas for cheap fares)
- **Improved service frequency**: OAOs may improve service frequency
- **Crowding**: by running additional services, OAOs may deliver crowding benefits (NB conversely this could also be a disbenefit if OAOs run lower capacity trains on slots currently operated by a FO with higher capacity vehicles)
- **Customer and market focus**: being smaller, the OAOs are incentivised to stimulate demand by catering for local markets
- **Marketing**: OAOs will generate journeys through innovative approaches to marketing.

3.3 Non-user benefits

3.3.1 Through serving new markets and encouraging mode shift from car and air, increased competition may offer a number of non-user benefits:

- **safety, environmental and highway decongestion benefits**: from the reduction in car kilometres
- **environmental benefits**: from a reduction in air travel

[6] On Rail Competition Analysis Arup, 2010

- **benefits from reduced rail heading**: due to the introduction of direct train services to their local station, passengers may no longer drive to stations further away that had a superior level of service.

3.3.2 As a simplification, within the model, we only address the first of these.

3.4 Operating costs

3.4.1 The Literature Review set out the view that in terms of productivity improvements and reductions in operating costs, franchising has not achieved the kind of savings that would have been expected at the point of privatisation. Furthermore, direct competition, via Open Access, could drive out the savings not yet achieved.

3.4.2 The reduced operating costs which may be available to OAOs cover:

- **Terms & conditions**: OAOs can negotiate less generous pay and conditions than FOs
- **Rolling stock**: OAOs can take a more opportunistic approach to the provision of rolling stock, although they may need a greater proportion of spare cover
- **Cost of regulation**: provisions within the Franchise Agreement, both tangible (quality standards etc) and financial (bonds etc) have a cost that OAOs do not have to bear
- **Contract management**: OAOs do not have to resource Franchise Agreement compliance monitoring and management meetings.

3.4.3 However, the Literature Review does also suggest that whilst OAOs may have scope to reduce elements of cost compared with FOs, such savings will be offset in part or whole by a loss of economies of density.

3.5 Track Access Charges

3.5.1 Crucially, the study considers not only the number of paths transferred from FO to OAO, but also mechanisms allowing the OAO to contribute to the payment of FTAC.

3.5.2 Five examples of OAO contribution to FTAC are addressed using the following mechanisms:

- As now: zero fixed FTAC will be applied to the OAO cost base
- Proportionate allocation of FTAC: total FTAC allocated proportionately between FO and OAO in accordance with their share of paths
- Peak charge: total FTAC allocated proportionately between FO and OAO as above but with peak paths given higher weight
- Likely "auction" value: OAO charged FTAC set at the level of residual value (ie revenue – cost, including variable TAC) after a reasonable level of profit has been retained by the OAO (see section 3.6)
- Opportunity cost to the franchise: this value is determined by assessing the impact on franchise value of the FO giving up the path(s).

3.5.3 Detail on the calculation of FTAC in the above mechanisms is provided in section 5.8 of this report.

3.6 Operator Profit

3.6.1 Our experience of working with Owning Groups when bidding in franchise competitions suggests that FO profits are initially calculated as a percentage of revenue, essentially acting as a risk premium on the demand line as bid. Therefore throughout our modelling we have assumed that the level of retained FO profit (as set during the bidding competition) will be 6% of revenue. This then acts as a further element of cost in the revenue minus cost equation that derives the Franchise Payment.

3.6.2 As the OAOs have neither the comfort or specificity associated with a Franchise Agreement and are susceptible to a purely commercial (revenue - cost = profit) position, a higher level of retained profit has been assumed to be necessary to encourage potential operators to want to enter and remain in the market. In the calculation of the "auction" value of FTAC, this has been assumed to be 10%, although the results of sensitivities around this figure are detailed in Table 6.1.

4 Model

4.1 Introduction to the model

4.1.1 This chapter describes the model used to evaluate different options for on-rail competition and gives an overview of the model structure. Using this structure we describe each part of the model and set out the various elements that are included in each module.

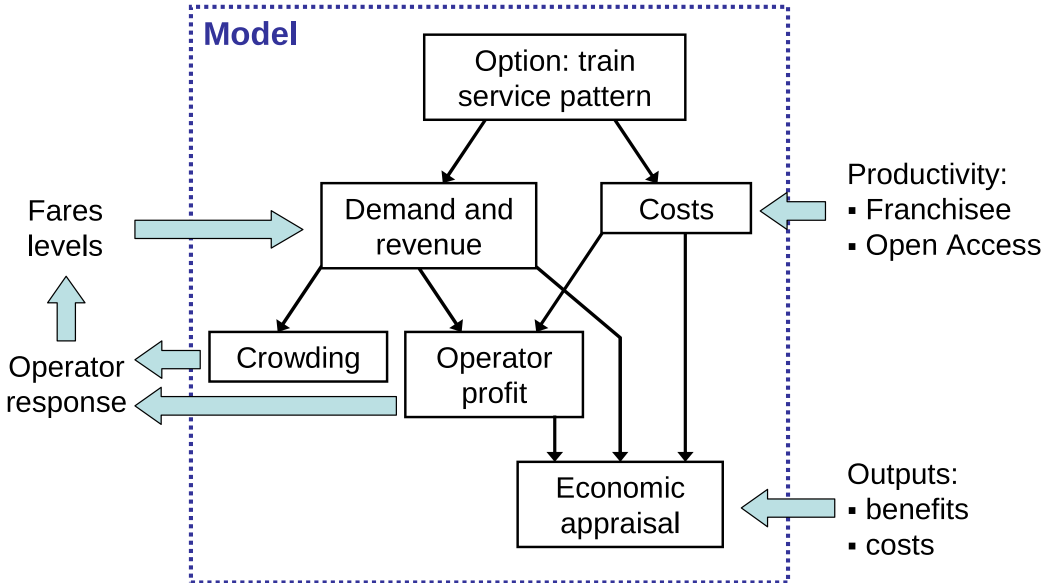


Figure 4.1 Overview of modelling process

4.1.2 Figure 4.1 indicates that the model is divided into the following modules:

- economic appraisal and output sheet
- demand and revenue, including crowding
- costs
- operator profit.

4.1.3 The next sections deal with each module in turn describing the elements of each module and the interactions between them.

4.2 High level model and output sheet

4.2.1 This section reflects the structure in Figure 4.2.

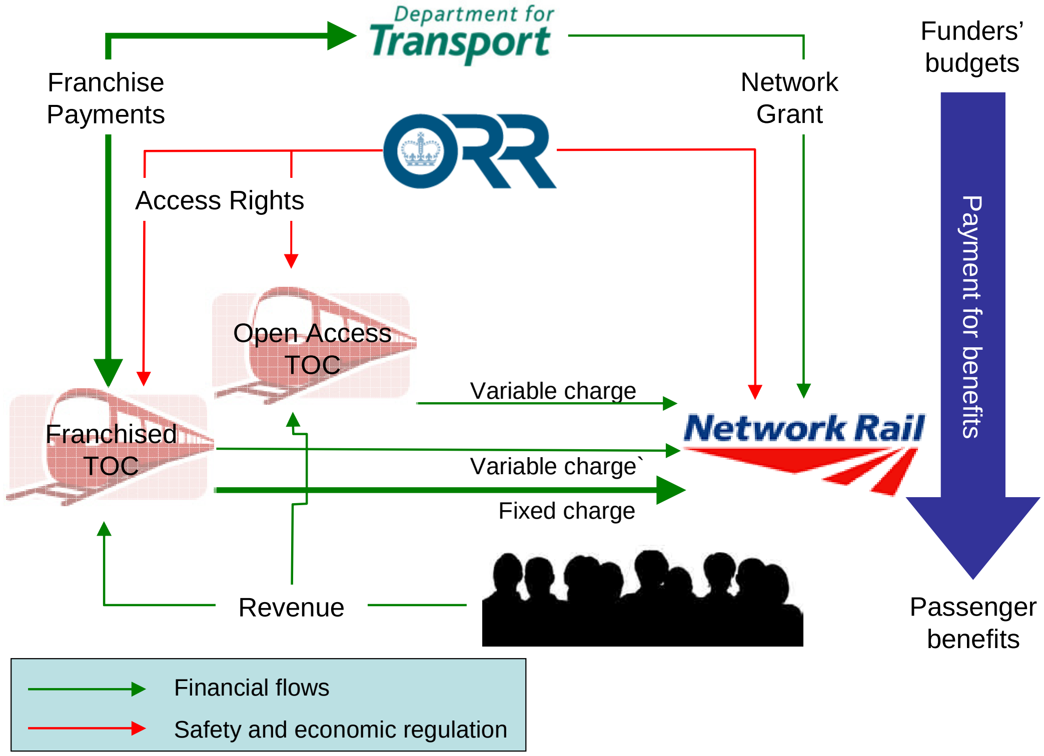


Figure 4.2 Key financial flows in the UK rail industry

4.2.2 Each flow has a value attached in £ sterling showing the impact on:

- Franchise Payments
- FO revenue
- OAO revenue
- network grant
- TAC as payable by FO and OAO.

4.2.3 From these the profitability/ viability of the OAOs can be seen under different assumptions regarding track access and other costs. In addition the impact on government finances can be identified.

4.2.4 Variable TACs are represented as a cost to FO and OAO in the model and a receipt to Network Rail. However, there is an equal cost to Network Rail in terms of additional maintenance and renewal of infrastructure: hence they do not represent a net change in the level of remuneration required by Network Rail from the FTAC and Network Grant.

4.2.5 Economic benefits and the BCR are shown as a TEE table for a single steady state year in line with WebTAG guidance.

4.2.6 The model calculates the user benefits through the generalised cost change: the full benefit accrues to existing rail users, with new users receiving half the benefit in keeping with standard practice. The generalised cost includes the following variables:

- interchange changes (for example the effect of serving new destinations, or not serving an existing destination)
- journey time changes
- service quality (including soft factors, ticketing, marketing, etc)
- fares
- service frequency
- crowding.

4.2.7 The model also calculates the change in rail demand and a simple rule is used to convert this into change in demand for car and air. From these the environmental benefits (reduced CO2 emissions), and for car the highway decongestion and safety benefits are estimated using standard WebTAG values.

4.3 Base case

4.3.1 The base case is set up using the following inputs:

- base timetable of December 2010
- demand and revenue extracted from MOIRA and LENNON
- operating costs, including variable TACs
- FTAC
- network grant.

4.3.2 The base case of the ECML model includes Open Access services extant in the December 2010 timetable. Costs for these OAO services were developed using the top down cost model as described in section 4.6, where total costs (excluding variable TAC) were pivoted via operator scale, density and efficiency functions to develop OAO costs.

4.3.3 Revenue information was extracted from MOIRA for December 2010 and supplemented using FO financial reports. FO cost information was amalgamated from the financial reports of GNER, National Express East Coast and Directly Operated Railways (DOR) for the ECML and from West Coast Trains financial reports for the WCML.

4.3.4 Please note that as a result of post-recession revenues on the ECML and WCML being below the level forecast at franchise bidding stage, forecast levels of subsidy are likely to be higher than those built into existing franchise bids. However, to demonstrate the relative effects of each of the modelled options, conclusions have been drawn based on the changes in CtG which is not affected by the starting position.

4.4 Model inputs and interface

4.4.1 The model interface allows the user to change the key variables for testing each scenario. This interface allows the user to change:

- number of paths allocated to the FO and OAO for each flow
- specify journey times (this can be used to proxy changes to stopping patterns) and number of interchanges by flow
- redistribute paths to different destinations
- change fare structures/ levels
- change the assumed level of profit of FO and OAO
- specify cost efficiencies of FO and OAO
- change the allocation of FTAC.

4.5 Demand and Revenue Model

4.5.1 For the ECML model we consider fifteen flows; all to/from London (includes Stevenage):

- Scotland (includes all stations in Scotland)
- Newcastle
- Darlington and Durham
- York
- Leeds
- Wakefield
- Doncaster
- Grantham and Retford
- Peterborough
- Sunderland to Eaglescliffe
- Northallerton/Thirsk
- Hull to Selby
- Bradford
- Halifax to Brighouse
- Lincoln

4.5.2 For the WCML we consider ten flows; all to/from London (includes Watford and Milton Keynes):

- Glasgow (includes Motherwell and Lockerbie)
- Carlisle (includes Penrith and Oxenholme)
- Preston (includes Lancaster, Wigan and Warrington)

- Liverpool (includes Runcorn)
- Manchester (includes Stockport, Wilmslow, Macclesfield and Stoke)
- Crewe (includes Stafford)
- Chester (includes Wrexham)
- North Wales (all other station on north Wales line)
- Birmingham (includes New Street, International, Coventry, Sandwell and Dudley, and Wolverhampton)
- Rugby (includes Lichfield, Tamworth and Nuneaton).

4.5.3 The model estimates the effect on total FO revenue by scaling the results from these flows to total FO revenue. Similarly demand is scaled (by a different factor) to estimate the total demand crossing a screen-line just north of Milton Keynes which is used for assessing crowding.

Alternative destinations

4.5.4 To evaluate potential alternative destinations, we have included three additional flows which allow us to estimate the effect of new destinations, both on demand/revenue and economic benefits:

- Blackpool (including stations en route)
- Blackburn
- Huddersfield.

4.5.5 For each flow we have nine segments:

- four ticket types – peak walk-up, peak Advance, off-peak walk-up, off-peak Advance
- each for business/leisure
- plus commuting which is assumed to be all peak and on seasons (for FO, given that the discount on seasons means that anyone commuting 2 or certainly 3 times per week should buy a season); the OAO may offer some other fare for commuters.

4.5.6 These nine segments are modelled separately for the choice between FO and OAO, based on their journey time, frequency, fare and if appropriate interchange and any soft factors; a factor is included as a penalty to reflect crowding; in the initial run it is set to zero, but it is changed in subsequently iterations (see below).

Journey times

4.5.7 The timetable elements are calculated from the timetable (average journey time, frequency, interchange) for typical two hour off-peak and peak periods. We do not use MOIRA for this, as we need the components of time separately (we need to be able to apply different factors according to ticket type, for example).

4.5.8 The generalised cost for each service (FO and OAO) is constructed using different parameters (including spread parameter) for the four ticket types (five including seasons) and purposes: this means nine sets of parameters – parameters are the same for FO and OAO. We do not include a separate frequency for FO and OAO in the generalised cost using the frequency penalty in PDFH, as this penalty is intended to reflect the impact on overall rail demand of changes in service frequency: it is clearly not sensitive enough to reflect the choices passengers make between different operators. To calculate the initial generalised cost we used the frequency of the entire service. We later allocate demand to operators (see paragraph 4.5.12).

Service quality including marketing and ticketing

4.5.9 The model allows an addition to generalised costs for FO and/or OAO to reflect 'soft factors': these can be any factor not detailed above, for example provision of WiFi, catering, friendly staff, effectiveness of marketing. Quantifying the appropriate value for these elements is clearly problematic, and needs to be based on judgement. So far as the model is concerned, one number in minutes is included, which can be positive or negative. Separate values can be provided for FO and OAO for the base and the scenario (although only the difference between these numbers in the scenario and the base will have an effect): the values can differ by flow if required.

4.5.10 The model calculates the shares of FO and OAO (excluding the effect of service frequency) using a simple Logit model; the composite generalised cost is then calculated.

Fares and ticket types

4.5.11 The model next allows some transfer between ticket types (this might mean Advance to/from walk-up, or peak to/from off-peak). To do this it uses an incremental Logit formulation as was developed for the ticket choice study MVA carried out for PDFC in 2009/10. This part of the model means that if the fare increases for a particular ticket type, people will transfer to other ticket types: evidence is that people are more prepared to transfer between walk-up and advance tickets than between peak and off-peak. The model calculates the constant associated with each ticket type that recreates the current ticket type share, thus ensuring the share with new fares only depends on the change in fare.

Service frequency

4.5.12 So far we have not taken into account the effect of service frequency. If all trains were equally attractive, then we would expect the FO and OAO to attract demand pro rata to their frequency. The earlier calculations have accounted for different levels of attractiveness of the FO and OAO: the model now multiplies the shares due to this by the service frequency to calculate the estimated demand for FO and OAO.

4.5.13 The final stage is to consider the effect of crowding and its potential to suppress demand, which is detailed in paragraph 4.5.19 onwards.

Current demand

4.5.14 The above is applied to a base demand for rail by journey purpose for each ticket type (which includes peak/ off-peak), for each flow. Peak is defined as trains arriving London between 08:00 and 10:00 and departing London between 16:30 and 18:30.

4.5.15 In some cases the base demand needed adjusting. This is where there is a proposal to provide a significantly modified service from a neighbouring station with an overlapping catchment area, which will be the case for some OAOs. Consider the example of Blackpool: some people today will drive to Preston, and LENNON will think they are Preston passengers. The proportion of Preston passengers that are from Blackpool has been estimated from NRTS; these have been subtracted from Preston and added to Blackpool.

4.5.16 In options where there is no direct service from Blackpool, then the model requires these passengers to make an interchange at Preston, and the associated penalty is included. The model does not distinguish between rail and car access at Preston (or other locations).

4.5.17 Blackburn (also connecting via Preston) and Huddersfield (connecting via Manchester) have been treated similarly.

4.5.18 The above part of the calculations is shown in Figure 4.3.

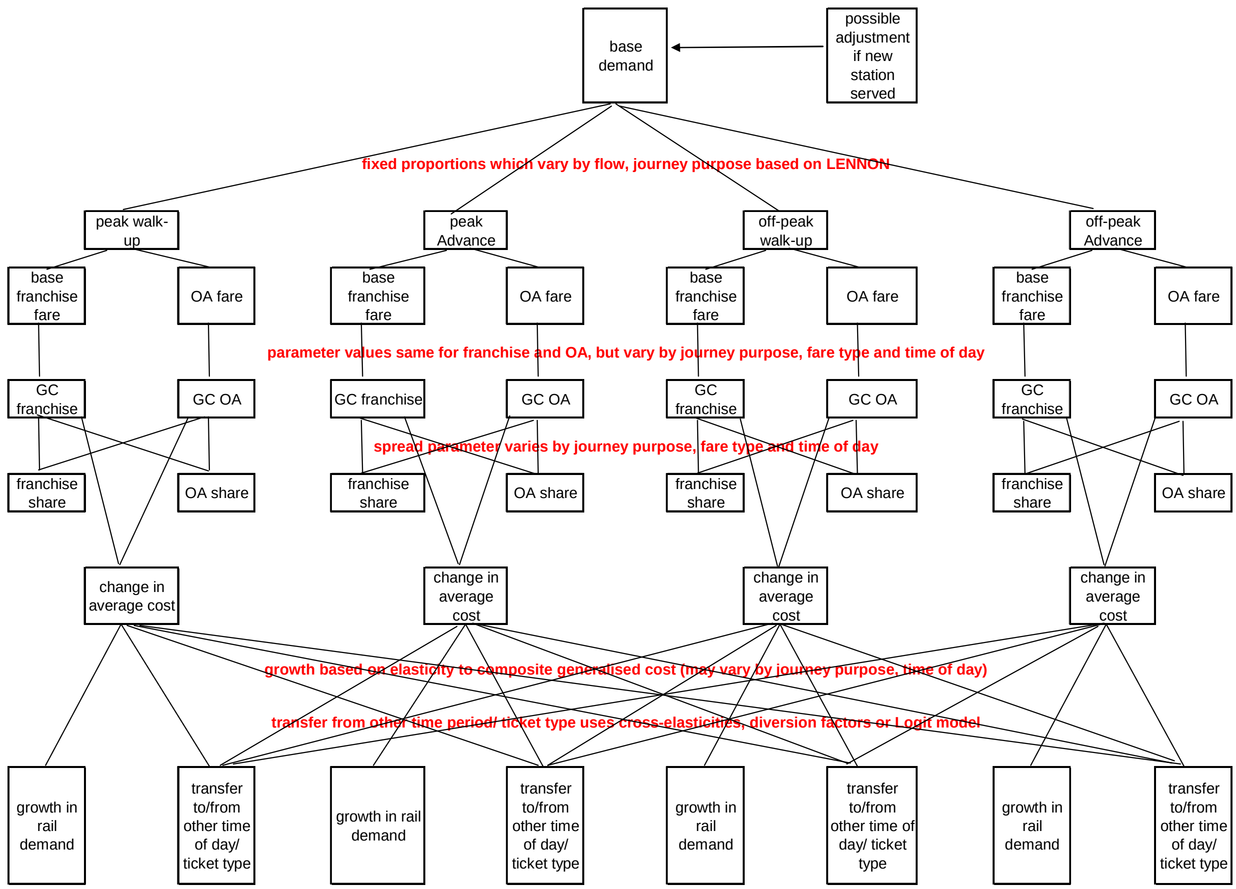


Figure 4.3 Demand model structure

Crowding

4.5.19 The outputs from this element of the demand model are the demand by journey purpose and ticket type for each flow for FO and OAO. The commuting model is similar but simpler: it will only include peak walk-up.

4.5.20 These are aggregated to give the total demand (all three journey purposes) in peak and off-peak by flow, and then flows are aggregated to create service groups. Some service groups comprise a single flow; others are two or more. Where a flow is shared between service groups, then this is treated as a fixed proportion (although this proportion will change according to the timetable).

4.5.21 Demand is loaded onto a direct service where one exists (separately by peak/off-peak and by FO/OAO). Where a direct service does not exist, demand is loaded onto services at a convenient interchange location. For Blackpool and Blackburn this is Preston; for Huddersfield it is Manchester; for other locations (e.g. Glasgow, Chester, Liverpool) it is Crewe. In all scenarios we assume that there is at least one direct service per hour by the FO from each of Manchester and Birmingham.

4.5.22 For each service group the crowding calculation is undertaken separately for peak and off-peak and for FO and OAO.

4.5.23 We assume that the demand in the period (separately for FO and OAO) is spread across trains using a GAMMA distribution[7]. From this we estimate the probability that the demand will exceed the capacity availability – for Intercity services such as those being considered, we allow a maximum of 95% load factor to reflect day by day variation and different load factors in First and Standard class. We also estimate the proportion of demand that is in excess of this maximum load factor and hence is suppressed.

4.5.24 We next calculate an equivalent crowding penalty that will be included in the generalised cost. This goes back into a second run of the demand model as above, and results in some reduction in the demand for crowded services (both FO and OAO).

4.5.25 For walk-up fares the modelling described above is complete. However, for Advance we have one final step. We are forecasting that Advance demand is crowded off trains and suppressed: in the context of yield management, this will result in higher average fares on the more crowded trains, meaning that while all the demand is lost, average fares are higher, and hence less revenue is lost. We assume that the yield management system is approximately 50% efficient and that a half of the lost demand is the result of higher fares. The appropriate fares adjustment is calculated using the value of time inherent in the model (which is based on the relativity of the elasticities of time and fare).

4.5.26 Because the crowding functionality is designed to estimate a steady state, it is not iterated again, but results are calculated on the basis of the second run.

[7] The GAMMA distribution is used as it does not give negative loadings on any trains, and previous work has shown it to be a reasonable approximation to actual distributions of demand.

4.5.27 Figure 4.4 shows the above element of the demand model.

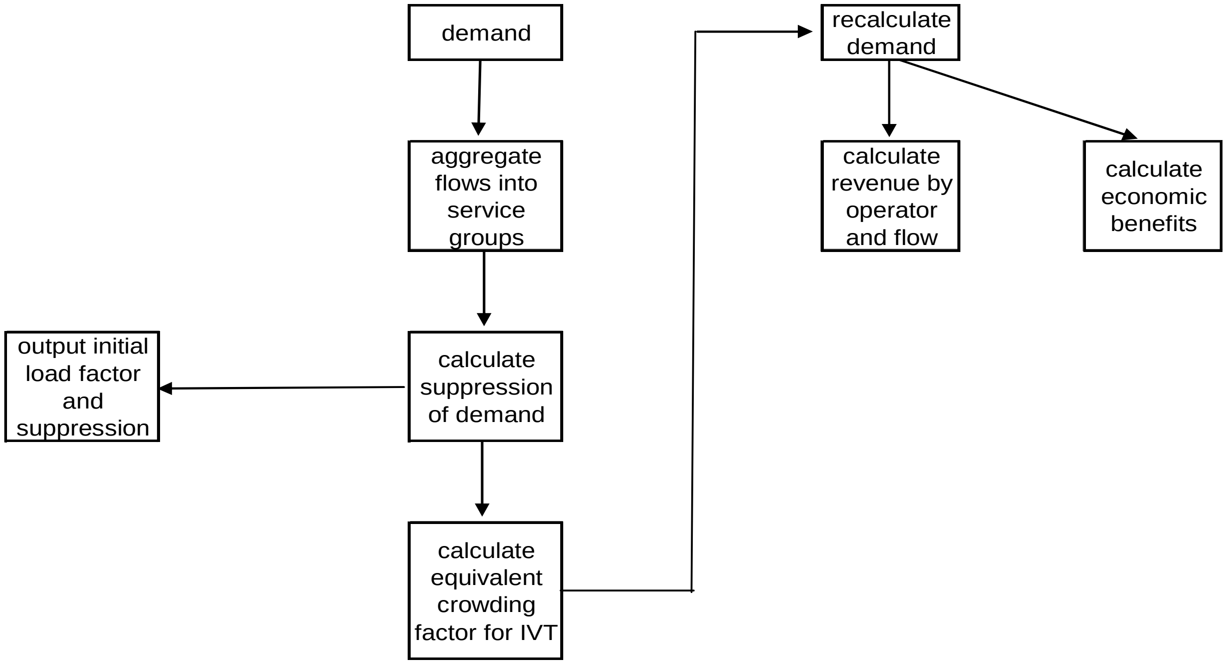


Figure 4.4 Demand model – treatment of crowding

4.5.28 Key outputs from this are the initial load factors and the proportion of suppressed demand for each flow. These are used by the model operator to consider whether the initial fares are appropriate and if necessary to modify them, and rerun the model.

Fares levels

4.5.29 The crowding module automatically increases the yield of Advance tickets as load factors increase. However, the decisions on fares levels of both FO and OAO will be more complex than this. The model can be run with different input fares levels for both FO and OAO to determine the optimum fare for each in a competitive market. In doing this, the model can take account of:

- whether significant numbers of passengers are crowded off
- the likelihood of each operator to compete on fares
- the FO is constrained to some extent by both regulation and by the need to ensure a consistent pricing structure across all origins/ destinations.

4.5.30 Furthermore, the fares modifications take into account the operating costs and TACs, ensuring that both FO and OAO are left with a sufficiently profitable business.

Demand and revenue data

4.5.31 Annual demand and revenue has been derived from MOIRA for full, reduced and season for each flow and for the total franchise. LENNON has then been used to split reduced into walk-up and Advance the latter being split into peak and off-peak on the basis of fare level. We allocated demand to business and leisure based on PDFH v5 Chapter B0, but also using some judgement. Flows are allocated to service groups using proportions derived from MOIRA.

Open Access Demand in the ECML Base Timetable

4.5.32 In contrast to the WCML, the ECML has OAO operators existing in the base December 2010 timetable. Demand and revenue data was extracted from MOIRA and LENNON in the same way as for the FO. However, for those flows that had both FO and OAO demand, an Alternative Specific Constant (ASC) was used to calibrate the FO/OAO shares to those shown in the base data.

4.5.33 Demand and revenue for Grand Central services to Sunderland and Bradford were likely to still be in a ramp up period following implementation. Using ramp up values for major new services in PDFH Table B12.1, demand and revenue for these services was increased to the level of demand that would have been expected in 2010 if the services were fully ramped up.

Parameter values

4.5.34 Parameter values have been estimated to ensure the model behaves in a consistent way in comparison to elasticities and other parameters from PDFH. Some values were also taken from other models we have developed, e.g. Ticket Choice for PDFH, crowding in the context of franchise bids for ICEC. Economic benefits are calculated using values from WebTAG.

4.5.35 The following parameters were derived:

- for each ticket type and purpose (but same across flows): parameters for constructing generalised cost: value of time, frequency, interchange, spread parameter – these were based on PDFH elasticities
- for choice between ticket types – these were based on our previous ticket type model, but modified to ensure that spread parameters were the same at the lower level of the hierarchy (the parameter for choice between walk-up and Advance was the same in the peak and off-peak – without this the model produced anomalous results)
- for each ticket type and purpose (but same across flows): elasticity to generalised cost – these were based on PDFH elasticities
- parameters for crowding module (gamma distribution): maximum load factor, standard deviation divided by mean
- values of time and other parameters (e.g. highway decongestion) for calculating economic benefits – from WebTAG.

4.5.36 Other inputs were based more on judgement, using evidence from the Literature Review (Chapter 2), PDFH, and experience from other studies we have undertaken. These include the effect of soft factors on demand: this factor can include rolling stock quality, on-board and at station service, reliability, marketing and ticketing, and any other differences between the operators not elsewhere modelled.

4.6 Cost Module

4.6.1 A high-level cost model was developed to allow "Top Down" modelling of costs, based on work by ITS (described in Chapter 2). It allows the potential for changes in structure of access costs and including potential (in) efficiencies from multiple operators on the ECML or WCML.

4.6.2 The user identifies the relevant changes to services, including changes between FO and OAO. The user is also able to specify new services including stock type and frequency per two hour period in each of the peak and off-peak. Train mileage is calculated from the origin and destination. Route mileage is calculated using the sum total of inter-station distances on the route served by the operator

4.6.3 Costs are based on outturn costs for 2009/10 adjusted to reflect the December 2010 timetable.

Elements of Cost

4.6.4 The base case costs have been developed based on reconciliation to the top-down outturn costs (using data from 2009/10 WCT accounts, DfT and Network Rail).

4.6.5 The cost module then adjusts costs based on the paths added/removed in the scenario, covering costs for FOs and OAOs. Costs excluding track access were modelled on a top down basis for both FOs and OAOs pivoting from the base FO costs. The user can specify 'unit cost efficiency' assumptions separately for the FO and OAO (these are described in section 2.9) based on the findings of the Literature Review. Additional staff unit cost efficiencies can also be applied based on the cases outlined in the Literature Review. Economies of density are also applied to estimate cost based on the methodology described in 2.9.4.

4.6.6 Total operating costs were broken down into line items as reported in the outturn costs of the FOs. There are some cosmetic differences between the East and West Coast items, but broadly costs were separated the following categories:

- rolling sock lease & maintenance costs – vary in line with density and scale of operation for FO and OAO
- train staff costs – wage costs per train mile, can be varied for shorter length OAO services (see 2.9.18): for both FO and OAO these are subject to economies of density
- other staff costs – residual outturn staff costs not covered by train staff. Costs assumed to vary in line with size of FO/OAO based on economy of density (see 2.9.18). It is assumed that the OAO does not become an SFO and is not responsible for station staff costs
- other costs – FO costs assumed to vary in line with size of FO based on economy of density (see section 2.9.4), OAOs based on scale and density of operation.

4.6.7 In addition to the costs above, track access costs were also calculated. These comprise:

- variable TACs – rates per vehicle mile, depending on which type of rolling stock is used (including train length)

- capacity charge rates – rates per vehicle mile, which vary by service code and weekday / weekend
- electrification asset usage charges – rates per vehicle mile for electric stock
- power costs - Traction costs (e.g. EC4T) or diesel costs – rates per train mile, vary by rolling stock type and configuration
- FTAC – for FOs, with a range of mechanisms to vary how the OAO pays in each particular scenario in line with the models discussed in section 2.7.

4.6.8 The module uses lookups based on the specified stock type to identify the appropriate unit rates for each of the track access elements identified above.

4.7 Economic Benefits

4.7.1 The model outputs consist of annual demand and revenue by flow, with an uplift to estimate the whole revenue for FO and if appropriate OAO. From these, abstraction from car and air are estimated. The model also outputs the change in generalised cost which is converted in the appraisal spreadsheet into user benefits.

4.7.2 The changes in car and air demand (including car used for rail heading) are used to estimate the non-user benefits of environmental (CO_2 emissions, noise, local air quality), accident, indirect taxation and highway decongestion.

4.8 Model Outputs

4.8.1 The following model outputs are provided:

- user benefits
  - journey time savings (existing and generated journeys)
  - benefits of lower fares
  - crowding benefits
- non-user benefits
  - decongestion benefits
  - infrastructure benefits (from reduced car use)
  - accident benefits
  - local Air Quality
  - noise
  - greenhouse gases
  - indirect taxation
- producer benefits
  - revenue of FO and OAO
  - operating costs (including Variable TACs) of FO and OAO

  - FTAC for the FO and OAO
- CtG (Franchise Payment plus Network Grant)
- FO and OAO profit
- rail industry revenue, cost and overall profit
- benefit:cost ratio (BCR).

4.9 Key Assumptions

4.9.1 We set out below a list of assumptions that underpin the model and its use.

Base timetable

- The base timetable to be used in the modelling will be the December 2010 timetable.

One year appraisal

- A one year steady state evaluation is appropriate for this study. Note that we have used demand and revenue data from 2010: it is likely that future demand and revenue will be higher.

Approach to fares

- Operators would not undertake predatory pricing strategies: instead we assume that the fares are set to profit maximising levels
- FO will set fares in line with the existing regulatory restrictions; dedicated fares will also apply in the same way as currently.

FO Response

- The FO has 'perfect knowledge' of the level of competition (i.e. at the point of bidding they are aware of how many Open Access paths will be granted): it is assumed that the franchise is run in a similar way as the existing franchise.

Structure of Costs

- FO overhead costs are fixed as per the base: overhead costs for OAOs are based on benchmarked costs for comparable existing OAOs.
- Fleet costs for FOs vary pro rata to service distance.
- On-train staff costs for FOs vary by service distance; other staff costs remain unchanged e.g. all stations are assumed to be still staffed by the FO rather than the new OAO.
- Rolling stock is assumed to be 125mph stock.

Performance

- Performance is assumed to be unaltered and therefore there are no changes to the base position in relation to costs and revenue relating to performance changes.

4.10 Model parameter values

4.10.1 We outline below the principal parameter values included in the model.

4.10.2 Demand forecasting:

- penalty to reflect the effect of service interval – see PDFH v5 Table B4.7
- penalty for interchange – see PDFH v5 Table B4.10
- fares elasticities set to be approximately those in PDFH v5 Table B3.3 through adjusting the value of time.

4.10.3 Other choices are based on Logit models: for completeness we include the spread parameters in these models, recognising that such parameters have only limited meaning outside the specific model.

Table 4.1 Choice model spread parameters

Spread parameter	Business	Leisure	Commuting
Between FO and OAO	-0.025	-0.025	-0.025
Peak vs off-peak fares	-0.003	-0.003	N/A
Walk-up vs Advance fares	-0.01	-0.01	N/A

4.10.4 Crowding:

- maximum load factor: 95%
- ratio of standard deviation of demand per train to mean demand per train: 0.3 in peak, 0.35 off-peak (see PDFH v5 paragraph B6.4.2 – peak value is higher for Intercity operator than for commuter FO).

4.10.5 Yield management:

- assumed to be 50% efficient – ie 50% of revenue crowded off is recaptured through higher Advance fares.

4.10.6 Economic benefits:

- all relevant figures are taken from WebTAG
- 42% of change in overall rail demand is to/from car, with occupancy of 1.6, this gives a change in car km of 26% of the change in rail passenger km (these figures are based on WebTAG).

5 Methodology

5.1 Overview

5.1.1 This chapter explains how the model has been used to test various options for the allocation of paths, OAO profit maximisation and FO response, as well as the testing of various FTAC mechanisms.

5.1.2 In both East and West Coast Mainline Case Studies, similar methodologies were used, although the option definitions for the runs undertaken were in some cases different due to the pre-existence of OAO operation or not.

5.1.3 The core methodologies used in both Case Studies were:

- selection of FO paths removed
- selection of OAO destinations served
- fare competition
- FO Fare Sensitivity
- alternative Fixed Track Access Charging mechanisms.

5.2 Selection of FO paths transferred

5.2.1 The FO paths to be transferred to the OAO were determined by least franchise value (i.e. greatest CtG in terms of Franchise Payment requirement). One train path per two hour cycle was removed sequentially from each franchise service group across the day (treating the peak and off peak in the same way), and the effect on the CtG examined.

5.2.2 As a further test, we checked whether the OAO was likely to make a profit on this service. To test this, the FO path was replaced by an identical OAO path and then fares, staff costs and rolling stock costs were adjusted. As OAOs will only consider running paths that are commercially viable, only those that were deemed to be potentially profitable (as defined by OAO Revenue – OAO Cost) were removed for allocation to OAOs; non-commercial paths were left with the FO effectively representing a Public Service Requirement.

5.2.3 So that the decision to remove a path was carried out in a consistent way a number of rules were used:

- a similar approach was used for both Peak and Off-peak paths
- services were not removed in increments of less than one train every two hours.

5.2.4 With the first path identified and removed, further paths per two hour period were then removed in turn for each service group, again examining the additional effect on the CtG, with the path with the greatest CtG tested for potential OAO profit before being removed. This process was repeated until the four paths per two hour period (i.e. two fast trains per hour) required for Option 1 had been identified. Building on this, Option 2 comprised the Option 1 paths, in addition to the next four paths with the greatest CtG.

5.3 Selection of OAO destinations served

5.3.1 With each of the options to be tested, an assumption was made that the Not Primarily Abstractive (NPA) test, previously applied by the ORR to ensure that OAO services generate at least 30% of the revenue they abstract from the FO, would not be applicable to new OAO services tested using this model. As such, with the removal of the NPA test, the OAO was unconstrained in choosing the destinations it would serve with the paths taken from the FO.

5.3.2 Similar to the methodology for removing FO paths, OAO paths were added across the day (peak and off-peak periods treated identically) and as single trains per two hours cycles (i.e. one train per hour). All possible combinations of OAO services were tested depending on the option definition (see sections 1.8 and 1.9), with the most profitable services (OAO Revenue – OAO Costs) being selected as those to be taken forward.

5.3.3 The Central Case cost savings identified in the Literature Review (a reduction of 20% on FO costs and a further 12% saving on wage costs) were applied in all options, though sensitivities on these cost assumptions (a range of 0% to 50% and with wage savings not applied) were tested and results are reported in section 6.6.

5.3.4 Rolling stock operated by the OAO in each option was assumed to be the same as to that operated by the FO in the first instance. Once OAO destinations had been identified, the impact of shortened rolling stock was tested, as described in section 5.7.

5.4 Fare Competition

5.4.1 It was assumed that the OAO had free reign to determine its fares policy and would adjust its fares so as to maximise profit. Typically, OAO's have tended to offer flat rate fares to specified destinations, modelled as a percentage reduction of the available FO fare. As a rule, fare changes were only permitted on flows where there was competition between the FO and OAO as a result of the paths specified within the given option. Fare changes were modelled as "global" changes – the same discount was offered in relation to the FO fare across all flows. Advance and walk-up fares were always subject to the same changes, although fares were allowed to be different in the peak and off-peak periods in order to maximise capacity utilisation on the typically less crowded off-peak services.

5.4.2 Fare reductions were made to a point where OAO profitability ceased to be improved, or where excessive crowding became apparent on the OAO services to which the reduced fares applied. When the unconstrained load factor of a particular service group was close to or greater than 100%, further fare reductions were not permitted.

5.5 FO Fare Sensitivity

5.5.1 The second modelled component of fare competition was the response of the FO to reduced fares offered by the OAO. Once the optimum position for OAO had been reached, the FO was also permitted to adjust its fares.

5.5.2 As a guiding principle, the FO was only allowed to reduce its fares to the point where it no longer improves their overall net position. As it reduces its fares, the FO will abstract passengers back from the OAO who were initially attracted by the OAO reduced fare.

Eventually however, the new revenue from those abstracted passengers will not cover the lost revenue from reduced fares on other routes, and reducing the fare would worsen the commercial position of the FO. This would require a greater level of subsidy from Government, and therefore any such scenario was discarded from the modelling.

5.5.3 FO fares were subject to the same constraints as the OAO: fares could only be changed on flows where competition is present and could not be changed such that longer journeys become cheaper than shorter journeys on the same route. Advance and walk-up fares were also changed by the same amount, although peak and off-peak fares were again allowed to differ. An additional constraint on FO fares was that they could only be reduced to, and not beyond, the level of the OAO fare. A reduction beyond the OAO fare would engender a further competitive response on the part of the OAO. Such second order pricing decisions was not within the scope of this study.

5.6 OAO Costs

5.6.1 As discussed in the modelling methodology (section 4.6), OAO costs are a function of capacity and power charges, staff costs, Variable TACs and rolling stock costs, the majority of which are dependent on the number of vehicle miles (scale) and route-km (density) operated. The “top-down” cost model has been used in all model results described in this report. The Central Case of OAO cost savings is 20% of costs excluding access charges, as identified in the Literature Review (paragraph 2.9.14).

5.6.2 OAO staff wage rates were also altered by the model, which applied the Central Case saving suggested by the Literature Review (paragraph 2.9.17) of a 12% reduction on FO staff costs.

5.6.3 Given that the deliverability of reductions on the part of the OAO is dependent on the realisation of savings which are outside the range of existing OAO scale , sensitivities were carried out on the results of key options (with OAO savings of between 0% and 50% of FO costs included in the modelling). Results of these sensitivities are presented in section 6.6 of this report.

5.7 Half length rolling stock

5.7.1 An OAO rolling stock specification was also defined (see 2.9.19) in order to test whether variants other than full length 9-car Pendolinos or Intercity Class 225 stock would yield greater profits for the OAO. The attributes of this stock were:

- for WCML: 5-car Pendolinos with 33% more seats that equivalent 9-car FO Pendolinos to reflect a lower proportion of First Class, replacement of the shop and possible higher density seating
- for ECML: 5-car Class 225 (electric loco-hauled) with 33% more seats than equivalent Mark 4 coaches, reflecting the same expected alterations as on the WCML.

5.7.2 The inclusion of an option for flexibility in the length of rolling stock operated by the OAO is intended to represent innovation and efficiencies not currently realised by the FO. OAOs have an incentive to utilise stock efficiently in order to maximise load factors and minimise operating expenses.

5.7.3 The selection of shortened rolling stock was used in specific options when available train paths and fares competition had reached a stable position, in order to assess the likely effect on OAO profit and whether reductions in train length would lead to significant over-crowding.

5.8 Alternative Fixed Track Access Charge (FTAC) Mechanisms

5.8.1 Currently, FTAC is paid in its entirety by the FO. The results of the initial tests outlined in section 6 were obtained with that assumption held true in all cases. The OAO paid no FTAC to Network Rail, any requirement over and above the FTAC paid by the FOs was assumed to be covered by Government in the form of increased Network Grant, demonstrated in the model by holding Network Rail harmless.

5.8.2 Four alternative FTAC mechanisms were tested to determine overall effect on the BCR:

- **Proportionate allocation of FTAC**: total FTAC allocated proportionately between FO and OAO dependent on number of paths[8] operated

  $$\text{FO FTAC} = (\text{FTAC}/n) * p$$

  $$\text{OAO FTAC} = (\text{FTAC}/n) * p$$

  where

  n is the total number of paths, and

  p is the number of paths operated by the FO or OAO

- **Peak charge**: total FTAC allocated proportionately between FO and OAO as above but with additional charge of 50% to OAO for operating peak paths.

  $$\text{FO FTAC} = (\text{FTAC}/n) * p$$

  $$\text{OAO FTAC} = [(\text{FTAC}/n) * p^{\text{OFF-PEAK}}] + [1.5(\text{FTAC}/n) * p^{\text{PEAK}}]$$

  where

  n is the total number of paths

  p is the number of paths operated by the FO or OAO

  $p^{\text{OFF-PEAK}}$ is the weighted number of OAO off-peak paths

  p^{PEAK} is the weighted number of OAO peak paths

- **Likely "auction" value**: OAO charged FTAC set at the level of residual value (i.e. revenue – cost, including variable TAC) after a reasonable level of profit has been retained by the OAO (set for the purpose of this exercise at 10%, also tested with additional risk sensitivities in Chapter 6).

  $$\text{FO FTAC} = (\text{FTAC}/n) * p$$

  $$\text{OAO FTAC} = 0.9 * \text{OAR}$$

  where

  n is the total number of paths

  p is the number of paths operated by the FO or OAO

  OAR is OAO revenue

[8] ORR policy is currently that the FTAC is apportioned to FOs based on timetabled vehicle miles

- **Opportunity cost to the franchise**: this value is determined by assessing the impact on franchise value of the FO giving up the path(s). This lost value in the franchise becomes the amount payable by the OAO in FTAC. The FO pays FTAC proportional to the number of paths it operates.

$$\text{FO FTAC} = (\text{FTAC}/n) * p$$

$$\text{OAO FTAC} = (\text{FO Rev} - \text{FO Costs} - \text{FO Retained Profit})^{RUN} - (\text{FO Rev} - \text{FO Costs} - \text{FO Retained Profit})^{BASE}$$

where

n is the total number of paths

p is the number of paths operated by the FO or OAO

5.9 Option Definitions: West Coast

5.9.1 As agreed, and building on the options defined in the Terms of Reference (ToR), the following were tested:

- **Option 1:** Two fast train paths per hour transferred from the FO to an OAO
- **Option 2:** Four fast train paths per hour transferred from the FO to an OAO
- **Option 3:** Variations on Option 2, such as alternative destinations
- **Option 4**: for comparison, all train paths continue to be held by the FO, but the four paths with the greatest CtG are recast to maximise franchise value.

Option 1

5.9.2 In Option 1, the first two fast trains per hour (i.e. four paths per two hour period) identified as the having the greatest CtG were transferred to the OAO. These paths were to be operated on the same routes as vacated by the FO for back-to-back comparison.

Option 2

5.9.3 The process was then repeated for the four fast trains per hour (eight paths in the two hour period) defined for Option 2.

Option 3

5.9.4 In Option 3, the four fast train paths per hour used in Option 2 were again transferred to the OAO, but different destinations and/or stopping pattern for the path were tested to determine how the OAO would use the paths to maximise profits if the NPA test had been removed. Due to capacity constraints, when allocating OAO services the number of paths to Birmingham and Manchester were never more than the number that existed in the December 2010 timetable.

Option 4

5.9.5 In Option 4, the four fast train paths per hour with the greatest CtG were recast within the franchise to maximise franchise value (i.e. the reverse of the method to remove the paths in Options 1 and 2). In this scenario, it is assumed there were no OAOs on the WCML.

5.10 Option Definitions: East Coast

5.10.1 Taking the options defined in the ToR as a starting point, the following options were tested:

- **Option 1:** Transfer of existing (December 2010) OAO path from current destinations to new OAO destinations (unconstrained by NPA test)
- **Option 2:** As Option 1, with one additional fast train path per hour transferred from FO to OAO
- **Option 3:** Existing FO services split into two equally sized franchises
- **Option 4:** As Option 3, but with an OAO operating instead of the second franchisee.

Option 1

5.10.2 In Option 1, the existing OAO services in the December 2010 timetable (to Sunderland, Bradford and Hull) were removed, with that path being granted to the OAO without the constraint of the NPA test. This meant that the OAO was free to operate to the destination or combination of destinations which would maximise its profit.

5.10.3 The path was tested to determine how the OAO would use the path to maximise profits, as determined by pure profit (OAO Revenue – OAO Costs). The two hour modelling period was treated as disaggregate (i.e. the OAO was not forced to use its path to run to a single destination and could operate a service with different destinations in alternating hours).

Option 2

5.10.4 For Option 2, an additional path per hour was transferred from the FO to the OAO. Initially this was tested with the OAO forced to run to the destinations forgone by the FO (Option 2a) and then with the OAO given the freedom to select its own profit maximising destinations (i.e. unconstrained by the NPA test) (Option 2).

Option 3

5.10.5 For Option 3, the existing OAO path was transferred back to the FO based on a least CtG measure. Then, the franchise paths were distributed equally between two FOs based on the geographical split of the ECML, with FO1 operating to Leeds and Bradford and FO2 operating to Edinburgh, Newcastle and Hull. In effect this became the base position for Option 4, which tested the cost savings of having an OAO of an FO size/density, but not running in direct competition.

Option 4

5.10.6 Option 4 presented a development on Option 3. Once the paths had been split by geography, the route to Edinburgh, Newcastle and Hull were operated by an OAO instead of a second FO. In Option 4, the level of on-rail competition is minimal compared to other options (FO competes with OAO only at stations south of Doncaster). However, this option presents the outcome of creating an OAO of significant size and density, and in conjunction creating a dense FO (operating all of its train-miles on a short section of the total network).

6 Results

6.1 Introduction

6.1.1 This chapter presents the results of modelling which sought to test the hypotheses that on-rail competition through transfer of FO paths to OAOs is able to deliver benefits to both users and non-users through reduced fares on competitive routes, decongestion both on the rail and highway networks and savings to Government via efficiencies resulting from innovation and repatriation of profits via FTAC mechanisms.

6.1.2 As outlined in Chapter 2, the Literature Review presented evidence that increased competition tends to lead to lower prices and better services, and this conclusion applies to rail passenger services. Typically both OAOs and FOs cut fares when competition emerges, frequencies improve, direct services are offered to a greater range of destinations and on board services may improve. The result is not just user benefits but also external benefits as passengers are attracted from car and air

6.1.3 The Literature Review also found that competition for the market did not produce lasting reductions in costs per train km for passenger rail in Britain. There were a number of reasons for this, but one important difference from other cases where franchising has been more successful is that in Britain there is no opportunity for a new entrant to bring in its own workforce, wages and conditions.

6.1.4 Current Open Access operation is limited to the periphery of the UK rail industry, partly due to the constraints of the NPA test requiring Open Access services to generate at least 30% of the amount of revenue they abstract from FOs. This study applies the assumption that an OAO would be granted paths removed from the FO and would be free to operate them to such destinations as modelling deems most commercially attractive, subject to certain modelling constraints.

6.1.5 The Literature Review suggested that OAOs could achieve efficiencies not yet realised by FOs, as direct competition via Open Access could drive out the kind of savings referred to in the McNulty review.

6.1.6 Furthermore, it is assumed that the central case efficiency savings outlined in the Literature Review are achievable through the innovation of OAOs and must be realised in order to for them to remain in the market as viable, commercial businesses. In doing so, it tests the hypothesis that given suitable scale and density, OAOs will deliver passenger benefits through fare competition and reduce costs through financial incentives not present in current Franchise Agreements.

6.2 Base case

6.2.1 Each option has been compared against the base case as detailed in Section 4.3. Each uses 2010 demand and revenue levels and the December 2010 timetable with associated costs so as to produce a "stable year" at a notional point in time so as to best test the key indicators of user and non-user benefits, total industry revenues and costs and CtG.

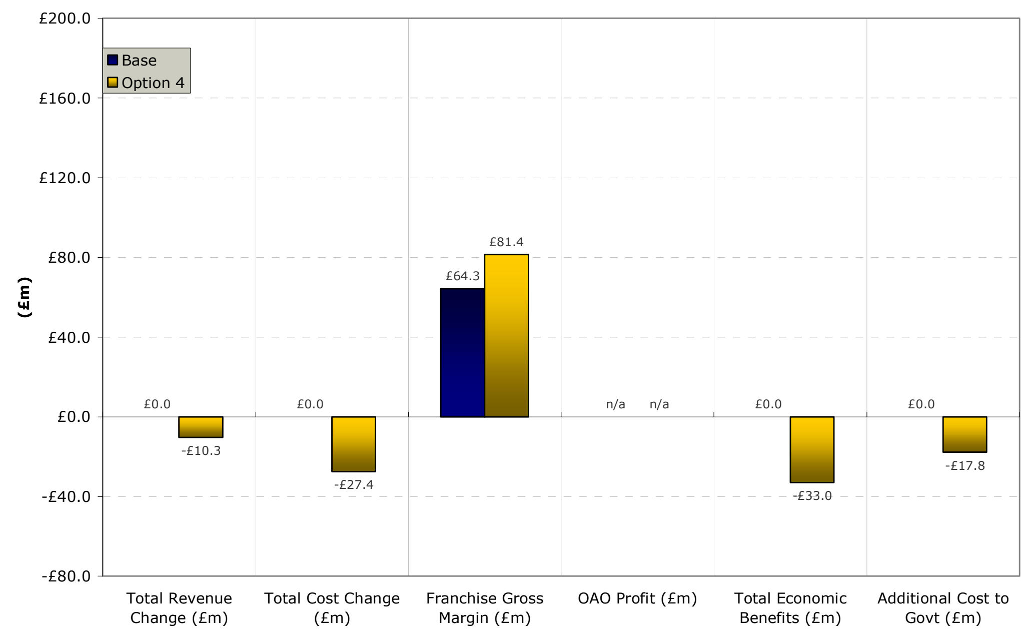
6.3 West Coast Results

6.3.1 The WCML model was used to test the following options set out in the Terms of Reference:

- Option 1: Two fast train paths per hour transferred from the FO to an OAO
- Option 2: Four fast train paths per hour transferred from the FO to an OAO
- Option 3: Variations on Option 2, such as alternative destinations
- Option 4: for comparison, all train paths continue to be held by the FO, but the four paths with the greatest CtG are recast to maximise franchise value.

6.3.2 For the purposes of the report, we have presented the results of certain options only and in an order that best tells the story of how different levels of on-rail competition affect economic benefits and CtG (the change in franchise subsidy/premia and network grants payable by Government, relative to the base position). More detail on each Option is presented in Appendix A of this report.

Option 4: Recasting of franchise to maximise franchise value



Description: As base, but with a two-hourly service transferred from Glasgow to Chester

Figure 6.1 WCML Option 4: Recasting franchise to maximise franchise value

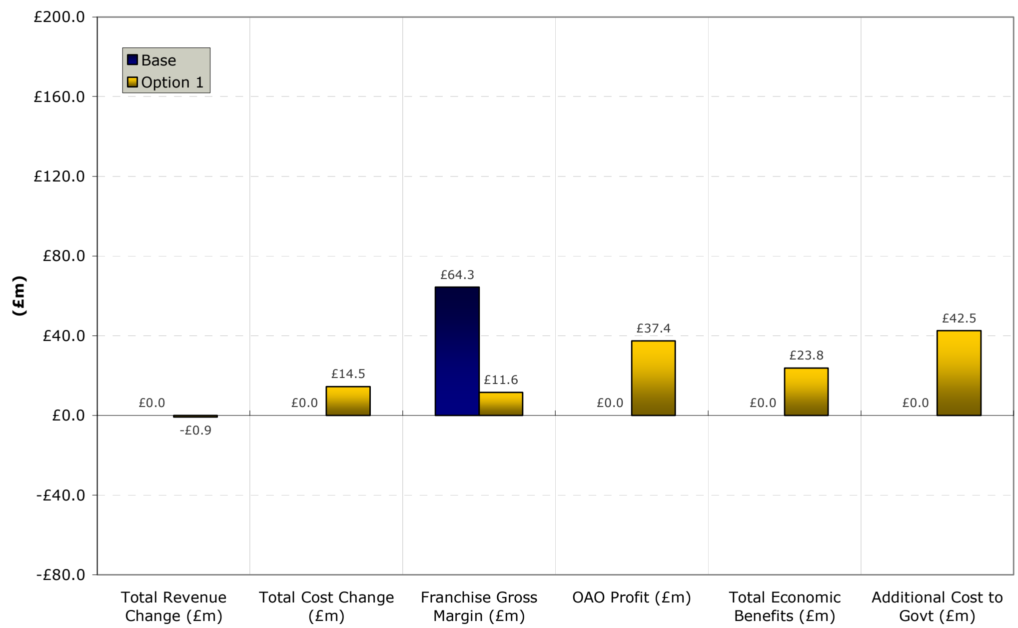
6.3.3 As a starting point, the model was used to recast the current WCML franchise in order to assess whether any savings in CtG could be achieved through maximisation of franchise value, in the absence of on-rail competition.

6.3.4 As Figure 6.1 shows, a saving of £17.8m was achieved by recasting current franchise services: removing the second, heavily subsidised path to Glasgow and sending it instead to Chester at lower cost. CtG is comprised of the change in subsidy/premia as a result of changes in franchise value, and, in later examples, any transfers to or from Network Rail as a result of changes in FTAC. In this example, there is no change to FTAC policy. The change in CtG in this option is equal to the difference between the reduction in FO revenue (£10.3m) and the reduction in FO cost (£27.4m plus £0.6m of additional cost, from the reduction in FO retained profit).

6.3.5 However, the decrease in CtG shown in Figure 6.1 came with an associated reduction of £33m in economic benefits, predominantly as a result of removing the second heavily subsidised path to Glasgow.

Option 1: Transfer of two paths per hour to an OAO

6.3.6 In Option 1, the two most costly FO train paths per hour are transferred to an OAO, and this option tested the OAO operating an hourly service to Manchester and two-hourly services to Chester and Glasgow.



Description: Hourly FO service to Manchester and two-hourly FO services to Glasgow and Chester transferred to OAO

Figure 6.2 WCML Option 1: Transfer of two paths per hour to an OAO

6.3.7 This option presents the effects of introducing a small amount of on-rail competition to a selected number of destinations on the WCML (Manchester, Chester and Glasgow). As a result of transferring the two paths an hour to the OAO, £53m of franchise value was lost and CtG increased by £43m, reflecting abstraction from FO revenues by the OAO as it competes for passengers. The additional CtG in Figure 6.2 is presented before any change to FTAC (i.e. the totality of FTAC is still paid by the FO).

6.3.8 Even with the realisation of central case cost savings by the OAO, total industry costs are increased by £14.5m relative to the base in this option. The introduction of the OAO reduces the density of the FO (particularly to Manchester) and the OAO itself is not yet operating at the kind of scale where sufficient economies of density can be achieved.

Option 1: Impact of fare responses

6.3.9 On a flow that has two operators competing for patronage, fare pricing is a tool at the disposal of both the OAO and FO (with the exception of some ticket types due to fare regulation). An OAO may decide to reduce fares to compete head-on with an existing FO in order to maximise profits. If the OAO does so, it will take market share from the incumbent operator and this was the first run carried out in our modelling.

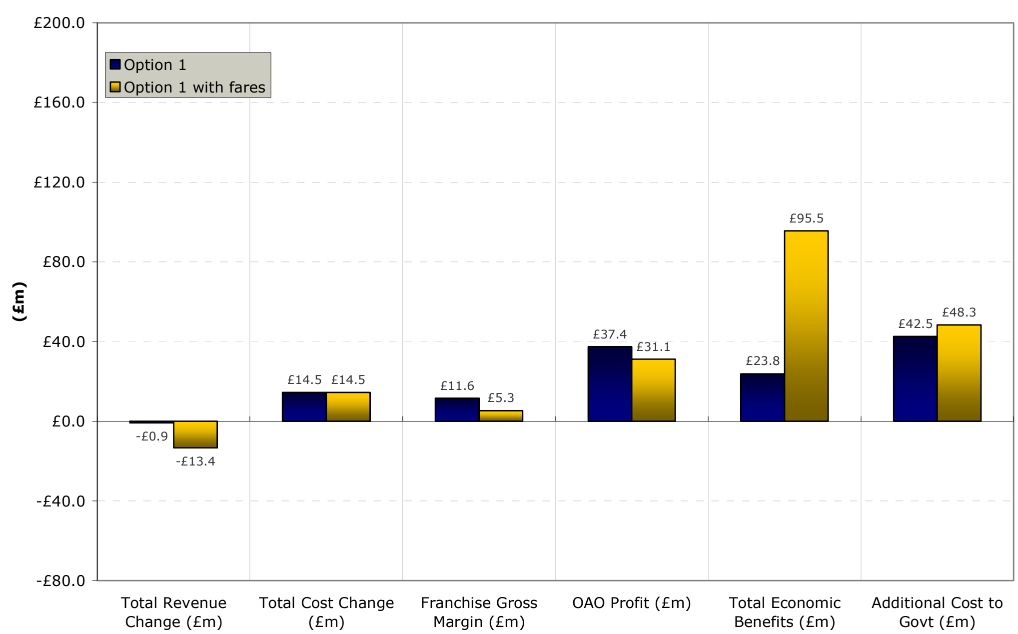
6.3.10 However, the FO is likely to respond with their own fare reductions. The next runs looked at the likely response of the FO to lower fares being introduced by the OAO. In most cases, the model suggests the FO will respond with similar fare reductions.

6.3.11 OAO fares are currently lower because they operate generally inferior (longer journey times, lower frequency than competing FO), niche services to new destinations. For the options run as part of this study it has been assumed that journey time and quality are the same for the FO and OAO. Where the service is of equal quality it should be expected the fares levels would be similar.

6.3.12 Actual behaviour of two distinct competing operators is hard to predict and could result in 'gaming effects'. However:

- when OAO and FO compete head-on on a major flow, then fares are likely to be forced down resulting in customer benefits and higher CtG, but supported by a good BCR
- when OAO and FO operate on different routes fares will probably not be reduced.

6.3.13 The model run shown below contains the same service specification as Option 1, but includes fare competition between the OAO and FO and presents the effect on economic benefits.



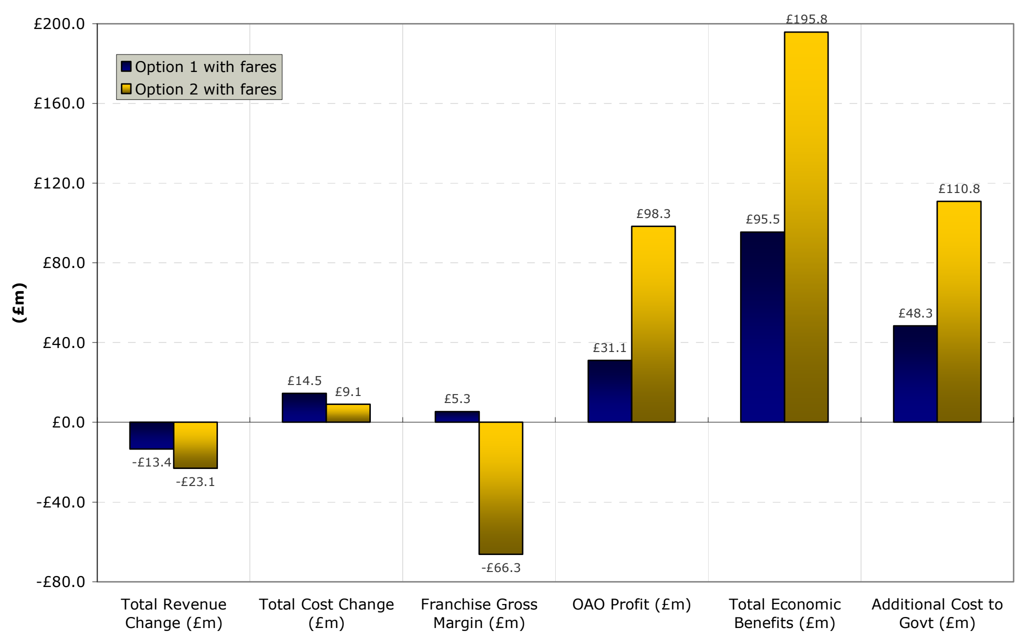
Description: As Option 1 but with OAO/FO fares optimised.

Figure 6.3 WCML Option 1 – Effect of fare competition

6.3.14 Fare competition between the FO and OAO reduces total rail industry revenue by £12.5m. Franchise value and OAO profit are both marginally decreased, but the most significant result of reduced fares is a large increase in economic benefits, driven by reduced costs to rail users. The slightly increased CtG in this option delivers a BCR of 2.0:1.

6.3.15 The results of Option 1 suggest that on-rail competition does provide benefits to passengers through fares competition, and, on the assumption that efficiency savings are realised by the OAO, profits can be made by a new entrant in competition with the FO. However, such small scale competition results in increased CtG which is required to subsidise decreases in franchise value. Again, additional CtG in Figure 6.4 is presented before any change to FTAC.

Option 2: Doubling the number of paths transferred



Description: As Option 1, with additional hourly train to Birmingham and two-hourly services to Liverpool and Manchester transferred from FO to OAO.

Figure 6.4 WCML Option 2: Increasing size of OAO with additional path

6.3.16 The number of paths transferred to the OAO in Option 2 is double the number in Option 1, with an additional hourly service to Birmingham and further two-hourly services to Liverpool and Manchester transferred from the FO to the OAO.

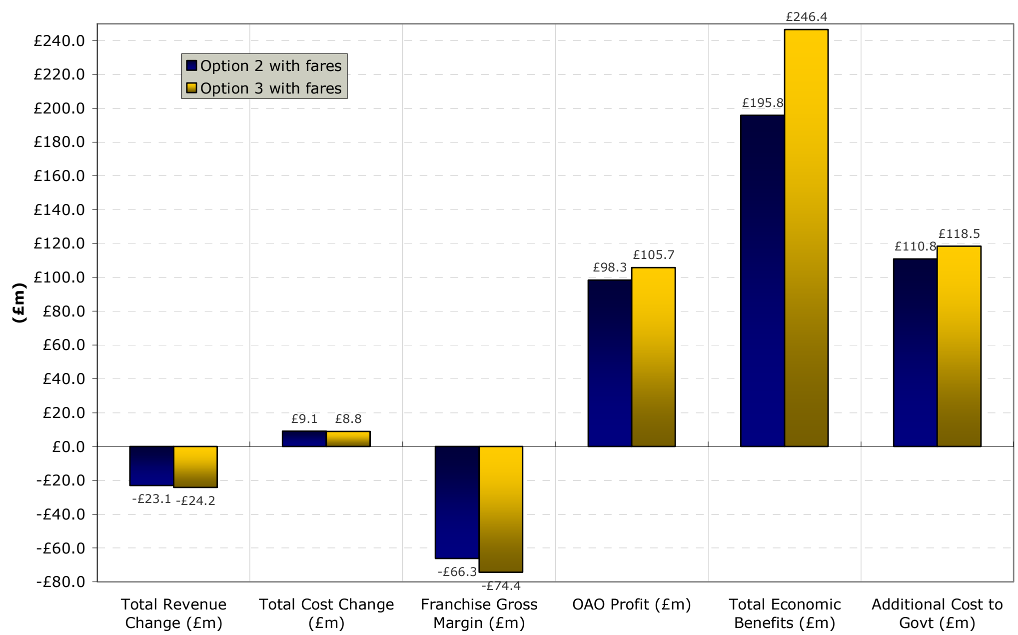
6.3.17 Figure 6.4 shows the effect of increasing the size of the OAO by transferring the extra FO path. As in Figure 6.3, the effects of fare competition are modelled in this comparison.

6.3.18 Increasing the number of paths transferred significantly increases the OAO profit at the expense of franchise value (due to continued abstraction from FO revenues). As was evident from Figure 6.3, on-rail competition in this option creates large increases in economic benefits through downward pressure on OAO and FO fares. However, the continued reductions in franchise value mean that CtG (before changes in FTAC) is also significantly increased as value is removed from the franchise, resulting in a BCR of 1.77.

Option 3: OAO given freedom of destination

6.3.19 Each of the WCML options presented so far has been subject to a modelling constraint of "like for like" operation. This means that the OAO is obliged to operate services with the same specification as those on the paths removed from the FO. WCML Option 3 presents the results of removing this constraint, allowing the OAO to run to the destinations it deems most profitable.

6.3.20 Taking the four fast train paths transferred from the FO in Option 2, and not constrained by having to run "like for like" to the same destinations, the OAO, driven by profit maximisation, will operate to Manchester (1.5 tph), Birmingham (1tph), Glasgow (0.5tph), Liverpool (0.5tph) and Blackpool (0.5tph).



Description: OAO operating to Manchester (1.5 tph), Birmingham (1tph), Glasgow (0.5tph), Liverpool (0.5tph) and Blackpool (0.5tph)

Figure 6.5 WCML Option 3: OAO freedom of destination relative to Option 2

6.3.21 As part of the specification of OAO services in WCML Option 3, a consideration was included to the operational practicality of increasing service provision to Birmingham and Manchester. Services to these destinations were constrained at current timetable levels; Option 3 modelling assumed that only the same number of services as had been removed from the FO could be operated by the OAO.

6.3.22 A key feature of Option 3 is that despite the freedom to operate to "commercial" destinations, the OAO is still not able to reduce industry costs. In fact, due to the nature of the key WCML markets, and capacity constraints at Birmingham and Manchester, the "best" OAO service pattern is similar to the paths forgone by the franchise: substituting only a two hourly Blackpool service for a FO path previously serving Chester and North Wales.

6.3.23 In this Option, passenger benefits are greatly increased relative to Option 2 due to decreased congestion on Anglo-Scottish routes (Blackpool service relieving demand at Preston) and increased fare competition relative to Option 2. These benefits are delivered at a marginally increased CtG, resulting in a BCR of 2.1:1. However, overall CtG remains high at £119m.

6.3.24 On the WCML, the removal of economies of density from the FO (the smaller FO now serves the same destinations as in the base, but has seen a significant decrease in total train miles), leads to an increase in FO cost per train mile. Furthermore, the diverse operations of the OAO (serving many markets to maximise revenue) means it too does not receive any tangible density benefits. The results of Option 2 suggest that for the WCML while any increase in on-rail competition is able to deliver benefits, it cannot provide savings in CtG.

Interim Conclusions from West Coast modelling

6.3.25 The options tested on the WCML show that competition in the market through Open Access operation could bring benefits to passengers, albeit at an increased CtG (before changes in FTAC policy).

6.3.26 However, even with the assumed realisation of OAO efficiency savings identified in the Literature Review, total industry costs are increased relative to the base, as moving from one large incumbent to two smaller operators causes a loss of economies of density. This outcome is most evident in Options 2 and 3 where the scale of the OAO is increased, resulting in a reduced FO.

6.3.27 WCML route characteristics prevent the OAO and FO from enjoying significant economies of density. The way in which the WCML markets are structured and the fact that for some stations, the majority of demand can be satisfied by a reduced service (for example on Anglo-Scottish services where removing one third of services to Glasgow only removes 10% of the demand) suggests current inefficient rolling stock utilisation of FOs. In the above options, whilst there is a high level of on-rail competition, this competition results in increased cost both to the rail industry and Government[9].

[9] Changes in CtG on the WCML are presented before the implementation of any FTAC policies. In the above options, FTAC is always paid in whole by the FO. The large CtG value shown in Figure 6.4 and Figure 6.5 would be mitigated, but not wholly offset by, any changes in FTAC policy. FTAC options are discussed further in the ECML results.

6.4 East Coast Results

6.4.1 Using the outcomes from the Options tested on the WCML as a basis for further investigation, the model was adapted to test the effects of on-rail competition on the ECML. Modelling of the WCML looked at on-rail competition being subject to capacity constraints on the network (at Manchester and Birmingham). As part of the ECML modelling, the operational practicality of the service specification is not explicitly considered – the modelling scenarios explore whether benefits can be produced which are worthy of further investigation that seeks a delivery scenario. If scenarios modelled in the ECML options are considered beneficial then practical solutions could be investigated with Network Rail, but such considerations lie outside the scope of this study.

6.4.2 As specified in the Terms of Reference, the ECML model was used to undertake the following tests:

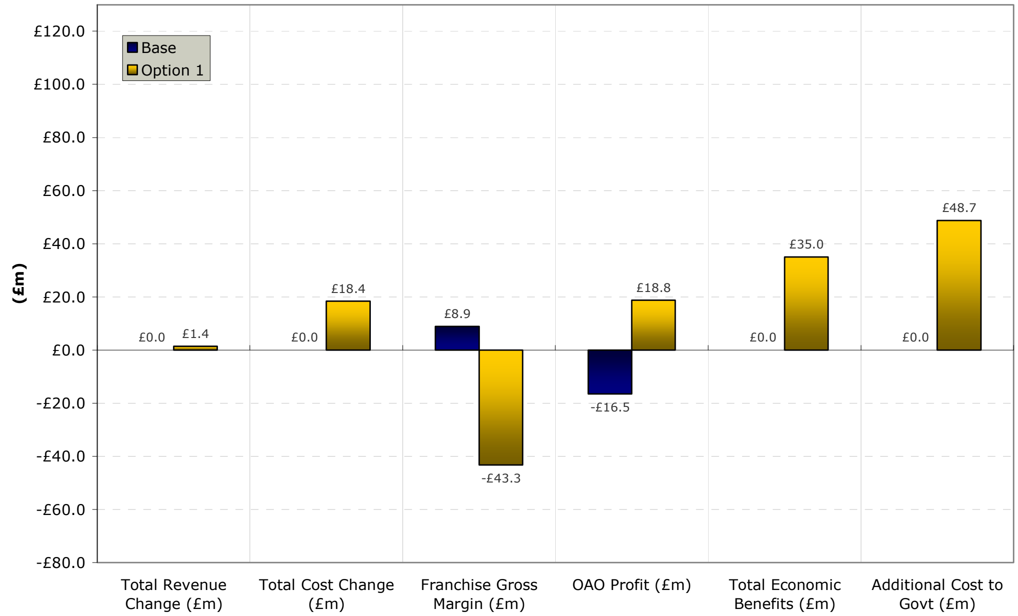
- **Option 1:** Transfer of existing (December 2010) OAO path from current destinations to new OAO destinations (unconstrained by NPA test)
- **Option 2:** As Option 1, with one additional fast train path per hour transferred from FO to OAO
- **Option 3:** Existing FO services split into two equally sized franchises
- **Option 4:** As Option 3, but with an OAO operating instead of the second franchisee.

6.4.3 Again, as in section 6.3, options are presented here in the way which best informs the conclusions of the study.

Option 1: Removal of the NPA test

6.4.4 The East Coast Main line already has a small amount of Open Access operation in the base. However, as was outlined in the introduction to this chapter, the constraints currently placed on OAOs have limited any such operation to the fringes of the network. One OAO constraint, the NPA test, seeks to protect SoS funding by minimising the impact on the value of the franchise, expressed here as Franchise Gross Margin (FO revenue minus FO costs including FTAC).

6.4.5 As a starting point on the ECML, Option 1 forecasts the impact of removing the NPA test on the value of the franchise and hence CtG. With the removal of this constraint, the OAO is allowed to use the path currently filled with extant services to Hull, Bradford and Sunderland to run services to the destinations where they can make the most profit.



Description: Current OAO path to Sunderland, Bradford and Hull redirected to Newcastle (0.5 tph) and Leeds (0.5 tph)

Figure 6.6 ECML Option 1: Re-allocation of extant OAO services

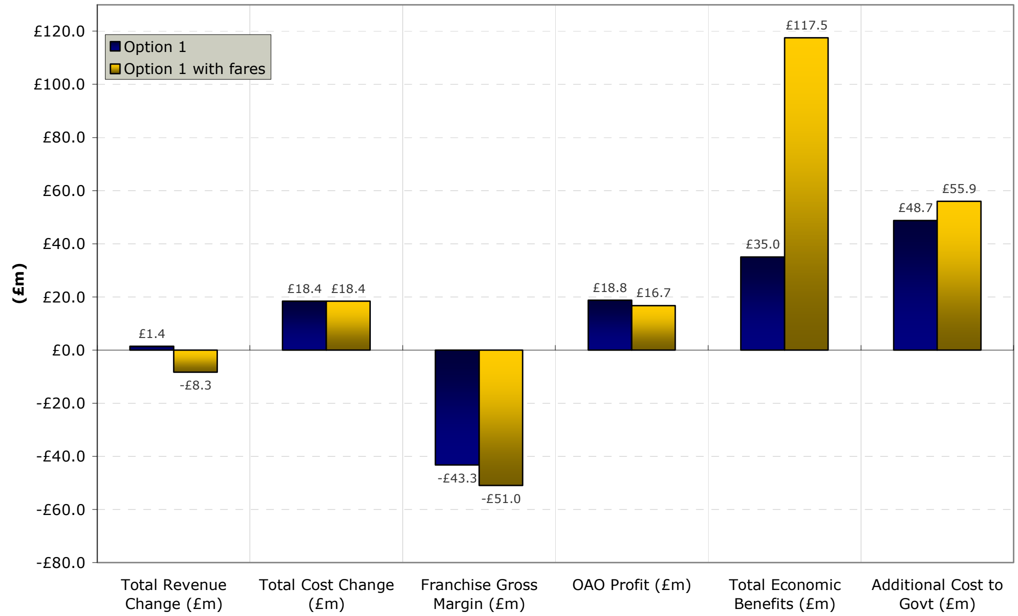
6.4.6 Without the constraints of the NPA test and outside of operational practicality considerations, our modelling suggests that the OAO would choose to run to the most profitable East Coast markets of Newcastle and Leeds in alternating hours. The impact of this change in service means that Sunderland, Hull and Bradford lose the majority of their direct services (some FO services remain to Hull and Bradford), and there is an increase in head-on competition at Newcastle, Darlington and Durham, York, Leeds and stations south of Doncaster.

6.4.7 The OAO services to Newcastle and Leeds create direct competition with FO services at major stations including Newcastle, Darlington and Durham, York, Leeds and particularly Peterborough, leading to abstraction of revenue at these stations and significant reduction in franchise value. Total industry cost increases by £18.4m due to an 8% increase in train miles compared to the December 2010 timetable and longer, more expensive rolling stock being operated by the OAO on all routes[10]. Economic benefits of £35m are driven primarily by producer benefits (OAO profit), but come at the expense of increased CtG resulting from decreased franchise value and associated increased subsidy required to cover OAO abstraction from FO revenue.

Option 1: Impact of fare responses

6.4.8 Where the OAO competes directly with the FO, this is likely to lead to price competition as seen on the WCML (paragraph 6.3.14). This sensitivity on Option 1 seeks to replicate the first order fares response of the OAO and FO on flows where there is direct competition as set out in Chapter 5 and discussed in Appendix A. Details and commentary on fare changes as suggested by the model are presented in Appendix A of this report.

[10] As part of the modelling assumptions it was specified that the OAO would run the same stock type as the FO for direct comparison.



Description: As Option 1 but with OAO/FO fares optimised

Figure 6.7 ECML Option 1 – Effect of fare competition

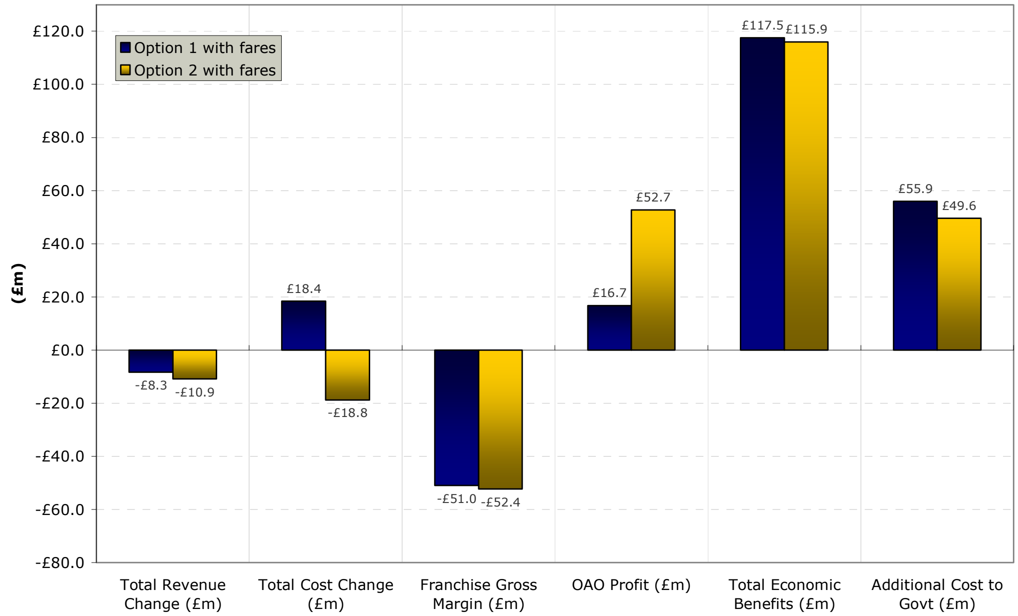
6.4.9 As was evident on the WCML, the primary result of fare competition between the OAO and FO is the generation of large user benefits, which arise at a slightly increased CtG (value of the franchise is decreased as overall industry revenue falls). The effect of fares competition in ECML Option 1 delivers a BCR of 2.1:1, similar to the WCML result of Option 1 (2.0:1).

Option 2: Transferring an additional path to from the FO to the OAO

6.4.10 Having assessed the effects of small scale Open Access operation when unconstrained by the NPA test, ECML Option 2 explores changes in costs and benefits from the transfer of an FO path to the OAO. In this option, one of the FO Edinburgh paths was transferred to the OAO as it had the greatest CtG. This additional path provides the OAO with two paths per hour. Despite the increased cost associated with serving Edinburgh, the abstraction of revenue from the FO that can be achieved by the OAO is large, and offsets the cost increase. Therefore, instead of building on Option 1 and running an hourly service to Newcastle, it sends one train per two hour period to Edinburgh.

6.4.11 The OAO now has one further train per two hour period to allocate. It is not optimal for the OAO to send an additional service to Edinburgh as the marginal benefits (some further abstraction) are outweighed by significant marginal costs of increased train miles. Instead, it chooses to improve its Option 1 service to the large Leeds market, abstracting further revenue from the FO at competing intermediate stations (Leeds, Wakefield, Doncaster and Peterborough) and gaining economies of density by operating increased train miles on this section of the its route.

6.4.12 Therefore in Option 2, the OAO operates to Edinburgh and Newcastle in alternating hours, with an hourly service to Leeds.



Description: As Option 1 with one FO Edinburgh service per hour transferred to OAO. OAO serves Leeds (1 tph), Newcastle (0.5 tph) and Edinburgh (0.5 tph). OAO/FO fares optimised.

Figure 6.8 ECML Option 2: FO path transferred to OAO

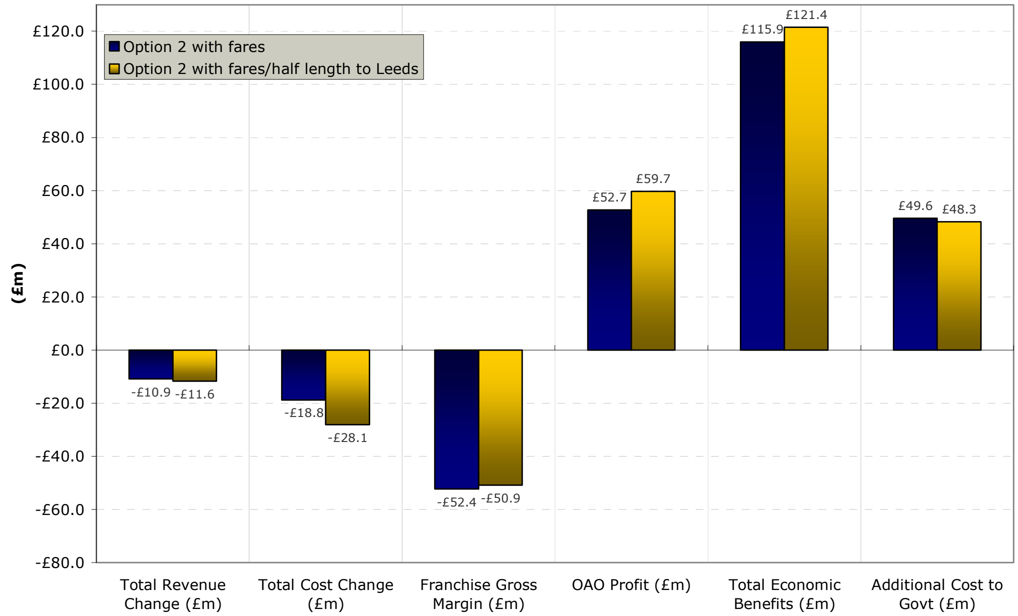
6.4.13 Through the transfer of the most costly FO path (to Edinburgh), total industry cost is reduced relative to the base. Reductions in industry cost are partially a function of the reduced cost to the FO of the foregone Anglo-Scottish services, but also the assumed efficiency savings on the part of the OAO relative to the FO, and of the service specification which allows the OAO to operate at significantly increased scale on a route network comparable to the base, thus benefiting from increased economies of density.

6.4.14 Franchise Value is not greatly affected with the transfer of the train path, as FO costs decrease almost proportionally with revenue, but due to efficiency and density effects, the OAO is able to make a significant profit on its newly specified route. The overall level of benefits does not exhibit much change, but the composition of economic benefits does vary between the options.

6.4.15 In Option 1, there are competitive pressures on fares which are not achievable in Option 2 due to congestion on Anglo-Scottish services (fare changes for each ECML option are shown in Appendix A). Some £58m of user and non-user benefits are still received in Option 2, but total economic benefits are more reliant on producer benefits than in Option 1 due to lower fare competition in Option 2, as discussed in more detail in Appendix A.

Use of shorter rolling stock

6.4.16 The McNulty review commented on the role that efficient utilisation of stock could play in reducing industry costs. Currently, FOs are constrained in the rolling stock they use. However, the more commercially flexible OAO is likely to actively seek out all available potential efficiency savings. Therefore, to explore the possibility that the OAO may be able to cut costs by running shorter trains, each OAO service was halved in length in turn and the crowding levels noted.



Description: As Option 2, with shortened rolling stock used by OAO on services to Leeds.

Figure 6.9 ECML Option 2: Impact of reducing stock length on available routes

6.4.17 The use of shortened rolling stock by the OAO was tested on all options, assessing the effects on load factor and changes in OAO profit (as a result of decreases in cost but corresponding decreases in revenue). It was found that the hourly OAO service to Leeds in ECML Option 2 could be run with half length stock without significant overcrowding or at detriment to OAO profit. However, although half length rolling stock is sustainable at 2010 demand levels, crowding may become a problem in the peak within 5 years and in practice the OAO could have to revert to full length stock.

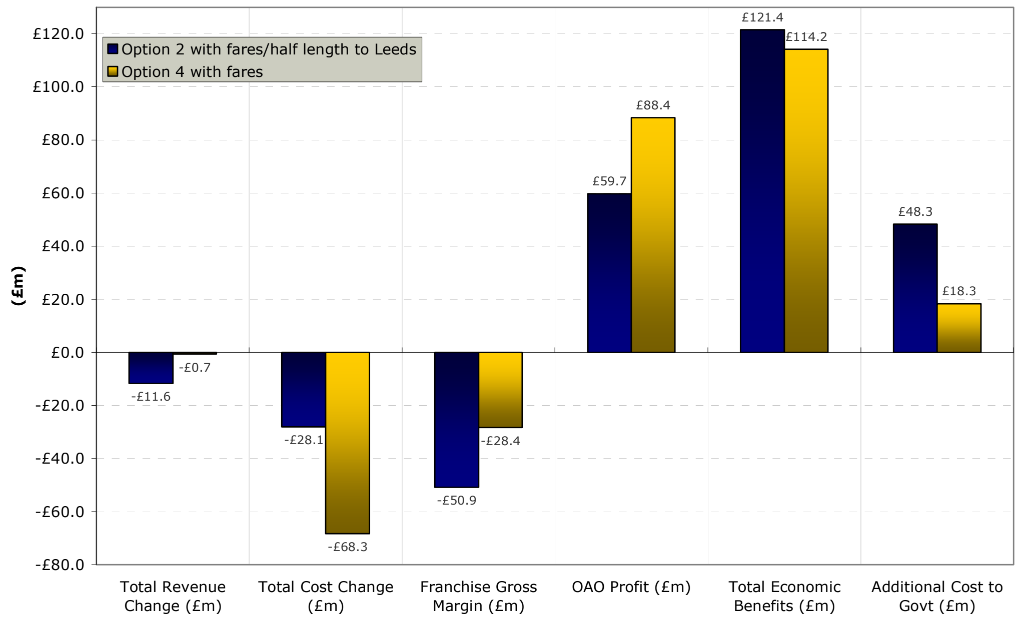
6.4.18 As shown in Figure 6.10, the OAO can lower its own (and industry) costs and increase profits with efficient utilisation of rolling stock. Value is also restored to the franchise as load factors increase on the OAO services and some passengers are re-allocated to the FO at stations south of Leeds.

Option 4: Splitting the paths by geography - creation of two dense operators

6.4.19 The results of ECML Option 2 and the interim conclusions drawn from the WCML results both suggest that it is possible for on-rail competition via the introduction of OAOs of a requisite size to deliver benefits to passengers through decongestion and fare competition.

6.4.20 However, it is evident from the WCML that on-rail competition is not on its own a driver of savings to government, as two operators competing to a number of destinations results in the removal of the economies of density possessed by a single FO. As shown in Figure 6.10, for significant reductions in industry costs, density of route must be present in addition to scale of operation.

6.4.21 In ECML Option 4, all paths are divided between the FO and OAO, with a geographically-based split. The FO is assumed to run the route to Leeds and Bradford and the OAO to run the route to Edinburgh, Newcastle and Hull. The logic of this is that the FO would provide commuter and other socially necessary services south of Doncaster, whilst other franchisees serve smaller stations further north. As such, the level of on-rail competition in this option is actually very low, with only stations south of Doncaster served by both operators.



Description: FO operates services to Leeds/Bradford. OAO operates services to Scotland, Newcastle and Hull.

Figure 6.10 ECML Option 4: Impact of creation of two dense operators

6.4.22 As a result of splitting the paths by geography, there is a significant reduction in industry costs: partially as a result of OAO efficiencies on longer and more expensive Anglo-Scottish routes, but also as a result of significant economies of density received by the FO. In this scenario, the entirety of the FOs train miles are now allocated on the relatively short route section between London and Leeds, resulting in a reduction in cost per train mile relative to the base. Density effects do not comprise all the cost savings in this option, but if the OAO is given the opportunity to achieve assumed efficiency savings, the incentive exists for entry to the market and reduction of industry costs.

6.4.23 Compared to Option 2, significant value is restored to the franchise, reducing CtG by £30m, and the profits of the OAO are also increased. In Option 4, economic benefits are marginally reduced relative to Option 2, but there is again a change in the composition of benefits. Figure 6.11 below shows how economic benefits are comprised in Option 2 (before rolling stock efficiencies) and Option 4.

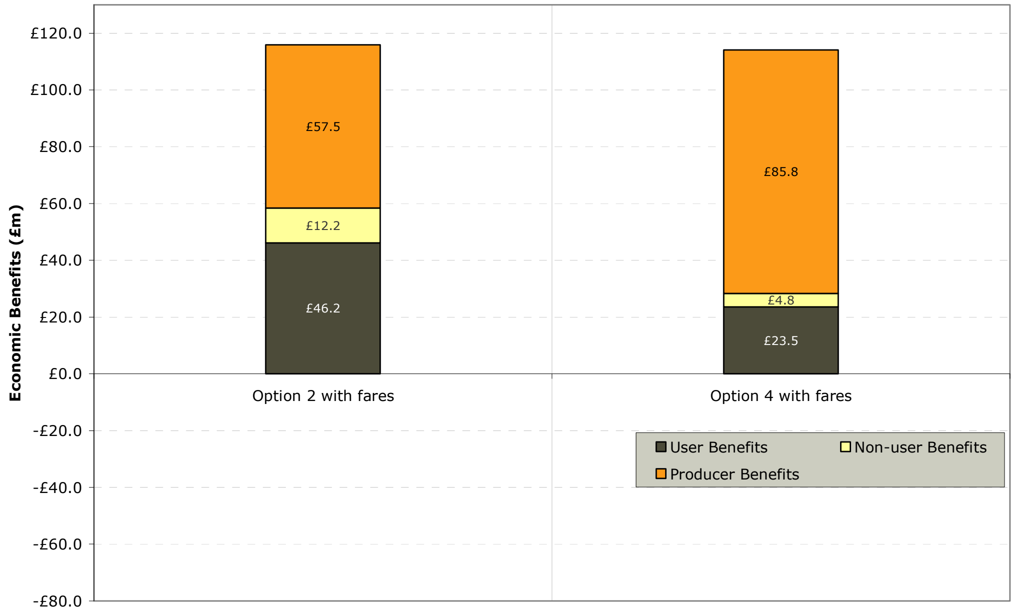


Figure 6.11 Composition of Economic Benefits – ECML Option 2 vs. Option 4

6.4.24 As described in paragraph 6.4.14, ECML Option 2 generates £58m of user and non-user benefits through fare competition and decongestion benefits, with remaining benefits coming from producer gains. This option contains a relatively high level of on-rail competition. In Option 4, the level of on-rail competition is greatly reduced (two distinct operators serving different destinations), meaning user and non-user benefits are suppressed, and the total amount of economic benefits is largely driven by producer benefits.

6.4.25 Figure 6.11 shows that in order to deliver benefits to rail passengers, a high level of on-rail competition is required. However, it is likely that this competition results in reduction in the value of the franchise and therefore increased CtG. The study therefore now looked to the use of FTAC as a way to recover franchise value, and minimise CtG.

6.5 Alternative Fixed Track Access Charge (FTAC) mechanisms

6.5.1 The Literature Review suggested that if an Open Access entrant reduced the profitability of a franchise, in the long run the taxpayer would bear the cost through changes to Franchise Payments. Indeed, modelling has shown that as competition in the market increases, value is removed from the franchise, resulting in an increased CtG. The revenue abstracted from the franchise is retained by the OAO as "excess profit". The Literature Review suggested that it may be reasonable for an OAO to replace in part or in whole the lost contribution from Franchise Payments. As such, Chapter 2 identified five different FTAC mechanisms. To re-iterate paragraph 2.7.9, the mechanisms are:

- As now: zero FTAC will be applied to the OAO cost base
- Proportionate allocation of FTAC (mechanism 1): FTAC allocated proportionately between FO and OAO in accordance with their share of paths

- Peak capacity charge (mechanism 2): total FTAC allocated proportionately between FO and OAO as above, but with additional charge of 50% to OAO for operating peak paths
- Likely "auction" value (mechanism 3): OAO pays FTAC set at the level of residual value (i.e. revenue minus cost, including variable TAC) after a reasonable level of profit has been retained by the OAO (see paragraph 6.5.3)
- Opportunity cost to the franchise (mechanism 4): opportunity cost is determined by assessing the impact on the value of the franchise as the FO gives up the path(s)

6.5.2 Figure 6.12 and Figure 6.13 show the impact on OAO profit and CtG of each of the FTAC mechanisms set out above.

6.5.3 In each case it is important to ensure the OAO maintains a level of profit at which they are still willing to run services. Without this incentive, the OAO would not enter the market. As outlined in section 3.6, it has been assumed for the purposes of this study that the level of required OAO profit is 10% of revenue, higher than an FO is likely to require during a franchise competition (modelled as 6%) due to the different risk positions of Open Access and Franchise Operators. In both Option 2 and 4, each of the FTAC mechanisms leaves the OAO with at least 10% revenue as profit.

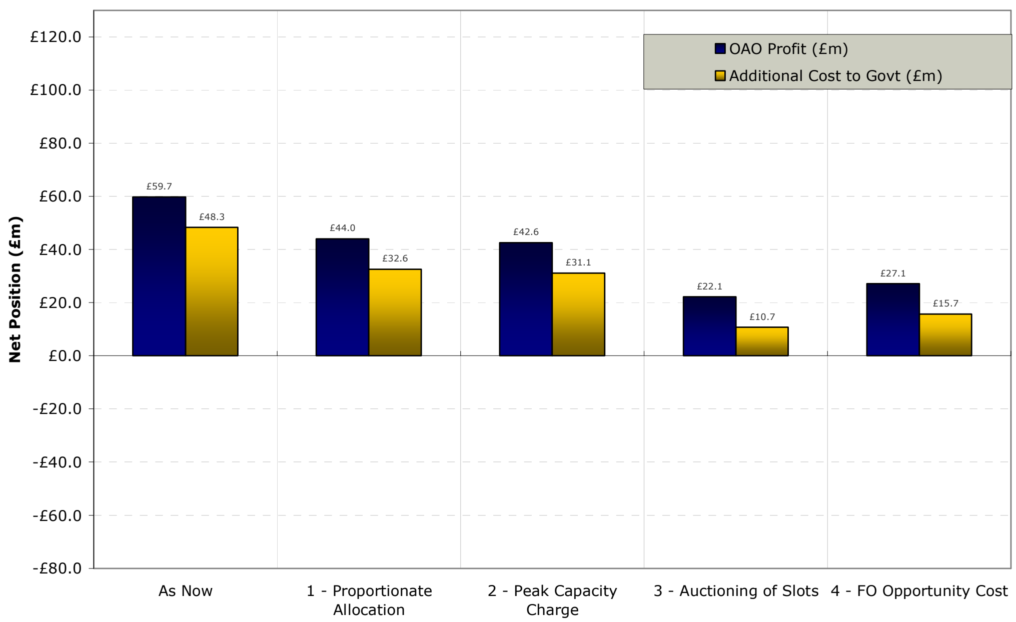


Figure 6.12 ECML Option 2: Comparison of FTAC Options

6.5.4 Using ECML Option 2 as an example to demonstrate how FTAC mechanisms can be used, the "As Now" position sees the FO paying all the currently levied FTAC. This artificially increases its costs (and therefore required level of subsidy), increasing the additional CtG (which stands at £48.3m). For ECML Option 2, implementing a policy of proportionate allocation of FTAC (mechanism 1) with or without a "peak capacity charge" (mechanism 2) helps the budget of the Government, but FTAC mechanism 3 ("Auctioning of Slots") is the most effective in reducing CtG to its lowest level. This requires the OAO to bid up-front for the paths it will receive and assumes that the OAO will forego all of its excess profits above the 10% of revenue level, which it would retain and pass to shareholders.

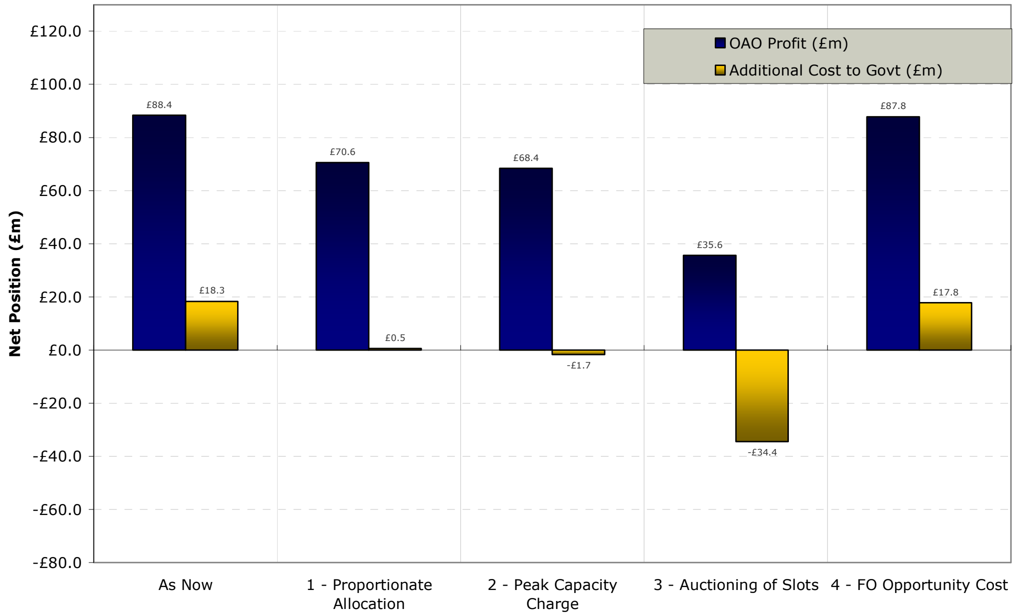


Figure 6.13 ECML Option 4: Comparison of FTAC Options

6.5.5 Similarly to Option 2, Option 4 shows that OAO profits can be returned to the Government to compensate for value taken out of the franchise. However, due to the significantly increased OAO profits of this option and the relatively small initial CtG due to economies of density experienced by the FO, FTAC mechanisms 1, 2 and 3 all reduce the CtG to close to or below zero.

6.5.6 Figure 6.12 and Figure 6.13 show that FTAC mechanism 3 is the most successful in terms of reducing CtG whilst still ensuring that the OAO retains a profit which will be seen as an acceptable rate of return on investment. Figure 6.14 shows the effect of applying this FTAC option on the key performance indicators of ECML Options 2 and 4.

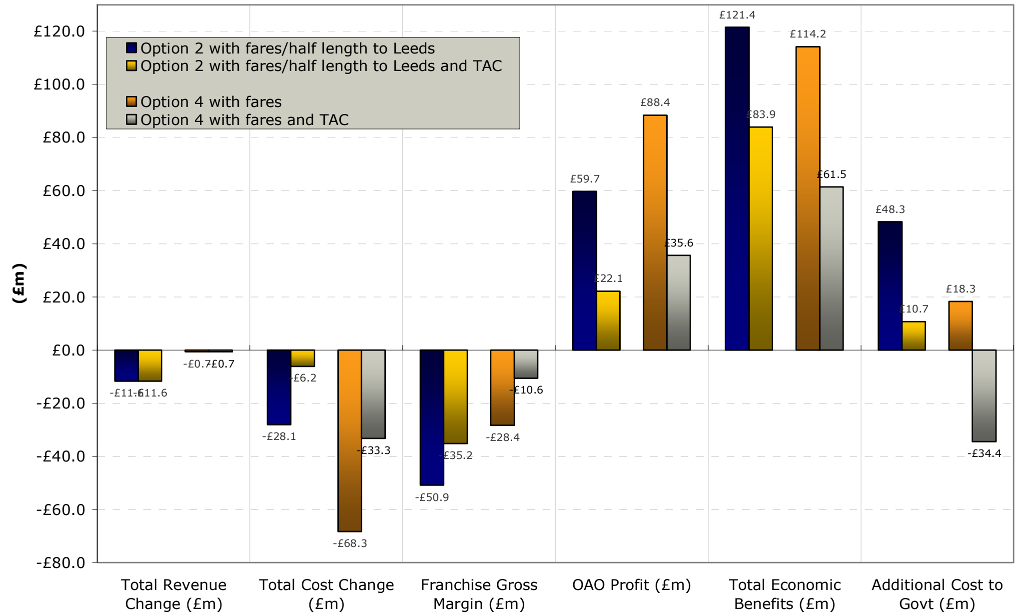


Figure 6.14 Comparison of FTAC option 3 on ECML Option 2 and Option 4

6.5.7 Figure 6.14 shows that with the exception of industry revenue, all key performance indicators are affected by changes in FTAC policy. Taking each indicator in turn:

- **Total Revenue Change:** no change. FTAC does not affect OAO/FO revenue
- **Total Cost Change:** in each Option, total industry costs are increased with the change in FTAC. The FO pays less FTAC (now only paying proportionally for its paths), but the OAO pays significantly more (to a level where it retains 10% of its profit). However, in both Option 2 and Option 4, total industry costs are shown to be reduced compared to the base. The reduction is largest in Option 4 due to the density effects described in paragraph 6.4.22
- **Franchise Gross Margin:** in each Option, Franchise Gross Margin is improved with the change in FTAC policy as the FO now pays only for the paths it operates and its FTAC burden is reduced
- **OAO Profit:** OAO profit is reduced with the application of FTAC, as this "excess" profit is passed back to Government via the "auction" for paths. OAO profit is constrained to 10% of revenue, and is higher in Option 4 as it has higher total revenue than Option 2 (£356m compared to £221m)
- **Economic Benefits:** economic benefits are reduced in both Options as producer benefits (in this case OAO profits) are reduced due to increased costs in the form of FTAC. Economic benefits are greater in Option 2 than in Option 4. This is because Option 2 develops a much higher level of on-rail competition than the geographically specified Option 4, which separates the operations of the FO and OAO, and is more focused on the exploration of density savings than on direct competition. The greater competition in Option 2 means more routes are affected by fare reductions which delivers much higher user and non-user benefits in comparison to Option 4 (as shown in more detail Figure 6.11, before FTAC was applied)

- **Additional Cost to Government:** imposition of FTAC on the OAO reduces the CtG in both Options, as was shown in Figure 6.12 and Figure 6.13. Option 2 with FTAC still represents a net CtG due to the greater abstraction of revenue from the FO (shown in decreased Franchise Gross Margin) and overall loss in industry revenue through competitive pressures reducing fares on a number of routes. ECML Option 4 with FTAC shows a saving to Government can be achieved as there is not only a significant amount of OAO profit to be recouped through FTAC, but also the effects on Franchise Gross Margin (and hence the required level of subsidy) are smaller, due to the FO operating its train miles on a reduced route and the implied density savings offsetting losses in revenue to the OAO.

6.5.8 However, the key issue arising from advocating the use of an auction to reimburse the Government with money taken out of OAO profits is the extent to which such track access charging policies remove incentives for OAOs to enter the market. To take account of how OAOs might price this constraint of their profits given they would be exposed to market risk in a way the FO is not, sensitivity tests were carried out on the attitude to risk of the OAO in bidding to enter the market.

6.5.9 In the absence of market evidence for the returns OAOs might require, we looked to the standard assumptions used in the assessment of PPP/PFI schemes (between 13% and 18%). The results of using these rates, which are higher than the 10% assumed in the Figures presented above, as sensitivities are shown in Table 6.1.

Table 6.1 OAO profit and CtG with differing required OAO profit level

	FTAC w/ 10% profit	FTAC w/ 13% profit	FTAC w/ 15% profit	FTAC w/ 18% profit
OAO Profit (£m)	£35.6	£46.3	£53.4	£64.1
Additional CtG (£m)	-£34.4	-£23.8	-£16.6	-£5.9

6.5.10 Table 6.1 shows that even at the most risk-averse end of the spectrum, using FTAC policy where slots are auctioned on ECML Option 4, a reduction in CtG is still achievable.

6.5.11 The second issue arising from the FTAC results presented above is how the auctioning process would be implemented. Such considerations are outside the scope of this study, but for consideration, we see no reason why (packages of) paths could not be competed for in a similar way to the way in which franchises are competed for at present. The key difference would be that unlike competing to run a highly specified service, the operators would be competing for the right to run services of their own choosing with little specification or regulation. In effect, this mechanism would become a way of delivering the Government's desire for "lighter touch franchising" where appropriate. It may be that Franchise Agreements continue to be the best way to procure socially necessary services (subsidy driven, fare regulation, tight SLCs), whereas competing for Track Access Rights is more appropriate for commercially driven enterprises such as Intercity services.

6.6 Treatment of costs in the modelling

6.6.1 The Literature Review found that competition for the market did not produce lasting reductions in costs per train km in passenger rail in Britain and that there were three possible reasons for this:

- rail was already efficient
- gains from increased competition were offset by other factors, such as loss of economies of scale, density and scope as a result of industry break-up
- the particular characteristics of the franchising process in Britain meant that the potential cost savings were not realised.

6.6.2 However, it is clear from the literature that far from seeing productivity improvements and cost reductions, FO costs have risen and productivity has fallen since privatisation.

6.6.3 In contrast, in Germany and Sweden cost savings of 20-30% were achieved through competitive tendering, where the market shares of non-state companies are between 15 and 20% (for reference, ECML and WCML operations currently represent only 4% and 7% of passenger train-km on the network respectively).

6.6.4 Although it is also not clear from the literature that competition in the market is necessarily more effective than competition for the market and given the lack of bottom-up evidence of OAO costs when at larger scale, our modelling pivoted off current FOs costs and applied cost reductions of comparable magnitude found elsewhere. At 20% for costs and 12% for wages, the reductions in our central case can be seen as suitable for the purpose of the project.

6.6.5 However, given that the deliverability of these reductions may be variable, sensitivities were carried out on the result of both ECML Option 2 and Option 4. The sensitivities are shown in Table 6.2 against the key indicators of total industry costs (Option 2) and CtG (Option 4).

Table 6.2 Operating cost sensitivities on ECML Options 2 and 4

Percentage cost savings	0%	10%	20%	30%	40%	50%
Option 2 Total Cost Change (£m)[11]	£6.33	-£10.86	-£28.06	-£45.25	-£62.44	-£79.64
Option 4 Additional Cost to Government (£m)[12]	£18.28	-£6.03	-£34.44	-£62.85	-£91.26	-£119.67

NB: figures shown above include 12% wage savings for all sensitivities.

6.6.6 Different indicators are used for the two options due to their differing applications of FTAC policy. In Option 2, there is no change to FTAC policy: the FO pays the full FTAC and the OAO pays zero FTAC. As such, the OAO profit line does not feature in the CtG function, and

[11] ECML Option 2 presented as per specification shown in Figure 6.9 with fares competition, shortened rolling stock to Leeds and TAC option 1.

[12]ECML Option 4 presented as per specification shown in Figure 6.10 with fares competition, but with addition of TAC option 3 (as introduced in Figure 6.13.

due to CtG being the same in each of the sensitivities it is therefore not shown. The cost saving does however reduce total industry costs, as shown in the table above.

6.6.7 In Option 4 when auctioning of paths (FTAC mechanism 3) is applied, additional cost savings made by the OAO are passed directly back to the Government through FTAC, as the model automatically constrains OAO profits to 10% of revenue. OAO costs are identical in all sensitivities (a saving in costs is immediately converted into an FTAC payment), meaning total industry costs do not change between the sensitivities and as such are not presented above. In Option 4, the key performance indicator is the additional CtG, as this decreases with increases in the level of cost saving achieved by the OAO.

6.6.8 Table 6.2 shows that in the Central Case (20% savings), the introduction of Open Access operation reduces industry costs in Option 2, and generates a saving to Government in Option 4 with an FTAC mechanism in place, as extra profit made by the OAO from increased savings is transferred back to Government through the auctioning of paths (FTAC option 3). The same result (decreasing industry costs and decreasing CtG) is also evident in the Low Case (10% savings) for both options, suggesting that even in circumstances where the savings made by the OAO are of a smaller magnitude than expected, there will be some accrual of benefits on the key performance indicators of this study.

6.6.9 As a further sensitivity, ECML Options 2 and 4 with Central Case savings (20%) applied were run with altered assumptions on wage rate savings (central case of 12% in all scenarios), testing a range between 0% and 18%. The results of changing this assumption are shown below in Table 6.3. Again, the key performance indicators are different for Options 2 and 4 due to the reasons outlined in paragraph 6.6.6,

Table 6.3 Wage cost sensitivities on Central Case of ECML Options 2 and 4

Percentage cost savings (with wage savings 0%)	**0%**	**6%**	**12%**	**18%**
Option 2 Total Cost Change (£m)	-£24.46	-£26.26	-£28.06	-£29.85
Option 4 Additional Cost to Government (£m)	-£28.84	-£31.64	-£34.44	-£37.24

6.6.10 Table 6.3 shows that the impact of changing the modelling assumptions on wage cost savings is generally small in both ECML Option 2 and Option 4. In Option 2, there is a £5.4m difference in total industry cost between assuming that no wage savings are achieved by the OAO, and the high case scenario (as identified in paragraph 2.9.17 of the Literature Review) which assumes a maximum reduction of 18% in relation to FO wages. This difference is equivalent to less than 1% of total industry costs. In Option 4, CtG is decreased as the rate of OAO wage savings increases, as this saving is taken out of the OAO bottom line and passed back to Government in the form of FTAC.

6.7 Soft Benefits

6.7.1 Depending on the commercial strategy of the OAO, they may choose to provide further benefits to attract passengers to their services and drive revenue growth. This may take the form of:

- improved customer service
- improved journey experience
- marketing.

6.7.2 In reality, the OAO will need to take a commercial decision based on their view of the likely Return on Investment (RoI) from such interventions and how they would balance this with their fares policy. For example, an OAO may decide to move their services up-market by investing in customer service and take the decision to charge higher fares for the superior product.

6.7.3 Quantifying the appropriate value for these elements is clearly problematic, and needs to be based on judgement. This is not least because the interventions the OAO is likely to make are at this point unknown, although the commercial pressure on an OAO will make it unlikely they will do nothing.

6.7.4 Given the level of uncertainly, we have modelled soft factors using sensitivities of 0%, 2% and 5% reductions to in-vehicle time.

6.7.5 Interventions of the type discussed in 6.7.1 would require a level of investment from the OAO. To take account of this we have assumed a RoI of 3:1. This compares to 4.2:1 for the Virgin Trains marketing campaign "Return of the Train", discussed in PDFHv5, which suggests our assumption of 3:1 seems prudent. An RoI of 3:1 implies a revenue uplift of £6m would cost the OAO £2m of initial investment.

6.7.6 Table 6.4 and Table 6.5 show the results of this sensitivity on ECML Option 2 and 4 respectively.

Table 6.4 Effect of soft factors on Revenue, Benefits and OAO costs; ECML Option 2

Equivalent improvement in OAO journey time	0%	2%	5%
ECML Option 2 OAO Revenue (£m)	£221.5	£227.4	£235.6
ECML Option 2 User/Non-User Benefits (£m)	£56.8	£54.9	£50.4
ECML Option 2 Implied Additional Cost (£m)	£0.0	£2.0	£4.7

6.7.7 In Option 2, revenue increases as demand is generated and abstracted from the FO. User benefits decrease due to increased crowding on the OAO services, while non-user benefits increase as people shift from highway. However, the user disbenefits outweigh the non-user benefits.

Table 6.5 Effect of soft factors on Revenue, Benefits and OAO costs; ECML Option 4

Equivalent improvement in OAO journey time	0%	2%	5%
ECML Option 4 OAO Revenue (£m)	£356.3	£361.2	£368.7
ECML Option 4 User/Non-User Benefits (£m)	£28.3	£28.4	£28.2
ECML Option 4 Implied Additional Cost (£m)	£0.0	£1.6	£4.1

6.7.8 Due to less competition in Option 4, the majority of the impact is from generation rather than abstraction. This is reflected in the lower sensitivity to IVT changes shown in Table 6.5.

6.7.9 In reality, the lower level of competition and hence sensitivity in Option 4 will result in a lower RoI than in Option 2 (in the sensitivities above, RoI is an input to calculate the likely cost of interventions). This is due to the OAO being able to abstract from the FO. However, on flows with competition, OAO innovation or marketing may stimulate a response from the FO which has not been modelled here.

6.7.10 Reduced sensitivity on flows without competition also suggests that innovations and marketing on these flows will result in lower RoI and hence less incentive for the OAO to invest.

7 Conclusions

7.1 Overview

7.1.1 The case for more competition in the rail passenger industry comes down to three questions:

- does on-rail competition lead to improvements, the benefits of which justify any increased costs?
- is on-rail competition more effective than competitive tendering in driving down industry costs?
- if further Open Access is deemed desirable, given that services will continue to be provided by competitive tendering, what is the most effective way to implement it?

7.1.2 In particular, our modelling sought to answer the first two bullets by testing the hypotheses that increased on-rail competition through transfer of FO paths to OAOs could deliver:

- user and non-user benefits
- reductions in total industry costs
- savings in CtG.

7.1.3 The Literature Review found that competition for the market did not produce lasting reductions in costs per train km for passenger rail in Britain. Although the bulk of our work was carried out before the publication of the results of the Sir Roy McNulty review into Rail Value for Money, it too found that GB rail should cost less than it did in 2008/9. In addition, the Literature Review suggested that OAOs could achieve efficiencies not yet realised by FOs, and could possibly drive out the kind of savings referred to in the McNulty review.

7.1.4 Our modelling therefore assumed that the central case efficiency savings outlined in the Literature Review are achievable through the innovation of OAOs and must be realised in order to for them to remain in the market as viable, commercial businesses. In doing so, our modelling tested the hypothesis that given suitable scale and density, OAOs will deliver passenger benefits through fare competition and reduce costs through financial incentives not present in current Franchise Agreements.

7.1.5 Our key findings were that:

- on-rail competition, through increased OAO operation, could deliver benefits to passengers, mainly through lower fares
- on-rail competition is itself not necessarily a driver of reductions in industry cost
- recasting franchises could lead to savings in CtG through better differentiation of ‘commercial’ and ‘socially necessary’ services, but savings come at the cost of reduced user and non-user benefits
- significant reductions in industry costs could be achieved through re-specification of FO services which allow FOs and OAOs to operate at significant scale on specific parts of the network, and thereby receive economies of density
- FTAC mechanisms could be used to ensure excessive OAO profits are returned to Government to compensate for value removed from the franchise.

7.2 Conclusions drawn from our modelling

7.2.1 The following paragraphs detail our findings behind each of the above findings.

On-rail competition, through increased OAO operation, could deliver benefits to passengers, mainly through lower fares

7.2.2 Both WCML and ECML modelling suggests that competition in the market through Open Access operation could bring benefits to passengers:

- while the effect of introducing a small amount of on-rail competition on the WCML was to reduce franchise value and increase CtG, it is likely the OAO will reduce fares and engender a FO response, increasing user benefits
- further increasing the number of paths transferred on the WCML delivers large increases in economic benefits through additional downward pressure on OAO and FO fares, significantly increasing OAO profit at the expense of franchise value and CtG
- not constrained by having to run "like for like" to the same destinations on the WCML, the OAO, driven by profit maximisation, is likely to operate similar services to those forgone by the FO. This leads to greatly increased passenger benefits due to increased fare competition, and decreased congestion on Anglo-Scottish routes where demand at Preston is relieved by services to Blackpool
- while the ECML modelling excluded looking explicitly at the operational practicality of the service specification, it suggested that where on-rail competition leads to reduced fares, large user benefits will be generated, as was evident on the WCML.

On-rail competition is itself not necessarily a driver of reductions in industry cost

7.2.3 On the WCML, the creation of two smaller operators resulted in the removal of economies of density from the FO leading to an increase in cost per train mile. The diverse operations of the OAO (serving many markets to maximise revenue) meant it did not receive any tangible density benefits. The results of WCML Option 2 suggest that while any increase in on-rail competition is able to deliver user and non-user benefits, it cannot provide savings in CtG.

7.2.4 On the ECML, the removal of the NPA constraint under which the current niche OAOs operate resulted in OAOs choosing to serve the most profitable destinations (Newcastle and Leeds), increasing industry cost due to additional train miles and more expensive rolling stock.

Recasting franchises could lead to significant savings in CtG through better differentiation of 'commercial' and 'socially necessary' services, but savings come at the cost of reduced user and non-user benefits

7.2.5 Our modelling suggests that recasting the current WCML franchise could lead to savings in CtG by increasing franchise value, predominantly through removing the second heavily subsidised path to Glasgow. However, there would be an associated decrease in user and non-user benefits as the "socially necessary" services are removed. In this case, removal of a path to Glasgow causes increased congestion on Anglo-Scottish routes reducing benefits for users, and also result in increased road trips after modal shift, increasing congestion and reducing benefits to non-users.

Significant reductions in industry costs could be achieved through re-specification of FO services which allow FOs and OAOs to operate at significant scale on specific parts of the network, and thereby receive economies of density

7.2.6 On the ECML, the transfer to the OAO of the most costly Edinburgh path (Option 2) allows the OAO to operate at increased scale on certain parts of the route network and therefore receive economies of density, which, when coupled with the reduction in FO costs due to removal of Anglo-Scottish services and the assumed efficiency savings on the part of the OAO, resulted in reduced industry costs.

7.2.7 Additional savings could result from the OAO running half-length stock on the hourly service to Leeds without significant overcrowding. The OAO can lower its own (and industry) costs through a more efficient utilisation of rolling stock.

7.2.8 Splitting the available paths by geography (ECML Option 4) led to a significant reduction in industry costs, partially as a result of OAO efficiencies on longer and more expensive Anglo-Scottish routes, but also as a result of significant economies of density received by the FO, which operated the entirety of its train kilometres on a relatively short section of the total route.

Fixed Track Access Charging mechanisms could be used to ensure excessive OAO profits are returned to Government to compensate for value taken out of the franchise

7.2.9 Our modelling suggests that OAO profits can be returned to the Government to compensate for lost franchise value, while still ensuring that the OAO retains a sufficient level of profit to generate an acceptable rate of return on investment. The most effective mechanism for reducing CtG is likely to be an "Auctioning of Slots" where the OAO is required to bid up-front for the slots it will receive and assumes the OAO will forego all of its excess profits above a certain level, which it would retain or pass to shareholders.

7.3 Implementation: speed or scale?

7.3.1 This was a research study. It should be noted that the options tested as part of this study represent significant changes to the structure of the rail industry. The purpose of the study was not to derive a specific policy solution but to explore different aspects of on-rail competition that move the debate forward.

7.3.2 In particular, the following points have not been considered directly as part of this study:

- ease of implementation of each option both operationally and politically
- impacts on the franchising process
- roles of Government departments.

7.3.3 If it is concluded, on the basis of this evidence, that more Open Access operation is desirable, the simplest way of implementing it, and a way which might best avoid TUPE complications, would be to allow an expansion of OAO operations where spare capacity exists, rather than expanding FO services to meet increasing demand. Given the uncertainties outlined in the bullets above, such a gradual approach would also offer the opportunity to learn from experience as to whether the postulated cost savings were achieved.

7.3.4 However, as the more significant benefits were achieved through relatively large scale Open Access operation and re-specification of FO services, thereby allowing sufficient economies of density to maximise reductions in CtG, there may be an argument for a more ambitious experiment: for instance handing over the ECML Anglo-Scottish service to OAO on the basis that social needs of commuting flows into London and other conurbations can be met by the FO serving Leeds, together with other franchises such as TPE and CrossCountry.

7.3.5 Such an eventuality could be achieved by simultaneously offering a franchise and a separate bundle of paths for OAO, although a certain amount of consideration would need to be given to the potential impact of the same company operating both.

West Coast Destinations by Option

Table A1 below shows the number of trains per hour provided by the FO and OAO to each destination on the WCML in the peak period. Services are presented for each of the four WCML Options discussed in Chapter 6 of the Report.

Table A1 WCML destinations served by FO and OAO by Option: Peak

	Base		Option 1		Option 2		Option 3		Option 4	
	FO	OAO	FO	OAO	FO	OAO	FO	OAO	FO	OAO
Birmingham	3		3		2	1	2	1	3	
Manchester	3.5		2.5	1	2	1.5	2	1.5	3.5	
Chester	1		0.5	0.5	0.5	0.5	0.5		1.5	
Liverpool	1.5		1.5		1	0.5	1	0.5	1.5	
Glasgow	2		1.5	0.5	1.5	0.5	1.5	0.5	1.5	
Blackpool								0.5		
Blackburn										
Huddersfield										
Total	**11**		**9**	**2**	**7**	**4**	**7**	**4**	**11**	

In the base, there are 11 paths per hour, which equates to 22 trains in the modelled two hour period. The current FO specification serves Birmingham, Manchester, Chester and North Wales, Liverpool and Glasgow. As per the methodology set out in Chapter 5 of the Final Report, paths were transferred from the FO to the OAO based on the greatest CtG.

In WCML Option 1, the most costly paths were determined by removing one train per two hour cycle sequentially from each of the service groups shown above. As per the modelling assumptions, "paths" were allowed to be split across service groups. For example: a Glasgow service in hour one and a Chester service in hour two effectively comprise one path, albeit serving different destinations.

Having removed each of the trains systematically and checked the effect on CtG, the two most costly paths were found to be split across the Manchester, Chester and Glasgow services, with one train per hour to Manchester being transferred to the OAO, in addition to trains in alternate hours to Chester and Glasgow, as shown in Table A1. These services were operated "like for like" by the OAO: there was no change in the overall distribution of services.

In WCML Option 2, two further paths were transferred to the OAO as per the methodology described above. This comprised one train per hour to Birmingham, and an alternating hourly service to Manchester and Liverpool. Again, in this Option services were run "like for like" and there was no change to the overall distribution of services.

In WCML Option 3, the "like for like" constraint was removed, and the OAO was given freedom of destination for each of its four paths. The effect of serving each destination in turn was tested with the decision criteria being the OAO profit (revenue minus cost) level. Option 3 identified that the only change from Option 2 was replacing one Chester service per two hour period with a Blackpool service. This change was made because although Blackpool is situated away from the main line (thus increasing route miles and decreasing density), the increased cost was compensated by the available demand on the Blackpool peninsula, and the increased abstraction of FO revenue at Preston as well as other southerly stations on the central, Glasgow route. The result of Option 3 is that FO service frequency to Chester and North Wales decreases to two-hourly from hourly in the base, and Blackpool gains a two-hourly OAO service.

WCML Option 4 examined the effect of recasting FO services to maximise franchise value. Here, the same four paths were removed as detailed the description of WCML Option 2, and were reallocated to the FO based on the lowest CtG. The result of this Option was that a Glasgow path was transferred to Chester as this increased franchise value by the greatest amount.

Table A2 below shows the WCML service specifications for each of the Options in the off-peak period.

Table A2 WCML destinations served by FO and OAO by Option: Off-peak

	Base		Option 1		Option 2		Option 3		Option 4	
	FO	OAO	FO	OAO	FO	OAO	FO	OAO	FO	OAO
Birmingham	3		3		2	1	2	1	3	
Manchester	3		2	1	1.5	1.5	1.5	1.5	3	
Chester	1		0.5	0.5	0.5	0.5	0.5		1.5	
Liverpool	1		1		0.5	0.5	0.5	0.5	1	
Glasgow	1		0.5	0.5	0.5	0.5	0.5	0.5	0.5	
Blackpool								0.5		
Blackburn										
Huddersfield										
Total	**9**		**7**	**2**	**5**	**4**	**5**	**4**	**11**	

Due to the modelling assumptions outlined in paragraph 5.2.3 of the Report, the off-peak period was treated in a similar way to the peak period in terms of removing FO paths and the transfer of paths to the FO. As such, OAO services are the same in the off-peak as in the peak (Table A1). FO services decrease by the same amount as they did in the peak (e.g. in Option 1 in the peak period, one train per hour to Manchester is removed from three and a half in total. In the off-peak, the same one train per hour is removed out of the three off-peak trains in total).

East Coast Destinations by Option

Table A3 below shows the number of trains per hour provided by the FO and OAO to each destination on the ECML in the peak period. Services are presented for each of the four Options outlined in Chapter Six of the Report.

Table A3 ECML destinations served by FO and OAO by Option: Peak

	Base		Option 1		Option 2		Option 3		Option 4	
	FO	OAO	FO	OAO	FO	OAO	FO1	FO2	FO	OAO
Edinburgh	1.5		1.5		0.5	0.5		1.5		1.5
Aberdeen										
Newcastle	1		1	0.5	1	0.5		1		1
Leeds	2		2	0.5	2	1	3		3	
Bradford	0.5	0.25	0.5		0.5		0.5		0.5	
Sunderland		0.25								
Hull	0.5	0.5	0.5		0.5			0.5		0.5
Lincoln										
Total	**5.5**	**1**	**5.5**	**1**	**4.5**	**2**	**3.5**	**3**	**3.5**	**3**

On the ECML there were extant OAO services to Bradford, Sunderland and Hull in the base. In reality these services are provided by two operators (Grand Central and Hull Trains), but for purposes of our modelling we assumed all Open Access operation on the ECML to be the responsibility of a single operator.

ECML Option 1 tested the re-allocation of these extant OAO services after the removal of the NPA test which is currently constraining destinations which the OAO is able to serve. The result of Option 1 was that when searching to maximise its profit, the OAO would split its path equally, with two-hourly services to Newcastle and Leeds. As a result, direct services to Sunderland are removed entirely, and services to Bradford and Hull are diminished with the removal of the direct OAO services.

In ECML Option 2, one FO path was transferred to the OAO based on the same CtG measure discussed above. The most costly path on the ECML was an hourly service to Edinburgh, given the amount of train miles (and hence additional cost) it contributed. This path was then given to the OAO, which was free to operate to the destinations which would maximise its profit.

Each combination of ECML destinations was tested in sequence, and it was found that the OAO would increase its service to Leeds to hourly from two-hourly (as in Option 1), and provide an additional two-hourly service to Edinburgh as the abstracted revenue from the FO Anglo-Scottish services offsets the increased cost associated with operating to Scotland. Total services to Edinburgh are reduced by one train every two hours, while Leeds gains an additional hourly service relative to the base.

ECML Option 3 sought to test the effect of splitting the current franchise into two smaller FOs, operating geographically separate routes. The first step in testing this Option was to reallocate the current OAO path back to the FO, based on the destination(s) which resulted in the least additional cost to Government. By systematically testing each combination of FO services, it was found that using the base OAO path to provide an additional hourly service to Leeds had the lowest associated cost, due to the short distance and increased density on that section of the total route.

The FO was then split in half, with FO1 operating three services per hour to Leeds and a two-hourly service to Bradford, and the remaining two paths operated by a second FO, which provided the one and a half trains per hour to Edinburgh, an hourly service to Newcastle and a two-hourly service to Hull. The total impact of Option 3 is similar to Option 1: Sunderland loses its direct service completely, and services to Bradford and Hull are reduced. Leeds gains an extra hourly service after the reallocation of the current OAO path.

ECML Option 4 was identical to Option 3 in terms of the specification of paths. However, instead of two FOs, the Edinburgh, Newcastle and Bradford services were operated by an OAO.

As on the WCML, off-peak services in ECML Options 1 and 2 were treated in the same way as the peak period, in terms of removing services and transferring them to an OAO. As shown in Table A4, the number of OAO services in these Options is the same as in Table A3.

Table A4 ECML destinations served by FO and OAO by Option: Off-peak

	Base		Option 1		Option 2		Option 3		Option 4	
	FO	OAO	FO	OAO	FO	OAO	FO1	FO2	FO	OAO
Edinburgh	1		1			0.5		1		1
Aberdeen	0.5		0.5		0.5			0.5		0.5
Newcastle	0.5		0.5	0.5	0.5	0.5		0.5		0.5
Leeds	2		2	0.5	2	1	3		3	
Bradford		0.25								
Sunderland		0.25								
Hull		0.5								
Lincoln										
Total	**4**	**1**	**4**	**1**	**3**	**2**	**3**	**2**	**3**	**2**

However, in ECML Options 3 and 4, the services operated by the OAO in the off-peak period are the same as the base services to "non-Leeds" destinations in that period, as providing the same services as in the peak would mean an increase in the total number of paths in the off-peak period.

As shown in Table A4, in ECML Options 3 and 4, the base OAO path was transferred back to the FO as described earlier in this appendix (an additional hourly service to Leeds), and the other services (hourly train to Edinburgh and two-hourly trains to Aberdeen and Newcastle) were allocated to the OAO. This gives a split of three paths to two in the off-peak, compared to three and a half and three in the peak, but most importantly retains a consistent geographic split across the day, and does not add any additional services compared to the base. The overall position is that Sunderland, Bradford and Hull lose their direct services completely (as they are not served by FO in the off-peak). Leeds gains an extra hourly service after the reallocation of the current OAO path.

WCML Fares

As part of the examination of the effects of on-rail competition on passenger benefits, this study examined the changes in fares that resulted from the specification of services developed as part of the modelling for each Option, as discussed above in this Appendix.

As outlined in Chapter Five of the Report, it was assumed that the OAO had free reign to alter its fares so as to maximise profit. Once the optimum position for the OAO had been reached, the FO was also permitted to adjust its fares in response. Guiding principles on modelling fare competition from the Report are reiterated below:

- fare changes were modelled as a percentage reduction on the base FO fare
- fare changes were only permitted on routes where there was head-on competition between the FO and OAO
- fare changes were considered "global" – the same discount in relation to FO fare was offered on all flows where fares were altered
- advance and walk-up fares were always subject to the same percentage changes
- peak and off-peak fares were allowed to differ in order to maximise capacity utilisation on off-peak services which are typically less crowded
- FO fare responses were permitted up to, but not beyond, the level of reduction of the OAO

Table A5 shows the modelled FO/OAO fare changes for each of the WCML Options by time period, and also the number of flows on which there was competition between the FO and OAO as a result of the service specification.

Table A5 Fare changes on WCML flows with competition compared to base FO Fare in each option

	Number of flows with competition	Peak		Off Peak	
		FO	OAO	FO	OAO
Option 1	10	-10%	-10%	-20%	-20%
Option 2	12	-10%	-10%	-20%	-20%
Option 3	10	-15%	-15%	-25%	-25%
Option 4	N/A	0%	0%	0%	0%

In WCML Option 1, it was found that when OAO fares were reduced by more than 10% in the peak period without FO response, this resulted in overcrowding on the OAO service to Glasgow, as large numbers of passengers switched from FO services. As such, peak fare decreases on the part of the OAO were constrained at 10%. In the off-peak period where capacity was less of an issue due to the greater total number of services, it was possible to reduce fares by 20% relative to the FO fare before capacity became constrained, which again occurred on the Glasgow services.

FO fare responses were then modelled, assessing the impact on load factors of the FO services and on franchise value. In both the peak and off-peak periods, it proved optimal for the FO to reduce its fares to match that of the OAO. Despite reductions in total industry revenue as a result of decreases in fares, this strategy resulted in the FO reclaiming "a bigger slice of a smaller pie" through re-abstraction of passengers and revenue from the OAO.

In WCML Option 2, overall fare changes were identical to those of Option 1. This is because, as shown in Table A1, there is no change in OAO services to Glasgow between Options 1 and 2. The capacity issues on these services that constrained OAO fare reductions in Option 1 are therefore also present in Option 2, leading to an identical outcome.

Table A5 shows that for Option 3, fares were reduced by a greater amount than in Options 1 and 2. The removal of the "like for like" constraint resulted in the OAO operating a service to Blackpool, which, in calling at Preston, could relieve some of the capacity constraints on Glasgow services also calling at that station. As a result, it was possible to reduce fares by a larger amount, relative to the base FO fare. As in earlier Options, it proved optimal for the FO to match OAO fare reductions in order to ensure re-abstraction of passengers and revenue.

In Option 4 (recasting of the WCML franchise to reduce costs), there is no on-rail competition. However, the effect of fare reductions in this option was still tested. Due to the modelling requirement of reducing fares on all flows by the same amount so as not to generate illogical fares (shorter distances more expensive than longer), fares on all WCML flows were reduced as part of this test. It was found that reducing fares by just 5% across the day would reduce total industry revenue, and therefore reduce franchise value. It was therefore not optimal for the FO to reduce its fares across the board, and Table A5 shows Option 4 as having no fare changes.

WCML Revenue

The fare competition for each of the options shown in Table A5 generally had a suppressive effect on total industry revenue, as demand generated by lower fares did not wholly offset losses in revenue from existing trips. Figure A1 presents a comparison of changes in total industry revenue in each of the WCML options.

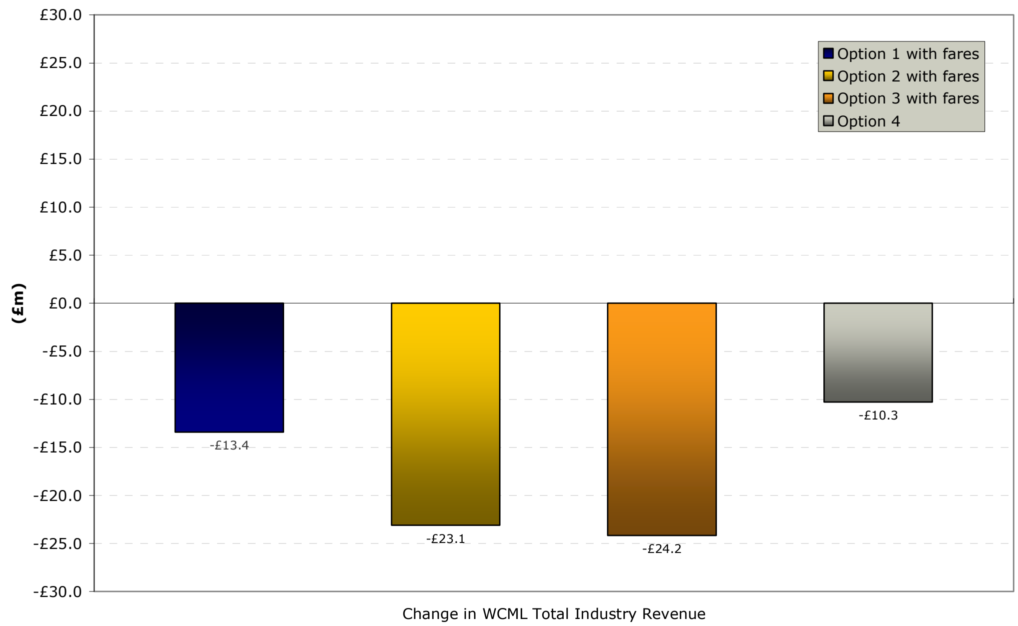


Figure A1 Effect of fare competition on WCML Total Industry Revenue

As shown in Figure A1, in each of the WCML options total industry revenue is reduced compared to the base. In Options 1 and 2, this decrease is due to the reduction in fares on routes with head-on competition. Despite fare changes being the same in percentage terms between the two options, total industry revenue falls by a greater amount in Option 2 due to an increased number of flows on which reduced fares are offered (i.e. West Midlands and Liverpool).

FO fares are reduced by a greater amount in percentage terms in Option 3 than in Option 2, but total industry revenue shows only a marginal decrease. This is because with the removal of the "like for like" modelling constraint, the OAO exchanges a service to Chester for one to Blackpool. Compared to Chester, Blackpool has higher unadjusted fares, and this increase mostly offsets the additional reduction in fares on other flows.

In Option 4 where there is no fare competition, total industry revenue also falls. This is due to the recasting of some Anglo-Scottish services to Chester, which removes a number of passengers who would ordinarily have paid a higher fare in the base.

ECML Fares

Table A6 shows the modelled FO/OAO fare changes for each of the ECML Options by time period, and also the number of flows on which there was competition between the FO and OAO as a result of the service specification.

Table A6 Fare changes on ECML flows with competition compared to base FO Fare in each option

	Number of flows with competition	Peak		Off Peak	
		FO	OAO	FO	OAO
Option 1	9	-10%	-10%	-20%	-25%
Option 2	10	-10%	-10%	-15%	-15%
Option 3	3	0%	0%	0%	0%
Option 4	3	-20%	-20%	-20%	-20%

Fare competition on the ECML was modelled in the same way as on the WCML described above. Again, it is evident from ECML Option 1 that it was possible for the OAO to decrease its fares by a greater amount in the off-peak than the peak, in order to most efficiently utilise extra capacity on these services. In ECML Option 1, fare reductions are constrained at 10% in the peak period as the two-hourly service to Newcastle becomes very crowded if fares are reduced beyond this level, due to abstraction from FO services. As was evident on the WCML, it was optimal for the FO to reduce its fares to match those of the OAO, as even though this reduced industry revenue in total it allowed the FO to reclaim revenue initially abstracted by the OAO.

In ECML Option 2, fares were not reduced by as much as in Option 1, which seems a counter-intuitive result, given the increased level of competition which would logically suggest increased differentiation on fare. However, as shown in Table A4, the OAO now offers a two-hourly service to Edinburgh in the off-peak, and much like the Glasgow service on the WCML, this service quickly abstracts a large number of passengers from FO services, and becomes capacity constrained sooner than the Newcastle services of Option 1. In this instance, it was only possible to reduce OAO off-peak fares by 15% relative to the FO fare before crowding became an issue.

ECML Option 3 examined two FOs which served geographically separate markets, with very little head-on competition (only at stations south of Doncaster). It was found that the effects of fare competition in this option were translated directly into additional cost to Government. As the FOs lower their fares on the three competing flows, they compete for market share, whilst reducing total industry revenue. In previous ECML options, the CtG could be mitigated by the FO reducing its fares, as it reclaimed revenue from the OAO, increasing franchise value and reducing the level of support required from the Government. However, in Option 3, the Government is liable for changes in profit (i.e. franchise value) in both operators, meaning that as fares are reduced, CtG increases. As was outlined in paragraph 5.5.2 of the Report, any scenarios where FO fare responses resulted in increased CtG was discarded from the modelling. Hence, in Option 3, there was no change to operator fares.

In ECML Option 4, whilst the specification of services is identical to Option 3, the second FO has been replaced by an OAO, whose profits (and losses) are not the responsibility of the Government. Here, when the OAO reduces its fares on the three flows with head-on competition, it abstracts some revenue from the FO, increasing its own profit, despite decreases in total industry revenue. It was found that a reduction of 20% formed the "tipping point" between increasing gains abstracted revenue and losses from reduced revenue from existing passengers. Given the OAO fare decision, it is now optimal for the FO to reduce its fares in response, as this reclaims some revenue from the OAO, and reduces CtG by improving franchise value.

ECML Revenue

The fare competition for each of the options shown in Table A6 again suppressed total industry revenue, as demand generated by lower fares did not wholly offset losses in revenue from existing trips. Figure A2 presents a comparison of changes in total industry revenue in each of the ECML Options.

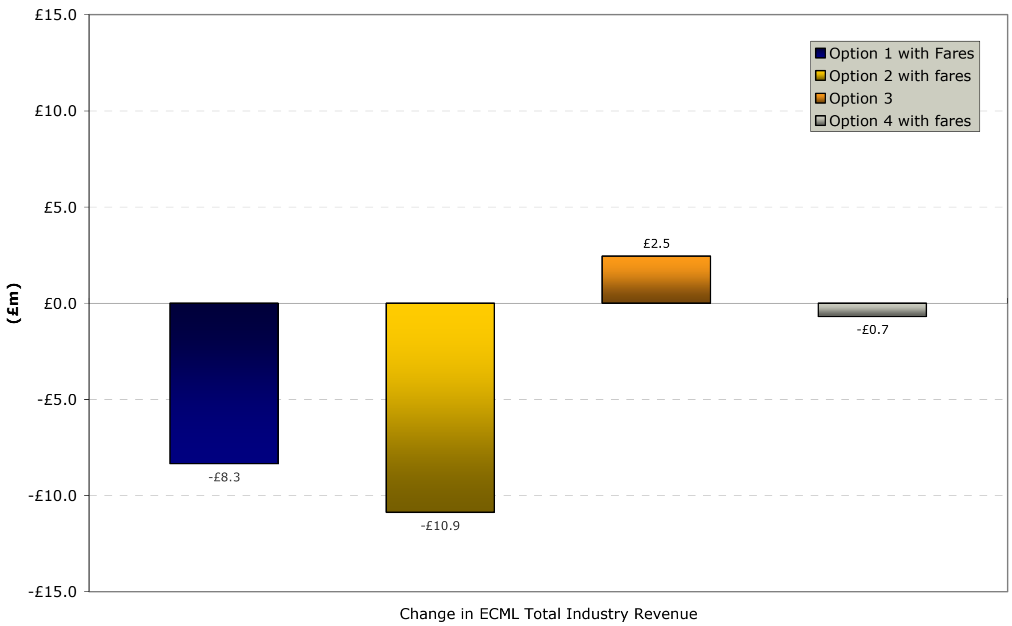


Figure A2 Effect of fare competition on ECML Total Industry Revenue

As shown in Figure A2, fare competition in ECML Options 1 and 2 reduces total industry revenue, as was evident in comparable Options on the WCML. Despite fare reductions being smaller in percentage terms in Option 2, total industry revenue decreases by a larger amount. This is due to the increased number of flows with head-on competition (and therefore where fares can be reduced), and also the fact that in Option 2 the OAO serves Edinburgh, which has a much higher base fare, meaning a smaller reduction in percentage terms on this flow outweighs a larger reduction on a flow with a lower starting fare.

Total industry revenue is increased relative to the base in ECML Option 3. Not only is there no fare competition in this Option, for reasons already described, but there has also been a transfer of the base OAO path back to the FO which results in a change in service specification and the slight increase in revenue shown in Figure A2. In this option, the lost revenue from the removal of direct OAO services to Sunderland has been offset by increases in FO revenue at Leeds and Peterborough (due to the increased service transferred from the OAO).

A similar effect is evident in ECML Option 4 which is also subject to reallocation of the base OAO path, but as described above, there is some fare competition between the OAO and FO in Option 4, which reduces total industry revenue to below the level of the base. It should be noted that although in percentage terms the reduction in fares made by the OAO and FO in Option 4 are relatively large (20%), this only occurs at a small number of flows, and on flows close to London where starting fares are much lower than for some longer distance trips.

Total Industry Cost: WCML

As detailed in Chapter Six of the Report, changing the service specification in each of the WCML Options has an effect on total industry costs. Figure A3 below shows the change in total cost for each option. It should be noted that these WCML figures are presented before any application of the FTAC mechanisms outlined in the Report, which generally increase total industry costs by requiring the OAO to contribute additional FTAC on top of its basic operating costs.

As described in Chapter Five of the Report, the effect of the OAO operating shortened length rolling stock was tested in each of the options. However, on the WCML it was not found to be optimal in any of the options due to reductions in revenue due to increased crowding offsetting any decreases in costs. As such, each of the results presented in Figure A3 is shown under the assumption of OAOs running identical rolling stock to the FO.

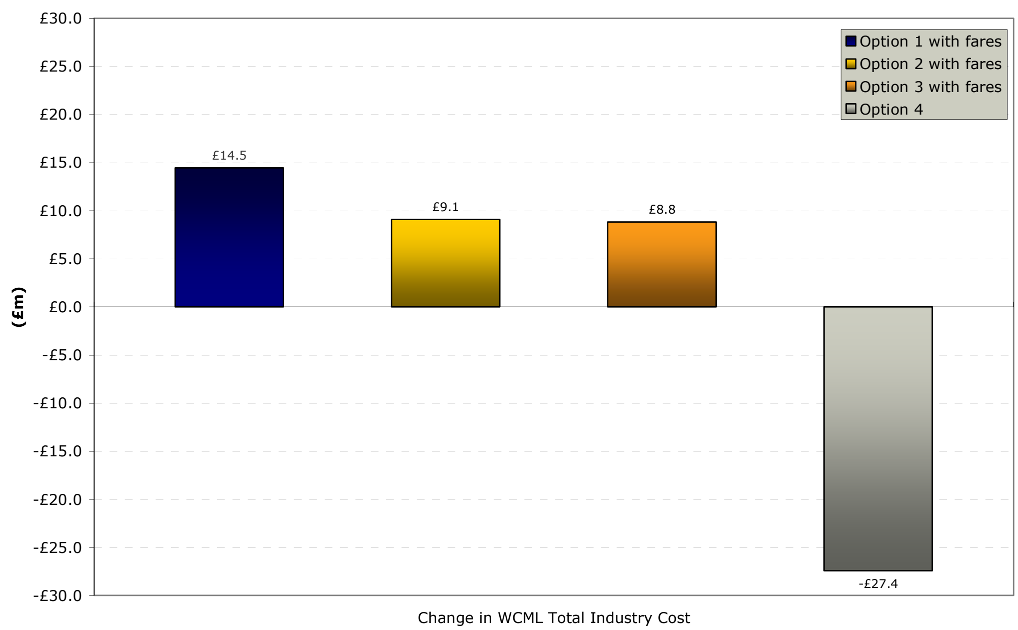


Figure A3 Change in WCML Total Industry Cost by Option

On the WCML, the transfer of the first FO path to the OAO raised total industry costs by £14.5m, due to the loss of economies of density in the FO (particularly on Manchester routes) and the fact that the OAO was not operating at the kind of scale where economies of density of its own can be achieved.

In WCML Option 2, the transfer of a further path reduced total industry cost compared to Option 1 as the OAO gained scale and density, but still resulted in a total increase in costs of

£9.1m relative to the base, due to the overall loss in economies of density as a result of two distinct operators replacing one incumbent.

Changes in total industry cost between Option 2 and Option 3 were small, as the only change was the replacement of a two-hourly Chester/North Wales service with a Blackpool service. In this option, costs still exhibit an increase of £8.8m relative to the base. Due to the structure of the WCML, on-rail competition results in both the OAO and FO serving a broad selection of markets in order to maximise revenue, which leads to an overall loss of economies of density, which even with assumed efficiency savings on the part of the OAO meant an increase in total costs.

By contrast, WCML Option 4 presents a decrease in total industry cost. This option is different to the other WCML scenarios, as it reflects no on-rail competition, but only a recasting of existing FO services, as shown in Table A1. Here, the reallocation of the most expensive FO service from Glasgow to Chester removes £27.4m of costs from the industry. However, as described in Chapter Six of the Report, the decrease in expenditure comes at the cost of a decrease in economic benefits of £33m (not shown above), predominantly caused by increased congestion on the remaining Anglo-Scottish service.

Total Industry Cost: ECML

Figure A4 below presents the change in total cost for each ECML Option. It should again be noted that these figures are presented before any application of the FTAC mechanisms which increases total industry costs by requiring the OAO to contribute additional FTAC on top of its basic operating costs.

Additionally on the ECML, each option was tested with the OAO running shortened length rolling stock on each of its routes. It was found that in Option 2, it was possible for the OAO to reduce the length of its rolling stock on services to Leeds without causing significant overcrowding or at detriment to OAO profit. As such, changes in total industry cost in Option 2 are presented twice, firstly with full length stock (in gold), and then with shortened trains on the Leeds routes (in orange).

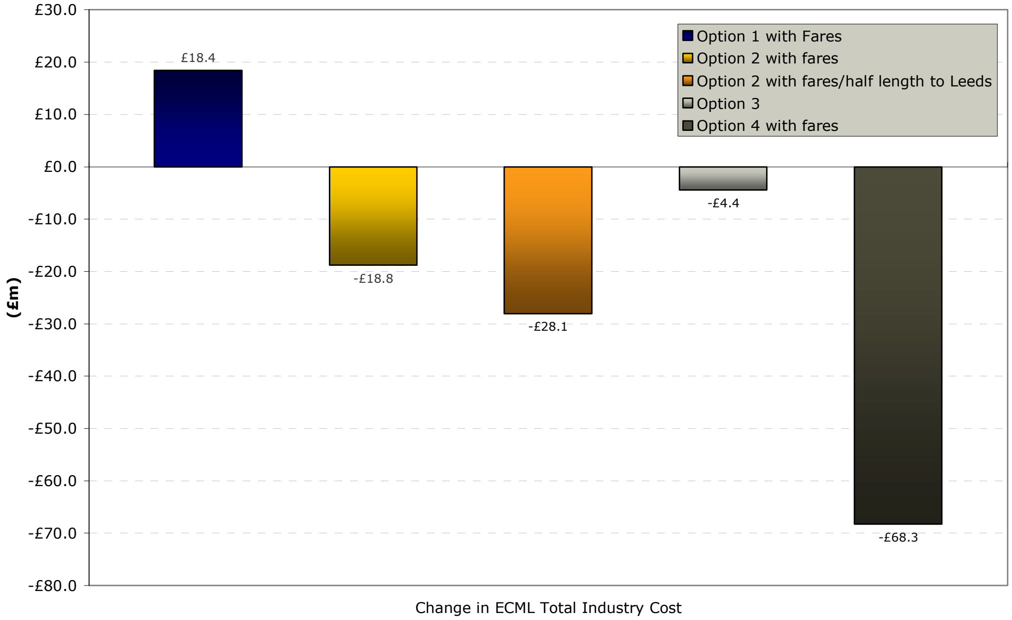


Figure A4 Change in ECML Total Industry Cost by Option

In ECML Option 1, the base OAO path is transferred to the destinations which maximise OAO profitability (Newcastle and Leeds), as shown in Table A3. In this option, total industry costs increase relative to the base, due to an 8% increase in train miles and the assumption that the OAO now operates the same full length rolling stock as the FO, as opposed to the shortened (cheaper) variants they run in the base.

With the transfer of the most expensive FO path to the OAO in ECML Option 2, total industry costs fall by £18.8m relative to the base, as a result of reduced cost to the FO of the foregone Anglo-Scottish service (as shown in Table A3), the assumed efficiency savings on the part of the OAO relative to the FO, and the new service specification which increases density on the Leeds section of the OAO network.

Furthermore, it was found that industry costs could be further reduced through OAO utilisation of shortened rolling stock on services to Leeds.

In ECML Option 3, the existing OAO path was transferred back to the FO, and services were split between two FOs based on geography. Here, there is a decrease in total industry costs of £4.4m relative to the base. This is a result of creating two operators whose routes are suitably dense as to partially offset the expected losses in economies of density that would normally occur from moving from one incumbent to two smaller operators. For example, the route of FO1 is reduced from 842 miles in the base to just 196 miles in the scenario (a reduction of 75%), whilst total train miles decrease by only 50% as the franchise is split, meaning the remaining service of the FO is proportionally more cost effective due to the increased density.

A similar picture is seen in ECML Option 4, where the specification of services is the same, but additional cost savings are present due to the second half of the franchise being operated by an OAO, which according to the central case efficiency scenarios developed in the Literature Review, could be expected to reduce costs by 20% relative to the FO. Here, as the

OAO operates the most expensive (i.e. longest distance) services to Newcastle and Scotland, it reduces total industry costs in comparison to Option 3 as a result of the efficiency savings that it brings. In addition to the significant density benefits received by the FO described above, there is a reduction in total industry costs in ECML Option 4.

Broadly speaking, costs decrease in line with density and the scale of the OAO. As such, in Option 1 where the OAO is smallest and the removal of economies of density is greatest, costs are high, showing an increase on the base. Similarly, with a large OAO and significant density benefits to the FO, Option 4 has by far the lowest cost. The other two changes in cost are broadly the same, with a larger decrease in the "less density, larger scale of OAO" Option 2, and only a slight decrease in costs in the "high density but no OAO" Option 3.

Economic Benefits/Cost to Government

Two of the key performance indicators of the effects of on-rail competition through increases in open access operation are changes in economic benefits and changes in CtG. This section of the Appendix highlights changes in both indicators on the WCML and ECML.

Figure A5 shows the breakdown of economic benefits for each of the WCML Options. To be consistent with how the results of the WCML were reported in Chapter Six of the Report, the economic benefits below are presented before the application of any of the FTAC mechanisms which would have reclaimed some producer benefits (OAO profits) for the Government.

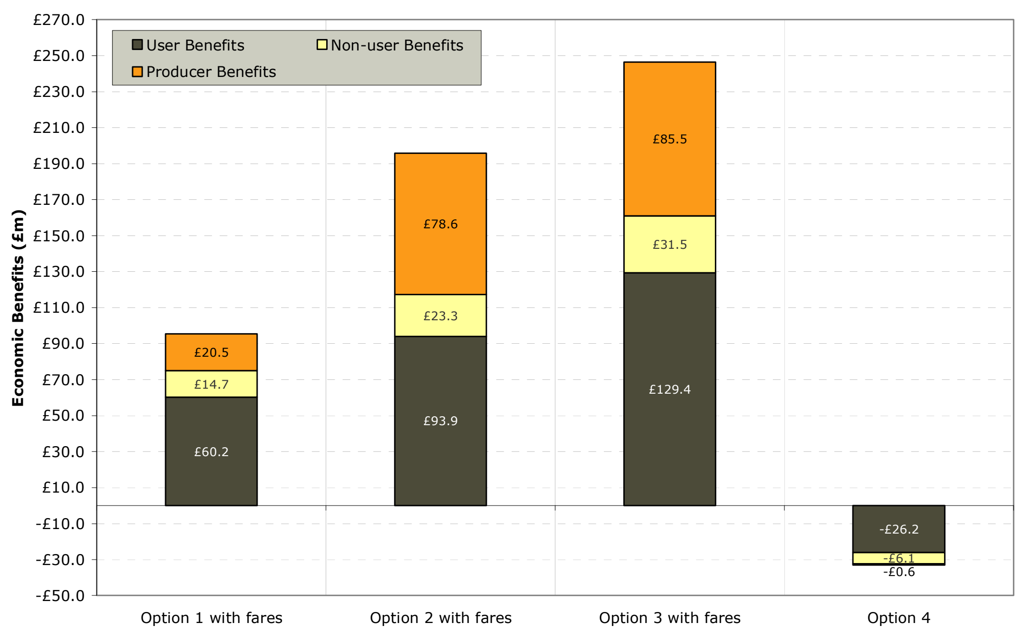


Figure A5 Breakdown of Economic Benefits for each WCML Option

Figure A5 above shows that in each of the first three WCML Options where there is some level of on-rail competition through open access operation, significant user benefits are delivered. These user benefits are a result of the combination of downward pressure on fares on flows where there is head-on competition, and also in WCML Option 3, the result of creating a direct service from London to Blackpool which removes some car trips (rail heading) from the network (non-users benefit), and decreases congestion on Anglo-Scottish routes (users benefit), relative to WCML Option 2.

WCML Option 4 exhibits an overall decrease in economic benefits of £33m. This is a result of the transfer of a Glasgow service to Chester, which increases congestion on the remaining Anglo-Scottish service thereby creating user disbenefits (£26m), and also means some previous rail passengers will shift mode to road, increasing congestion on the highway network, resulting in disbenefits to non-users (£6m).

Figure A6 below presents a similar breakdown of economic benefits from each of the Options on the ECML. It should be noted that in the figure, economic benefits are presented after the application of FTAC mechanisms, which repatriate some excess OAO profits to Government, reducing producer benefits. All Options below are presented with the most efficient FTAC mechanism applied.

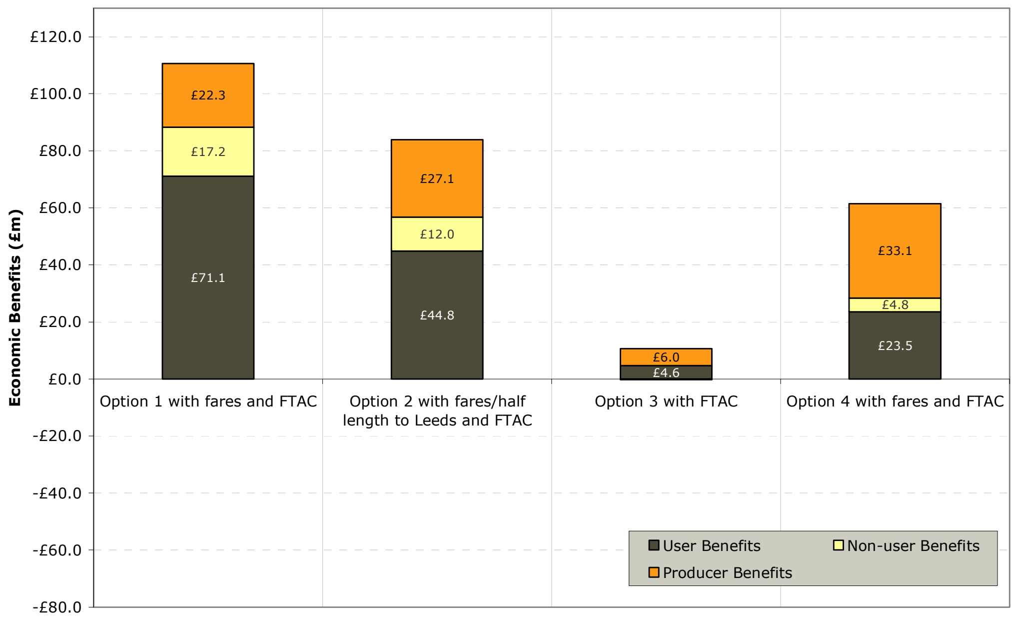


Figure A6 Breakdown of Economic Benefits for each ECML Option

Figure A6 shows that in ECML Options 1 and 2, the introduction of on-rail competition in these scenarios, with associated reductions in fares, delivers significant user benefits. As described in the fares section of this Appendix, fare reductions in Option 1 are larger than in Option 2 due to capacity constraints on OAO Anglo-Scottish services, hence the level of user benefits is reduced.

In ECML Option 3 (two geographically separated FOs), there are very few economic benefits in total. The reallocation of the existing OAO path as described in the ECML Destination section of this appendix results in some relief of crowding on services to Leeds providing a small amount of user benefits, and some producer benefits are created through the increased revenue as shown in Figure A2. The key factor in the low level of economic benefits in ECML Option 3 is the relative absence of on-rail competition, and resulting lack of any reductions in fares, as explained earlier in this appendix.

In contrast to ECML Option 3, Option 4 presents significant user and producer benefits due to the transfer of paths from FO2 to an OAO. Here, efficiency savings allow the OAO to make increased profit on their operations, some of which is retained after FTAC contributions, and figures in the £33m of producer benefits shown above. Also, user benefits are delivered through the increased frequency of services to Leeds, and through fare competition at stations south of Doncaster. The overall level of benefits in Option 4 is lower than in Options 1 and 2, suggesting that Options with more on-rail competition are more successful in generating economic benefits.

Figure A7 below presents the change in cost to Government for each WCML Option. As was the case for the economic benefits reported in Figure A5, values presented below are shown before the application of FTAC mechanisms, in order to be consistent with the reporting of results in Chapter Six of the Report.

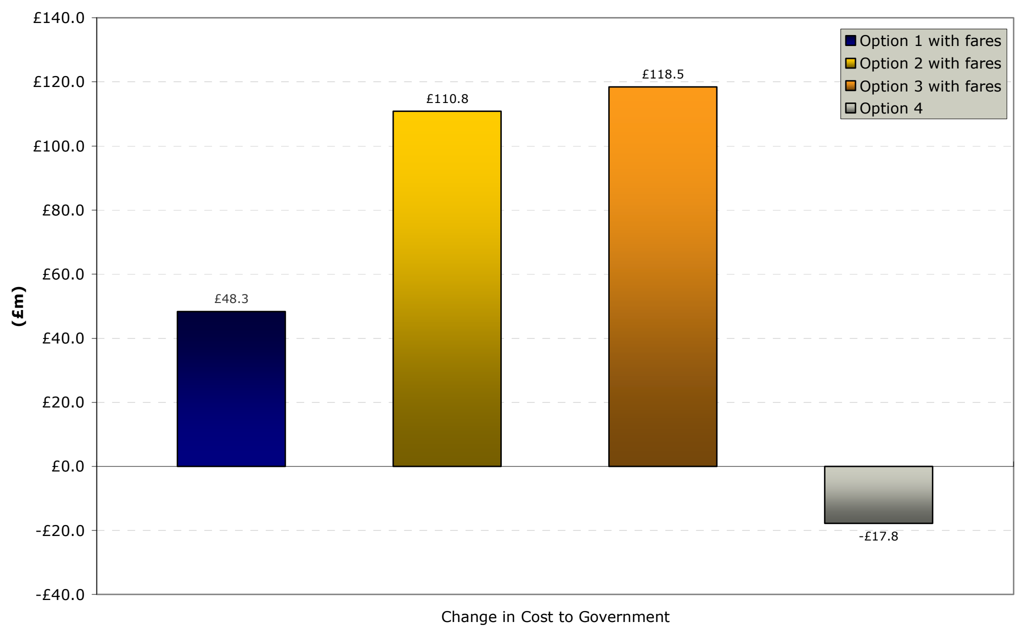


Figure A7 Change in CtG for each WCML Option

Figure A7 shows that on the WCML, there is a significant increase in CtG associated with each of the options where on-rail competition is introduced through increases in open access operation. CtG is correlated with the scale of the OAO: as the OAO increases in size and abstracts more revenue from the FO, this reduces franchise value and increases the level of Government support required by the FO. The only WCML Option to exhibit a decrease in CtG is Option 4, where costly FO services to Glasgow are removed, increasing franchise value and lessening CtG.

Moving to the ECML, Figure A8 below presents similar CtG values, but does so after the application of the most efficient FTAC mechanism. FTAC is more applicable on the ECML due to the increased OAO profits which were found to be available, relative to the WCML.

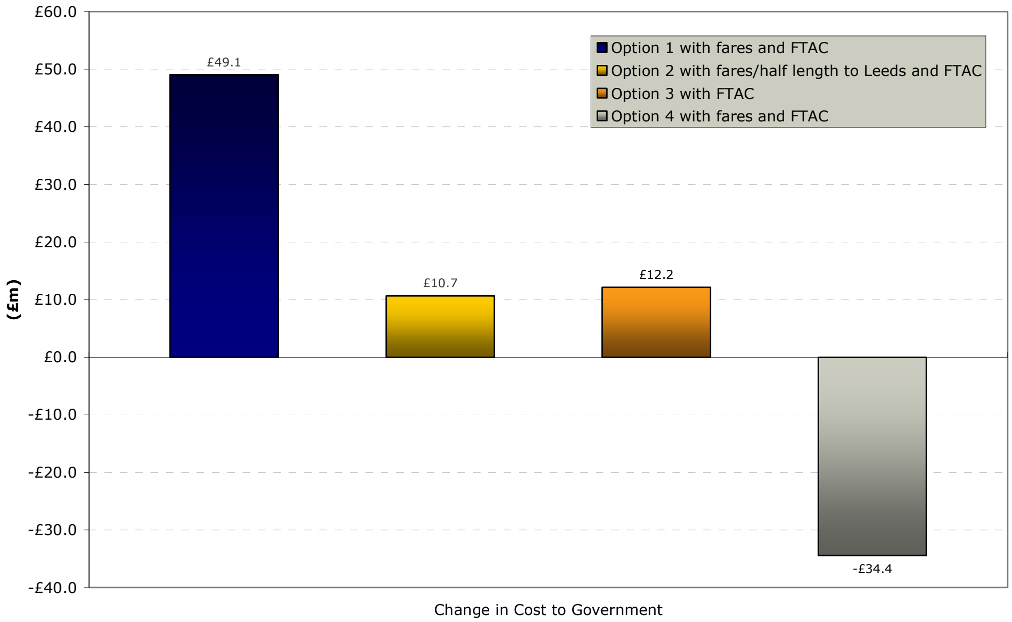


Figure A8 Change in CtG for each ECML Option with FTAC

Figure A8 shows that after the application of FTAC mechanisms which allow the Government to recoup losses in franchise value by reclaiming OAO profits above an assumed level of retention, additional CtG is much lower on the ECML than on the WCML. In Option 1 where there is a significant level of abstraction from FO revenues and no opportunity for the FO to reduce its cost by transferring costly paths to the OAO, CtG remains high. However, in Option 2 where an expensive FO path is transferred to the more efficient OAO, and the scale of the OAO begins to increase, we see that CtG is reduced to a much lower level. Offsetting this cost against the received benefits of £84m (as shown in Figure A6), this provides a positive BCR of 7.85 for ECML Option 2.

In Option 4 where the FO is able to reduce its costs by transferring half of its operation to the OAO and benefit from economies of density on its remaining route, CtG (after FTAC) is reduced relative to the base. The combination of the very small reduction in franchise value, and the Government reclamation of excess OAO profits arising from efficiency savings, mean that in the event of re-specification of FO services and the introduction of a relatively large scale OAO, positive economic benefits could be delivered whilst reducing CtG.

Sensitivity Testing

FO Cost Response

As part of the sensitivity testing of the model, the results of changing the assumptions on the level of efficiency savings realised by the OAO were reported in Chapter Six of the Report. As an additional sensitivity, an efficiency saving on the part of the FO as a commercial response to savings made by the OAO was tested. Table A7 shows the result of this sensitivity test, for ECML Options 2 and 4.

It should be noted that different KPIs are presented below for each of the options. Explanation of the presentation of this sensitivity table is provided in Chapter Six of the Report.

Table A7 Changes in ECML Industry Cost and CtG with FO Cost Reponse

Percentage FO cost savings	0%	10%
ECML Option 2 Total Cost Change (£m)	-£28.06	-£58.74
ECML Option 4 Additional Cost to Government (£m)	-£34.44	-£51.54

Table A7 shows that in ECML Option 2, if the FO reduces its cost by 10% in response to the efficiency savings made by the OAO on entry to the market, it can remove a further £31m of costs from the industry. The overall reduction of £59m is equivalent to 13% of total base costs excluding track access charges.

In ECML Option 4, the saving to Government is increased from £34m to £52m with the 10% “catch up” on cost savings being made by the FO. This saving reflects the reduction FO costs which leads to an increase in franchise value. The FO therefore requires less support from Government, which reduces additional cost as shown in Table A7.

Appendix B: References (Literature Review)

Literature Review References

AECOM, FCP and ITS (2010). Achieving Value for Money from People in the GB Rail Industry – Theme H Benchmarking. Report for Department for Transport / Office of Rail Regulation.

Affuso, L., Angeriz, A., & Pollitt, M. G. (2003). Measuring the efficiency of Britain's privatized train operating companies, unpublished version provided by the authors.

Alexandersson G (2009) Rail Privatisation and Competitive Tendering in Europe. Built Environment, vol 35, no 1, p. 37-52

Baumol W J and Panzar, J C (1982) Contestable markets and the theory of industrial structure. New York, Harcourt, Brace and Jananovich.

Baumol, W J (1983) Some Subtle Pricing Issues in Railroad Regulation. International Journal of Transport Economics, 10 (1-2) 341-355

Bitzan, J (2003) Railroad costs and competition. Journal of Transport Economics and Policy. 37 (2) 201-225

Cantos P, et al (2010) Vertical and horizontal separation in the European railway sector and its effects on productivity. Journal of Transport Economics and Policy. 44 (2) 139-160

Castillo-Manzano, José I. and Marchena-Gómez, Manuel (2010) Analysis of determinants of airline choice: profiling the LCC passenger, Applied Economics Letters, 18:1, 49 - 53

Cave, Martin and Wright, Janet (2010) Options for increasing competition in the Great Britain rail market: on-rail competition on the passenger rail market and contestability in rail infrastructure investment. Final report to the Office of Rail Regulation

Caves, D.W., L.R. Christensen, M. Tretheway and R.J. Windle (1987) Network effects and the measurement of returns to scale and density for US railroads, in: A.F. Daugherty, ed., Analytical studies in transport economics. Cambridge: Cambridge University Press, 97–120.

Coles, Heather (2004) Passenger Flights in Europe in Stephen Davies et al, The Benefits from Competition: some illustrative UK cases. DTI ECONOMICS PAPER NO. 9, London.

Demsetz, H (1968) Why regulate utilities? Journal of Law and Economics, 11 (April), 55-66.

Domah, Preetum and Pollitt, Michael (2001) The restrusturing and privatisation of electricity distribution and supply businesses in England and Wales: a social cost-benefit analysis. Fiscal Studies 22(1) 107-146.

Domberger, S., Meadowcroft, S. and Thompson, D. (1987), 'The Impact of Competitive Tendering on the Costs of Hospital Domestic Services', *Fiscal Studies*, vol. 8 (4), pp. 39-54.

Domberger, S., Meadowcroft, S. and Thompson, D. (1986), 'Competitive Tendering and Efficiency: The Case of Refuse Collection', *Fiscal Studies*, vol. 7 (4), pp. 69-87. This paper is also in Bishop, M., Kay, J. and Mayer, C. (1995), *Privatization & Economic Performance*, Chapter 8.

Evans, A. (1987) A Theoretical Comparison of Competition with Other Economic Regimes for Bus Services. Journal of Transport economics and Policy, vol 21

Everis Consulting (2010) Study on Regulatory Options on Further Market Opening in Rail Passenger Transport. DG Move, Brussels.

Fairhurst M. and Edwards D. (1996) Bus Travel Trends in the UK, Transport Reviews, vol. 16, No. 2, 157-167

Glaister, S (2006) Britain: Competition undermined by Politics, in Competition in the Railway Industry: An International Analysis, Edited by J.A Gomez-Ibanez and G de Rus 2006

Glass, A. J., (2004), Modelling Competition in the British Passenger Rail Industry, PhD Thesis, University of Leeds.

Griffiths T (2009) On Rail Competition: The Impact of Open Access Entry on the Great Britain Rail Market. Paper presented to the international conference on competition and ownership in land passenger transport, Delft, September 2009

Growitsch, C. and Wetzel, H. (2009) Testing for economies of scope in European Railways: an efficiency analysis. Journal of Transport Economics and Policy, 43 (1) pp1-24.

Heseltine, P M and Silcock, D T (1990) The effects of bus deregulation on costs. Journal of Transport economics and Policy, vol 24

Hotelling, H (1929) Stability in Competition. Economic Journal, 39(153) 41-57.

Ivaldi, M and McCullough G J (2001) Density and integration effects on class 1 U S freight railroads. Journal of Regulatory Economics, 19, 161-182

Johnson, D.H.; Nash, C.A. (2008), *Charging for Scarce Capacity: A Case Study of Britain's East Coast Main Line* , Review of Network Economics, Vol.7.

Johnson, D.H., Connors, R Nash, C.A., (2009), Estimating the opportunity cost of slots, Case Study, for CATRIN D8, European Commission, http://www.catrin-eu.org/

Johnson D.H., Shires, J., Nash, C.A. ,Tyler, J. (2006*)* Forecasting and appraising the impact of a regular interval timetable Transport Policy, vol13 no 3 pp349-366

Jones, I (2000) Developments in Transport Policy: the evolution of policy towards on-rail competition in Great Britain, journal of Transport Economics and Policy, Volume 34, Part 3, Sept 2000

Malighetti, Paolo, Paleari
http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VGP-4TXDXFD-1&_user=7523285&_coverDate=07%2F31%2F2009&_alid=1401137259&_rdoc=1&_fmt=high&_orig=search&_cdi=6044&_sort=r&_docanchor=&view=c&_ct=145&_acct=C000005458&_version=1&_urlVersion=0&_userid=7523285&md5=9255dc5e7ac2530dc4543fcb06f96dc9 - aff1

Stefano and Renato Redondi http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VGP-4TXDXFD-1&_user=7523285&_coverDate=07%2F31%2F2009&_alid=1401137259&_rdoc=1&_fmt=high&_orig=search&_cdi=6044&_sort=r&_docanchor=&view=c&_ct=145&_acct=C000005458&_version=1&_urlVersion=0&_userid=7523285&md5=9255dc5e7ac2530dc4543fcb06f96dc9 - aff2 (2009) Pricing strategies of low-cost airlines: The Ryanair case study. Journal of Air Transport Management. 15 (4) 195-203.

Merkert, R., (2009) The measurement of transaction costs in railways, Unpublished PhD thesis, University of Leeds.

Mohring H (1972) Optimisation and Scale Economies in Urban Bus Transport. American Economic Review, 591-604.

Motta, M (2004) Competition Policy, Theory and Practice.

MVA (2009) Making Better Decisions. Assessment of Alternative Track Access Applications on the East Coast Main Line. Report for The Office of Rail Regulation

Nash, C A (1993) British Bus Deregulation. Economic Journal 103(419) 1042-9.

Nash, C A (2008) Privatisation of Public Passenger Transport – Insight from the British experience. Paper presented at the conference on the future of public passenger transport at Greifswald, Germany, April.Nash, C A and Smith A (2010). Britain. In Community of European Railways: Reforming Railways. Lessons from Experience. Eurail Press, Brussels.

NERA (2006) The decline of bus services in the metropolitan areas. PTE Group, Leeds.

Nilsson, J-E (2002) 'Towards a Welfare Enhancing Process to Manage Railway Infrastructure Access'. Transportation Research A, 36(5), 419-436.

OFT (2007) Productivity and competition. An OFT perspective on the productivity debate January 2007.

Office of Rail Regulation (2011) Track Access Rights on the West Coast Main Line. ORR, London.

Oum, T. H. and C. Yu (1994) "Economic efficiency of railways and implications for public policy: A comparative study of the OECD countries railways", Journal of Transport Economics and Policy, 28(2):121–138.

Preston, J., M. Wardman and G. Whelan (1999), An Analysis of the Potential for On-Track Competition in the British Passenger Rail Industry, Journal of Transport Economics and Policy, vol. 33, part 1, pp. 77-94.

Preston J M, Holvad T and Rajé F (2002) Track Access Charges and Rail Competition: A Comparative Analysis of Britain and Sweden, Paper presented at the European Transport Conference, Cambridge.

Preston, J (2008) A Review of Passenger Rail Franchising in Britain: 1996/1997-2006/2007. Research in Transportation Economics.

Preston, J (2009) Competition for Long Distance Passenger rail services: The Emerging Evidence, International Transport Research Symposium, The Future for Interurban Passenger transport: Bringing Citizens Closer Together, Madrid, November 2009

Robbins, D (2007) Competition in the UK express coach market 25 years after deregulation: the arrival of Megabus.com. European Transport Conference.

Robbins, DK and White PR (1986) The Experience of Express Coach Deregulation in Great Britain. Transportation 13(4) 359-384

Séguret, S (2009) Is Competition On Track a Real Alternative To Competitive Tendering In The Railway Industry? Evidence from Germany, Paper presented to the international conference on competition and ownership in land passenger transport, Delft, September 2009

Smith, A., Nash CA and Wheat P (2009) Passenger rail franchising in Britain: has it been a success? International Journal of Transport Economics 36 (1) 33-62

Smith, A.S.J., Wheat, P.E. and Nash, C.A. (2010). Exploring the effects of Passenger Rail Franchising in Britain: Evidence from the First Two Rounds of Franchising (1997-2008). Research in Transportation Economics, 29, 72-79.

Smith, A.S.J. and Wheat, P.E. (2011), 'Evaluating Alternative Policy Responses to Franchise Failure: Evidence From the Passenger Rail Sector in Britain,' *Journal of Transport Economics and Policy*, published online (Fast Track Articles), February 2011.

Van de Velde, D (2005) The Netherlands, In Reforming Europe's Railways – Assessment of Progress, Published by the Community of European Railway and Infrastructure Companies – CER

Wheat, P.E. and Smith, A.S.J. (2010). Econometric Evidence on Train Operating Company Size. Report for ORR, Institute for Transport Studies, University of Leeds.

Whelan, G.A., Preston, J.M., Wardman, M., Nash, C.A (1997) The privatisation of passenger rail services in Britain: an assessment of the impacts of on-the-track competition, Presented to European Transport Forum, PTRC 1Arup (2009) On Rail Competition Analysis Key Findings. Report for The Office of Rail Regulation.

P R White (2008) Factors affecting the decline in bus use in the metropolitan areas. PTE Group, Leeds (available on www.pteg.net/PolicyCentre/Bus)

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Abu Dhabi
AS Business Centre, Suite 201, Al Ain Road, Umm al Nar, P.O. Box 129865, Abu Dhabi, UAE
T: +971 2 510 2402 F: +971 2 510 2403

Birmingham
Second Floor, 37a Waterloo Street
Birmingham B2 5TJ United Kingdom
T: +44 (0)121 233 7680 F: +44 (0)121 233 7681

Dublin
First Floor, 12/13 Exchange Place
Custom House Docks, IFSC, Dublin 1, Ireland
T: +353 (0)1 542 6000 F: +353 (0)1 542 6001

Edinburgh
Second Floor, Prospect House, 5 Thistle Street,
Edinburgh EH2 1DF United Kingdom
T: +44 (0)131 220 6966 F: +44 (0)131 220 6087

Glasgow
Seventh Floor, 78 St Vincent Street
Glasgow G2 5UB United Kingdom
T: +44 (0)141 225 4400 F: +44 (0)141 225 4401

London
Second Floor, 17 Hanover Square
London W1S 1HU United Kingdom
T: +44 (0)20 7529 6500 F: +44 (0)20 7529 6556

Lyon
11, rue de la République, 69001 Lyon, France
T: +33 (0)4 72 10 29 29 F: +33 (0)4 72 10 29 28

Manchester
25th Floor, City Tower, Piccadilly Plaza
Manchester M1 4BT United Kingdom
T: +44 (0)161 236 0282 F: +44 (0)161 236 0095

Marseille
76, rue de la République, 13002 Marseille, France
T: +33 (0)4 91 37 35 15 F: +33 (0)4 91 91 90 14

Paris
12-14, rue Jules César, 75012 Paris, France
T: +33 (0)1 53 17 36 00 F: +33 (0)1 53 17 36 01

Woking
Dukes Court, Duke Street, Woking
Surrey GU21 5BH United Kingdom
T: +44 (0)1483 728051 F: +44 (0)1483 755207

Email: info@mvaconsultancy.com

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