

Department for Transport

**Revisiting the Elasticity
Based Framework**

Rail Trends Report

FINAL

ARUP



Department for Transport

**Revisiting the Elasticity
Based Framework**

Rail Trends Report

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1 Introduction

1.1 Overall Objectives

In October 2008, Arup and Oxera were appointed by the Department for Transport to undertake the study, Rail Passenger Demand Forecasting: Revisiting the Elasticity-Based Framework. The objective of this study is to re-estimate the background growth (economic, socio-demographic and land-use, and intermodal competition) and fare elasticities for use in the Passenger Demand Forecasting Handbook (PDFH).

The market analysis phase of the project is being undertaken for a number of reasons:

- to help provide an understanding of the limitations and capabilities of the data sources proposed;
- to provide an overall view of the main trends in rail travel, highlighting potential anomalous trends, major events which need to be taken account of (such as Hatfield), and significant changes in travel patterns; and
- to help inform the initial testing of the elasticity framework, indicating which variables might have explanatory power and potentially variables to include (or reject).

1.2 Outputs

There are two key deliverables from the market analysis work:

- Firstly, the subject of this report, a narrative describing trends in the market for rail travel over the past twenty years; and
- Secondly, a report linking the observations from the market assessment workstream to initial recommendations for the econometric specification (including specification of the variables to be modelled) of the forecasting framework.

The work will also generate a data capability report, and a report setting out initial recommendations for segmentation.

1.3 Case Studies

Alongside the core econometric approach we intend to make use of a small number of case studies to demonstrate important features of the wider analysis, and to illuminate issues that cannot be captured within the broader framework.

The case studies will be incorporated and considered in more detail in the next stage of the market analysis (market assessment) and will be informed by this Rail Trends Report. Each case study will then be used in the model testing phase to understand the capabilities and limitations of the framework as it is developed, and to guide further development work. The case studies will be detailed in the next stage of the market analysis.

1.4 Structure of Rail Market Trends Report

The objective of this report is to provide an overall view of the main trends in rail travel compared with trends in independent explanatory variables both external and internal to the rail industry. At this stage no multivariate analysis has been carried out, although potentially important interactions between the main trends have been identified for further investigation. The next stage of the market analysis which will follow will then provide conclusions on the market segmentation and the outcomes of hypothesis testing to be taken forward as an input into the econometrics estimation.

Chapter 2 sets out the key issues for the market analysis. Chapter 3 presents a review of recent developments affecting the rail industry. Chapter 4 presents a high level overview of rail trends. Chapter 5 provides an analysis of the rail travel market with respect to the external explanatory variables currently included in the PDFH forecasting framework. Chapter 6 considers other measurable external variables which could be included in the

forecasting framework such as consumer confidence. Chapter 7 provides a market analysis of internal rail industry level of service factors currently included in the forecasting framework with an impact on rail demand including fares and ticketing, crowding, performance, journey time and passenger perception of the quality of rail. Chapter 8 considers the impact on the rail travel market of other rail industry internal factors not currently included in the forecasting framework such as marketing and affects of industry changes. Chapter 9 presents the overall conclusions.

2 Key Issues for the Market Analysis

2.1 Market Analysis Tasks

In undertaking the market analysis work stream the following tasks were undertaken;

- investigation of overall trends in rail demand and highlighting features of particular periods of time, demand segments (e.g. ticket type or journey purpose) or geographical areas;
- examination of trends in external variables which might potentially affect demand;
- testing relationships between rail demand and potential demand drivers;
- exploration of market segmentation issues, such as the relationships between ticket type and journey purpose.

This research has built on work undertaken previously including the LEK Long Time Series studies and the Investigation into Recent Rapid Growth in Rail Industry Demand (Rapid Growth) study.

2.2 Types of Issues Addressed

The investigation of overall trends in rail demand and the examination of overall trends in external and internal industry variables which may affect rail demand, described in this report, has addressed a range of issues, including:

- Modal competition—changes in rail's market share and possible drivers (car park prices, fuel prices, congestion, air security costs, etc);
- Changes in employment and population (absolute terms and composition), plus disposable income/other similar variables and land-use changes;
- Fare, timetable, performance, and soft changes (for example rolling stock quality); and
- Single leg pricing and other behavioural issues, through examination in shift in mix of ticket types.

The findings of the Rapid Growth Study on demand drivers were one of the references used in defining the potential variables affecting demand for rail.

This report does not consider the market segmentation in any detail, but provides an input into the next stage of the market analysis which will include a definition of rail market segmentation based on an investigation of market disaggregation by ticket type and journey purpose by geographic area.

3 Review of Recent Developments Affecting the Rail Industry

3.1 Review of Recent Developments Affecting the Rail Industry

This section provides an overview of the key developments in the rail industry since 1990. Over this period as a whole demand for rail travel has grown significantly, although there was a fall in demand in the early part of the period with a subsequent rise in demand. Major external events which have had an affect on the rail industry have included the economic cycle and competition from other modes. Within the rail industry there have also been significant developments affecting the industry, particularly in terms of railway governance (privatisation), rail infrastructure upgrades, fares regulation and the effects of Hatfield. Finally, there are the resulting impacts of the above developments in terms of the usage of the rail network and increasing capacity constraints, resulting in network congestion and train crowding.

These changes have been significant and fundamental, and this cannot therefore be a fully comprehensive review. However, key features will be highlighted in the following analysis and commentary.

3.2 Rail Privatisation

The Railways Act of 1993 initiated the rail privatisation process during the mid 1990s which represented a step change in the organisation and operation of the railway industry. British Rail had been responsible for the infrastructure and passenger and freight operations. With privatisation the responsibility for management, maintenance and development of rail infrastructure passed to a private company, Railtrack.

At the same time a franchise system was set up for the operation of passenger and freight services split between private rolling stock leasing companies (ROSCOs) and train and freight operating companies (TOCs/FOCs). Franchises were specified by Government for the operation of passenger and freight services. Initially, some 25 franchises were awarded through a process of franchise competitions to achieve the best value-for-money offer from bidders. Consolidation has since occurred as franchises have been re-tendered with five public transport groups currently running a majority of the seventeen franchised operations.

Following privatisation, the overall responsibility for the long term planning, direction and regulation of the rail industry was given to the newly created Strategic Rail Authority (SRA) from 2000 (replacing the Office of Passenger Rail Franchising) and the Office of the Rail Regulator (ORR). The SRA has since been wound up following the 2005 Railways Act with its responsibilities transferred to the Department for Transport, Transport Scotland and Network Rail.

3.3 Fares Regulation Changes

Before privatisation, there was no statutory regulation of rail fares, although the government could influence British Rail fares policy. However, fare rises significantly above inflation were not untypical, as pricing was seen as an acceptable means of managing demand when it threatened to exceed supply.

At the time of privatisation, a fares regulation mechanism was introduced and enshrined within franchise agreements. The regulatory mechanism was based around baskets of fares for each operator, and for some TOCs there was a mechanism linking fare rises to performance, which gave rise to a considerable degree of complexity. However, broadly the effect of the regulation was to limit fare rises on certain ticket types to 1% below the rise in RPI. The regulated ticket types were season tickets, and either day return or "Saver" tickets depending on the length of the flow.

Although a significant number of tickets, notably First Class and Advance Purchase tickets, were not subject to regulation, the regulated tickets effectively impose a “ceiling” on other tickets, and so regulation broadly had the effect of keeping average fare rises around the rate of inflation.

In 2003, the fares regulation regime was reviewed by the SRA. A simplified mechanism was introduced, and the link to performance abolished. At the same time the fares cap was increased from RPI-1% to RPI+1%, but with broadly the same range of tickets regulated. The policy was designed to explicitly rebalance the share of rail industry funding from the tax payer to the fare paying passenger. In some cases, (notably Southeastern), the cap has been raised to reflect additional investment. Although the new regime is slightly more relaxed than the old regime in terms of the level of price increases the TOCs are permitted to impose, the effects on overall fares structure are broadly similar, in that regulated ticket prices still have a capping effect on some non-regulated tickets.

A high level assessment of the trend in average revenue per journey is presented in Section 4.6.

3.4 Major Events

There have been a number of significant events over the study period (1990-2008) which have had an effect on rail demand.

Economic Growth

The period of assessment has seen significant period of sustained economic growth from the mid 1990s to 2007. This growth has been a key factor in the increase in rail demand.

East Coast Main Line Electrification

The electrification of the ECML was completed in 1990; therefore the works themselves will have at most a small residual effect on the data in the study period. However, the electrification brought significant improvements in journey times, as well as new trains, and so there will be a detectable demand effect in the earlier years.

West Coast Main Line Upgrade

The West Coast Main Line Upgrade project has been in progress across much of the last decade. The 125mph line speed enhancement of the WCML between London and Crewe was completed in 2005 with the latest enhancements completed in late 2008. With the infrastructure upgrade new timetables were introduced to offer improved morning and evening peak services. The upgrade caused significant disruption to rail services and resulted in a decrease in rail demand. Since completion of the majority of the upgrade, rail demand has increased significantly and is competing strongly with air on the London-Manchester route, as discussed later in this report.

Major Incidents

The study period saw a number of major incidents on the rail network. The Southall rail crash in 1997 and the Ladbroke Grove rail crash in 1999 which caused seven and thirty-one fatalities respectively followed a period with relatively few passenger fatalities, and may have had an effect on demand, although it is likely that this was short term. However, the Hatfield crash in 2000 had a far more fundamental effect on the industry, as the apparent cause of the crash (rail failure due to gauge corner cracking) led to the closure of large portions of the network for inspection. This wide spread network closure led to the implementation of an interim timetable to reflect the disruption to reliability and journey times. Whilst reliability recovered, the imposition of a very large number of temporary speed restrictions had a major effect on journey times. This, in turn, caused a significant reduction in rail demand as passengers were either unwilling to endure the longer journey times, or simply unable to make their desired journeys. The effects of this were compounded by a series of other incidents: The Selby crash together with severe weather conditions in the summer of 2001, and the Potters Bar crash in 2002. There is no doubt that

the combination of all these factors made a significant dent in rail's public image, from which it has only recently recovered. The Rapid Growth study also identified a lagged effect for the impact of major events.

Privatisation Strikes

In 1994, immediately following the restructuring of the rail industry and the creation of Railtrack, the RMT called a series of signallers' strikes, which severely disrupted rail services over a period of approximately three months. There was a significant effect on rail revenue as a result of this disruption to be borne in mind when using 1993-94 data in econometric analysis.

3.5 Domestic Air Market

Changes in the domestic air market have had a significant effect on rail demand. This is restricted to a relatively small number of flows which have direct air competition, but these are nonetheless significant. An assessment of air as a competing mode to rail for medium to long distance travel is presented in section 5.6.

The first major change was the advent of "scheduled low cost" or "no frills" operators. The model was developed by EasyJet and Ryanair, and these remain the largest such operators, but flyBe now operates a significant number of domestic routes, and there are several other minority operators on particular routes. The low cost model was first adopted by Ryanair in 1990, but they did not start UK domestic operations until 1995 with flights from Stansted to Prestwick. In the same year EasyJet launched its domestic flights from Luton to Edinburgh and Glasgow.

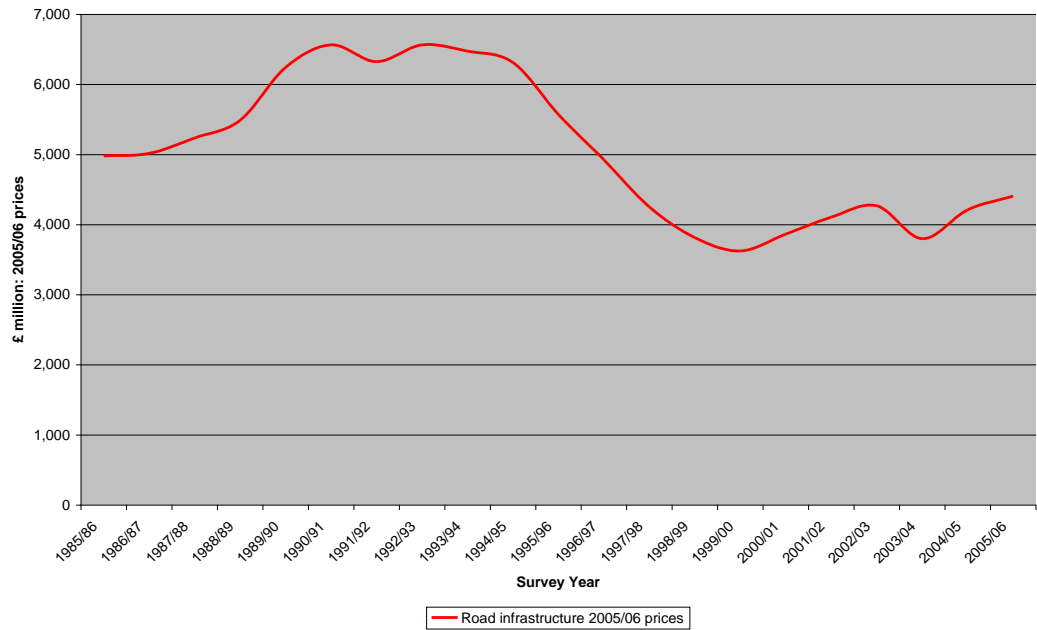
The low cost operators offered heavily yield-managed fares with very low headline prices, and a much simpler single-leg ticketing structure than that offered by the conventional operators. This had a direct effect on air demand, increasing traffic on the affected routes and capturing a significant proportion of rail market share. However, it is also accepted that there has been an indirect effect on the whole of the travel market, changing both perceptions of the cost of longer-distance travel, and acceptance of the single-leg internet-based booking mechanism.

The second major event affecting the domestic air market was the terrorist attack in New York of 11 September 2001. In the aftermath of this security precautions at airports were massively increased, which in turn increased end-to-end journey times. This impact increased with the checks for liquids in hand-luggage from 2006. This had the effect of driving passengers back to rail, helped by aggressive promotions from Virgin and GNER. These passengers discovered an improved rail service with new rolling stock and improved facilities including WiFi. Although airport transit times have improved again, the intrusive nature of security checks combined with the improved environment on trains seems to have meant that rail has regained some of its market share.

3.6 Road Building

Figure 3.1 shows the trend in road building since the mid 1980s. Investment in enhancing the road infrastructure reached a peak during the early to mid 1990s. Government policy changed in the late 1990s and the road building programme was scaled down. Over the last decade investment in road infrastructure has been significantly reduced with more emphasis being placed on traffic management measures rather than new roads.

Figure 3.1: Investment in Road Infrastructure 1985/06 to 2005/06

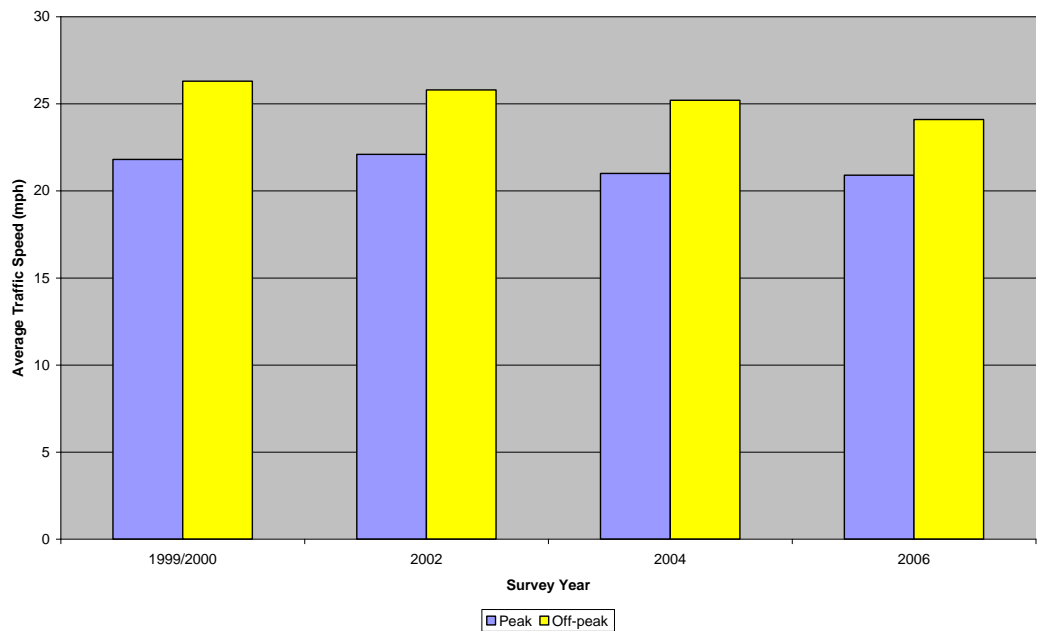


Source: TSGB

3.7 Road Congestion

Figure 3.2 shows average traffic speed, an indicator of traffic congestion, in England since 1999-2000 which indicated that traffic speeds have been decreasing both for peak and off peak travel. Therefore traffic speeds have been decreasing at the same time as the road infrastructure investment programme has been reduced. A further key factor is the increasing car ownership and car usage over this period which is analysed in section 5.7. An assessment of car as a competing mode is described in section 5.6.

Figure 3.2: Average Traffic Speeds in England 1990-00 to 2006



Source: TSGB

4 High Level Review of Rail Market Trends

4.1 Review of Data Sources

This chapter provides a time series analysis of rail trends at a high level which extends back to 1990, the period over which we have rail demand data for econometric analysis. Rail usage is presented in terms of a range of demand and supply measures.

The presentation of the analysis in this report is focussed on providing a descriptive assessment of the trends in rail demand, the dependent variable, and a range of independent variables likely to have a bearing on rail demand and revenue, including external factors and internal factors within the rail industry. Whilst the analysis aims to provide a view on trends over the period from 1990/91, analysis is also presented highlighting specific breaks in the growth trends.

In addition to describing rail market trends, the strengths and weaknesses of the data for econometric estimation is reviewed. It should be noted that the full description of data sources will be set out in the Data Specification stage of the study providing details on limitations and capabilities of the source data.

A number of sources of time series rail data have been used to present the national rail trends in this chapter. The principal data sources used are as follows:

- National Rail Trends data produced by the Office of Rail Regulation;
- Rail industry forecasting tool, RIFF-Lite
- LENNON/DeltaRail rail demand data set. The analysis of this dataset will be completed during the next stage of the market analysis once the season ticket data has been received; and
- National Travel Survey

National Rail Trends provides an aggregate breakdown of demand segmented by sector and broad ticket type.

RIFF-Lite is based on the same National Rail ticket sales data, (therefore excludes PTE zonal tickets and London Travelcard sold through TfL sales outlets). However, there is some discrepancy with National Rail Trends due to a slightly different methodology used to report the number of journeys. RIFF-Lite enables a more detailed geographic analysis to be undertaken.

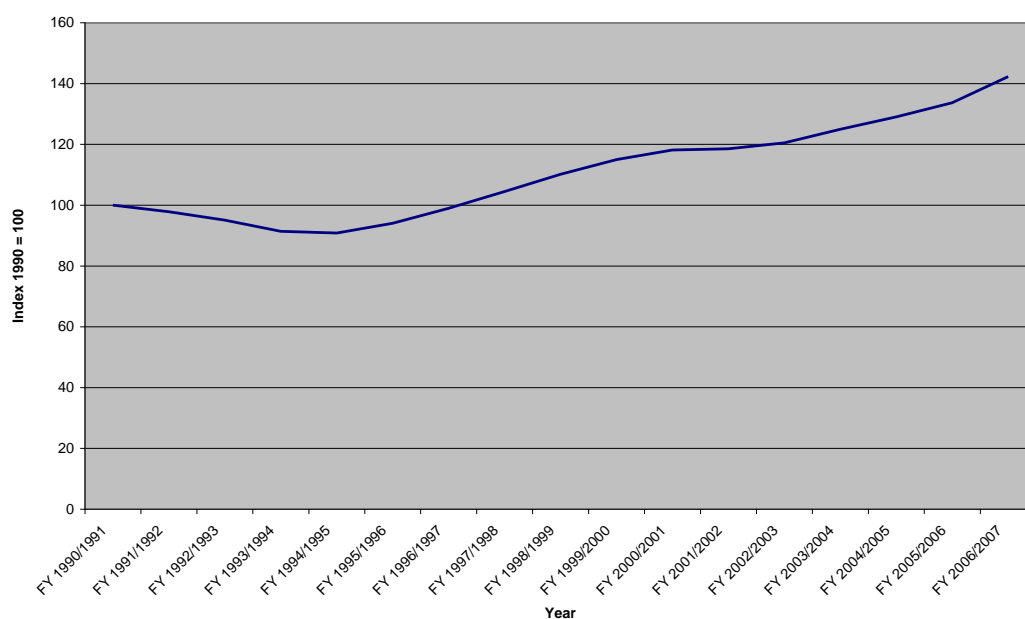
The LENNON/DeltaRail data set provides flow data by ticket type for a selection of over 6,580 flows representing a mix of long distance, regional and commuter flows.

An analysis has also been undertaken of rail market share. The key source for this high level market share assessment was the National Travel Survey. Market share is discussed further in section 4.9.

4.2 Change in Overall Passenger Journeys

Figure 4.1 shows the growth in rail passenger journeys over the period 1990/91 to 2006/07. The trend in passenger journeys shows a decline in the early 1990s culminating in a reduction of 4% year on year for 1993/94 immediately prior to privatisation. This trend is reversed from 1996/97 with average growth of around 3.5% per annum. The impact of Hatfield is evident from the very low growth rate in 2001/02, plus a decrease in London employment in that year. Thereafter, rail travel recovers with growth of about 3.5% per annum from 2003 to 2006, and more recently, 7% per annum growth for 2005/06 to 2006/07 (prior to the economic downturn). These differences in growth rates represent potentially important ‘breaks’ which will need to be considered in the econometric estimation.

Figure 4.1: Growth in Rail Passenger Journeys – Indexed from 1990



Source: National Rail Trends

4.3 Change in Passenger Journeys by Ticket Type

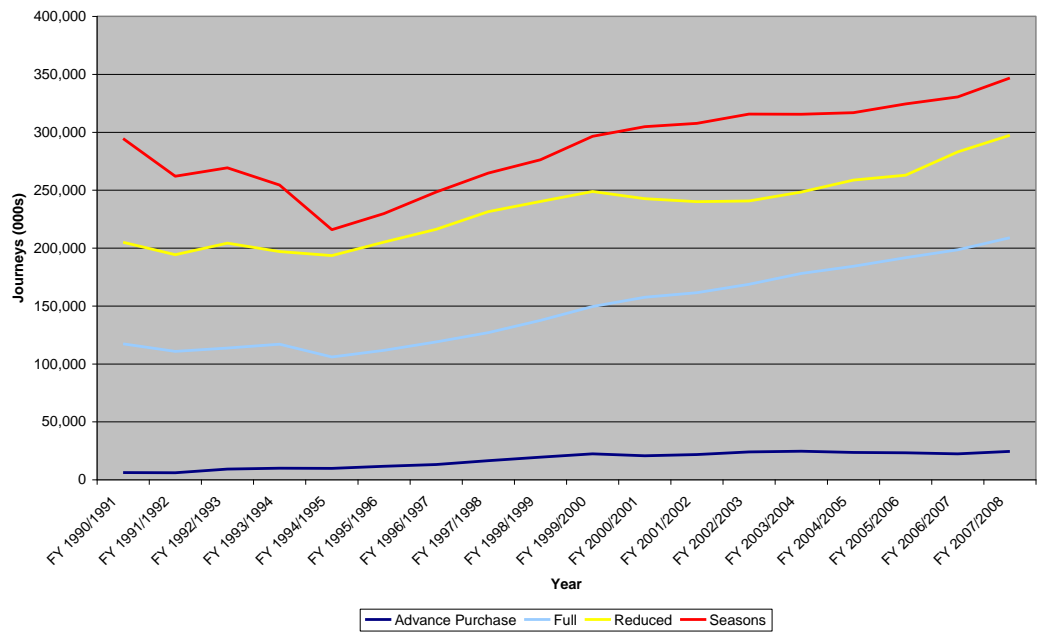
The trend in passenger journeys by ticket type is shown in Figure 4.2 which mirrors the overall trend line in passenger journey growth.

The impact of the decline in passenger journeys during the early 1990s is particularly noticeable for season tickets, dipping to 216,000 journeys in 1994/95 reflecting the impact of the recession on employment, and in particular central London employment, in the early-mid 1990s. Season ticket journeys recovered sharply in the late 1990s with further growth from 2001/02 albeit at a lesser rate.

Full and Reduced journeys were less affected by the recession in the early-mid 1990s with subsequent growth similar to Season journeys growth. For Seasons, Full and Reduced journeys there has been a common trend of significantly higher growth from 2006/07.

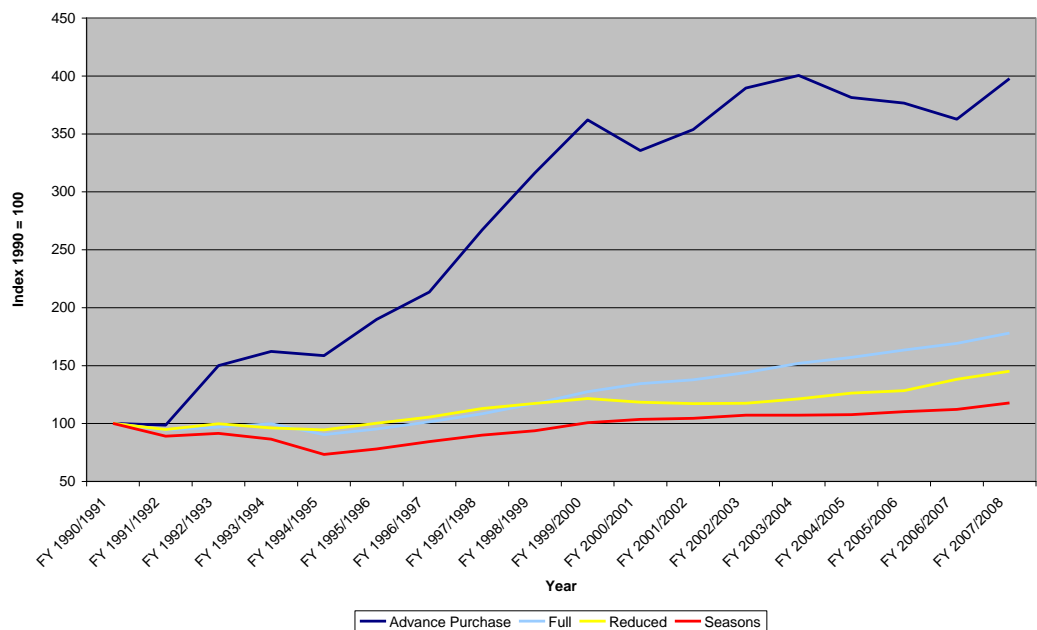
Advanced Purchase journeys have become more significant, particularly after rail privatisation. This is a result of the increasing availability of this type of ticket and the increasing adoption of advanced booking as practised by airlines to increase average loadings and yields. This feature of ticketing change and impact on average revenue is discussed in section 4.7. The scale of the growth in journeys made on Advanced Purchase tickets is demonstrated in Figure 4.3.

Figure 4.2: Passenger Journeys by Ticket Type



Source: RIFF-Lite

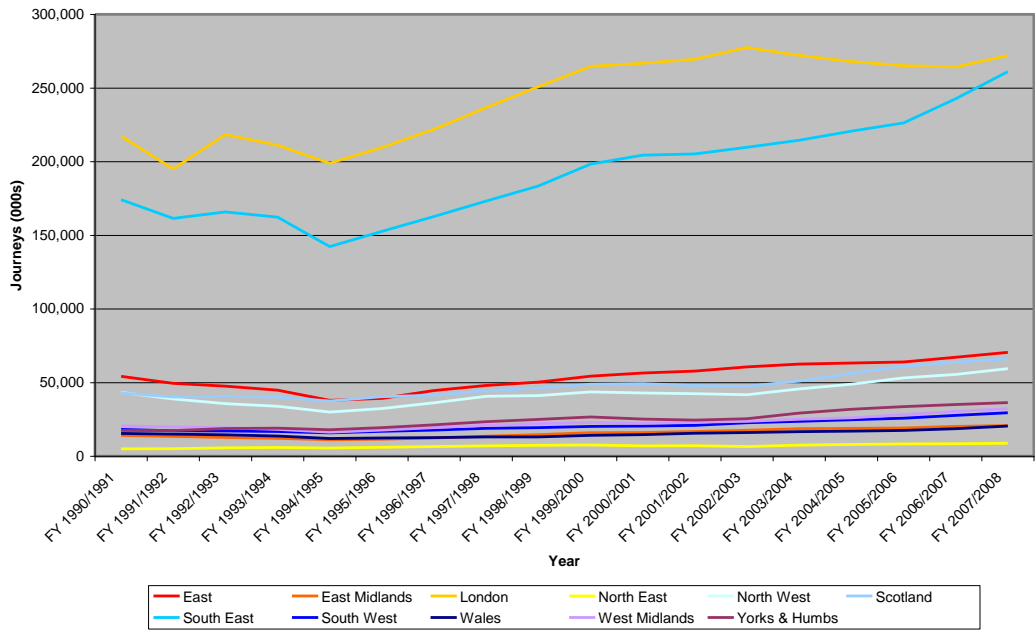
Figure 4.3: Indexed Passenger Journeys by Ticket Type



Source: RIFF-Lite

Figure 4.4 shows the absolute change in passenger journeys by geographic origin (Government Office Region). As to be expected, London and South East generates the greatest number of passenger journeys. Journeys originating in the South East have been growing at a greater rate than those from London and by 2007/08 were close to the London total. This is likely to reflect factors such as migration to South East locations with lower house prices than London and increased commuting into London, growth in employment opportunities in regional centres in the South East (reverse commuting), and growth in off peak travel with increasing disposable income.

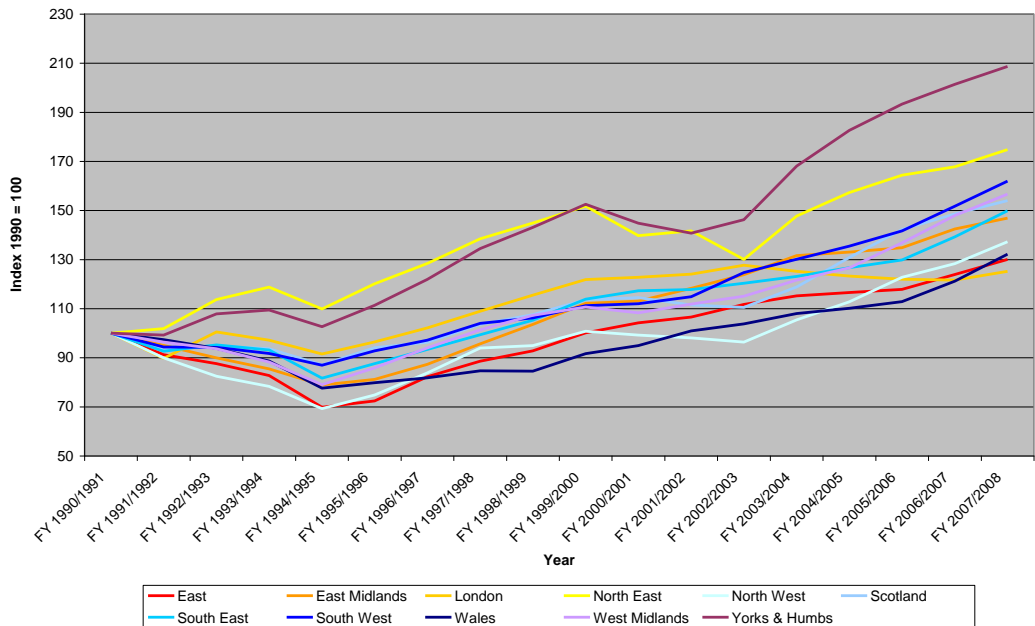
Figure 4.4 Passenger Journeys by Origin Government Office Region



Source: RIFF-Lite

When the growth is indexed a rather different set of trends is apparent, as shown in Figure 4.5 with higher relative growth in Yorkshire/Humberside and in the North East. A significant factor underpinning this increase in journeys is the growth in the local regional economy, particularly in Leeds. Another factor may be the increase in rail quality of service with Hull Trains open access service both a response to economic growth in the region and generating additional rail demand.

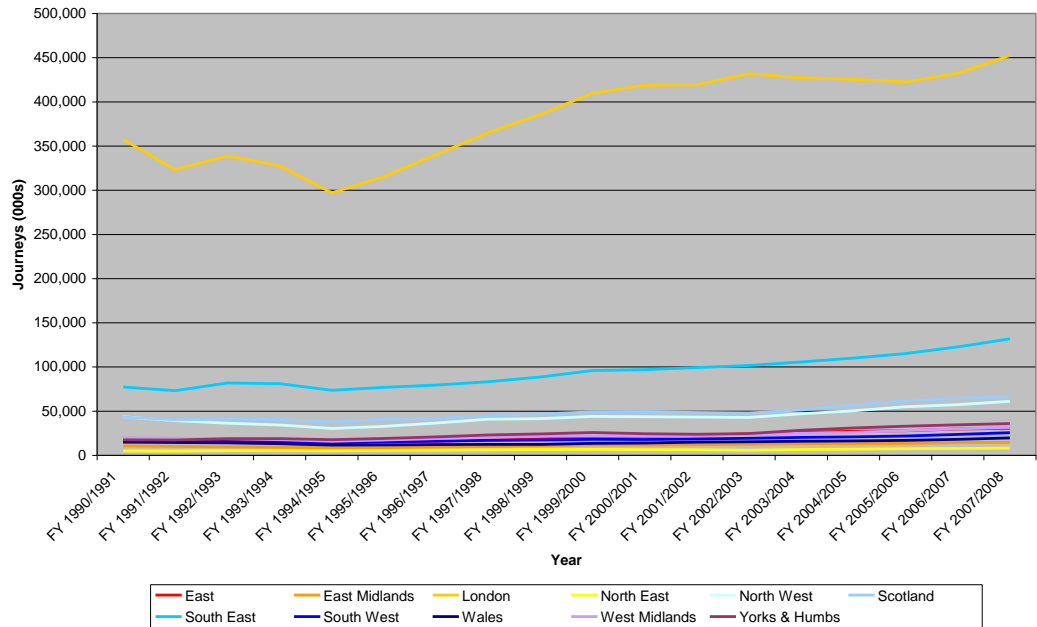
Figure 4.5: Passenger Journeys by Origin Government Office Region Indexed Growth



Source: RIFF-Lite

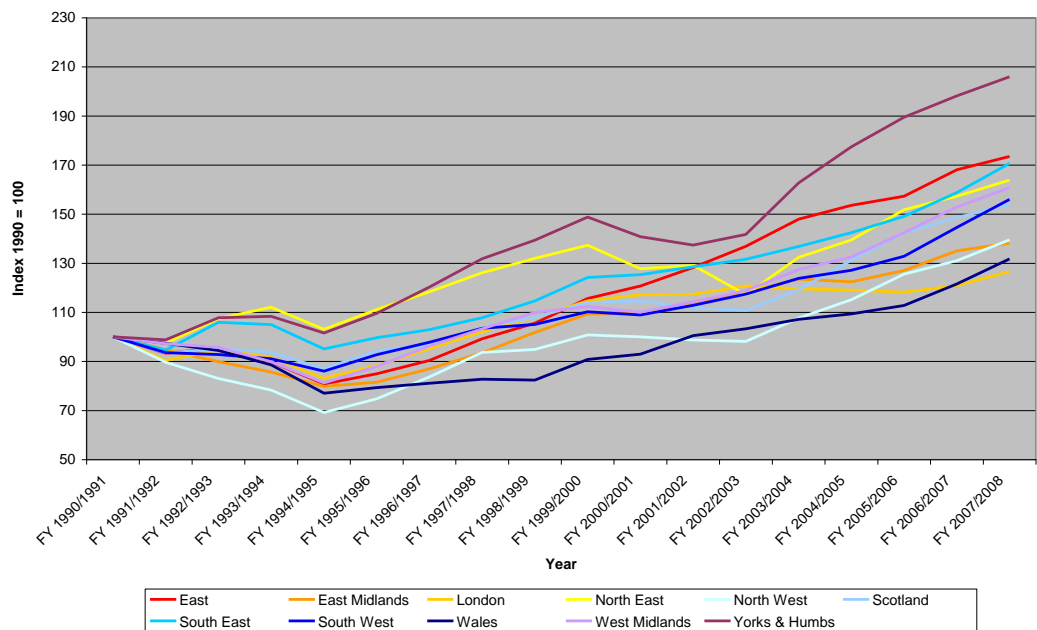
Passenger journey growth trends by destination Government Office Region highlights the significance of London as a destination (Figure 4.6). Comparison of indexed growth trends once again shows the relatively high growth in journeys terminating in Yorkshire and Humberside (Figure 4.7). This reflects both inter region journeys e.g. Leeds-London as well as more local intra-region journeys e.g. Leeds-York. This will be an issue for consideration in the next stage of the market analysis.

Figure 4.6 Passenger Journeys by Destination Government Office Region



Source: RIFF-LITE

Figure 4.7: Passenger Journeys by Destination Government Office Region Indexed Growth

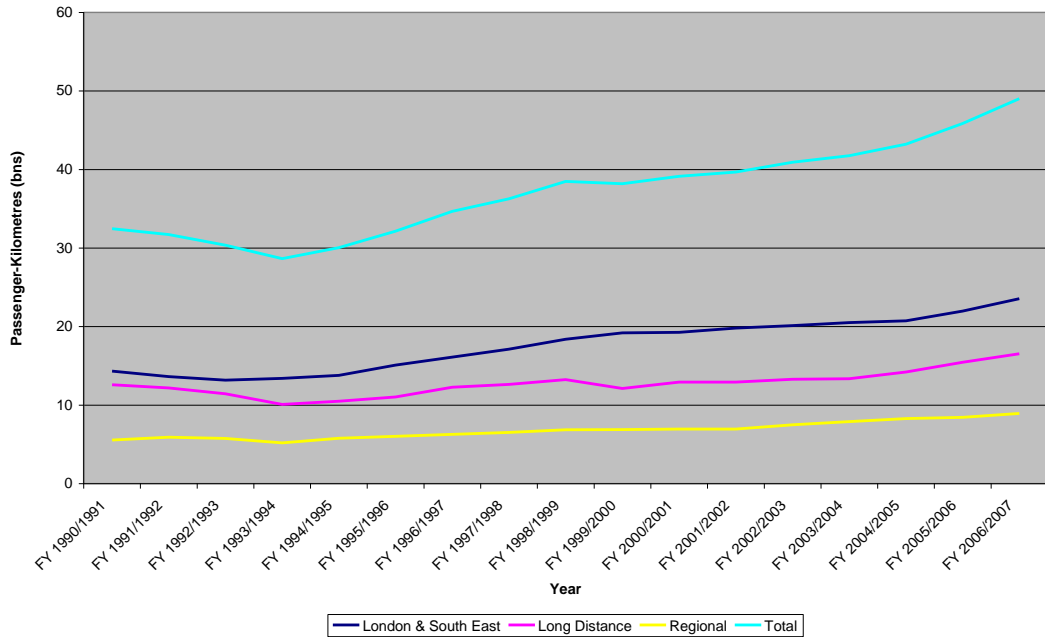


Source: RIFF-LITE

4.4 Change in Passenger-kms

Passenger kilometre data is available by sector which is shown in Figure 4.8. The trend line for total passenger-kms is similar to the overall growth in passenger journeys (Figure 4.1). As to be expected, London and the South East are the sectors with the largest number of passenger-kms and these sectors have increased relative to the other sectors since 2000/2001.

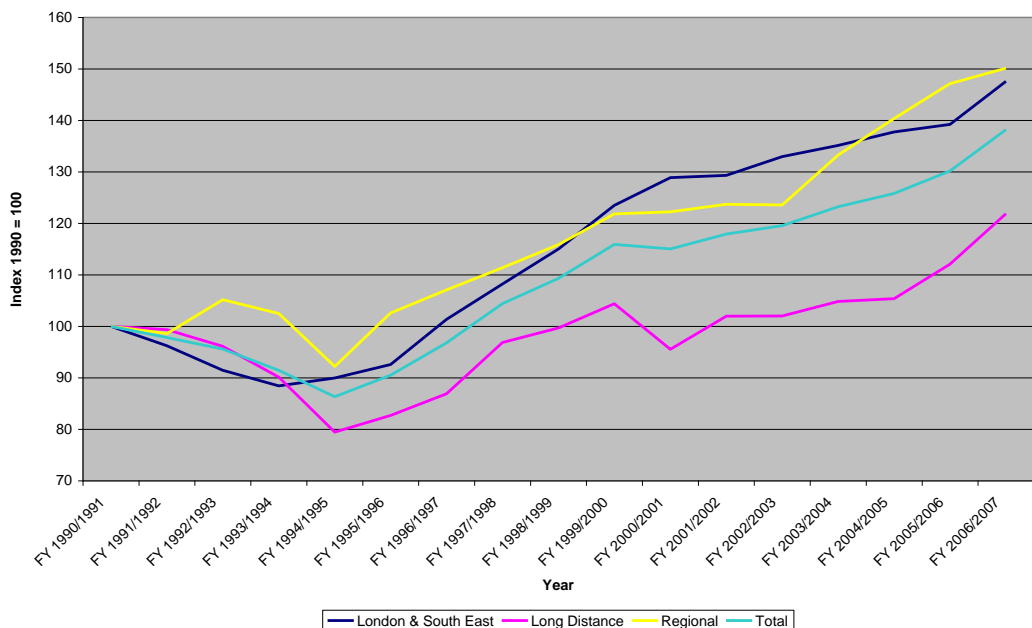
Figure 4.8: Change in Passenger-km by Sector



Source: National Rail Trends

The relative indexed growth in passenger-kms by sector (Figure 4.9) highlights relatively high growth in the regional sector, particularly since 2003/04. However, more recent growth (from 2005/06) appears to be driven by demand for the Long Distance and London and South East sectors.

Figure 4.9: Change in Indexed Passenger-km by Sector



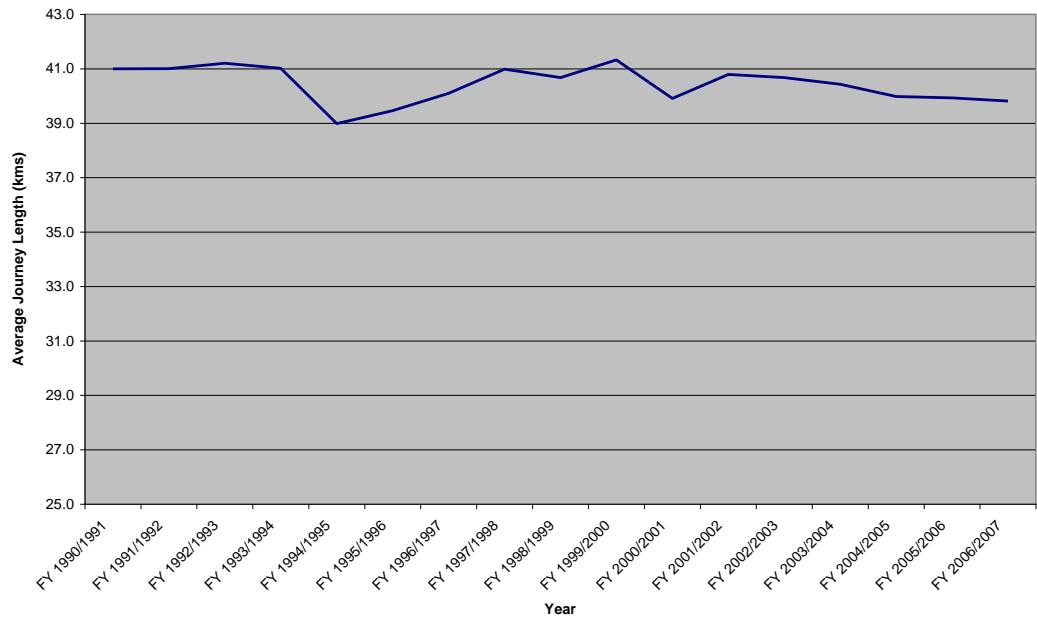
Source: National Rail Trends

4.5 Change in Average Journey Length

The trend in average journey length is shown in Figure 4.10. The trend line has been falling, albeit slowly, since 2001/02. This is perhaps surprising given the fairly similar trend lines for journey and passenger-kms growth since 1990/91 which are shown in Figure 4.11. Within the overall trend there has been some variation which may have implications for the econometric estimation of parameters using this aggregate data indicated by the difference in the trend lines presented in Figure 4.10 and Figure 4.11. In Figure 4.10 there are two distinct periods during which average journey length decreases (1994/95 and 2000/01). From Figure 4.11, it can be seen that whilst passenger-kms decrease relative to passenger journeys in 1994/95 there is less of a relationship for the 2000/01 data.

An assessment of average trip length at a more disaggregate level may highlight more distinct trends, for example longer distance commuting in the South East into London over the last ten years would imply an increase in average journey length. The assessment of rail market trends at a more disaggregate level in the next stage of the market analysis will identify the extent to which more localised phenomenon can be isolated from the broad trend presented in Figure 4.10.

Figure 4.10: Change in Average Journey Length



Source: National Rail Trends

Figure 4.11: Comparison of Trends in Passenger Journeys and Passenger-kms



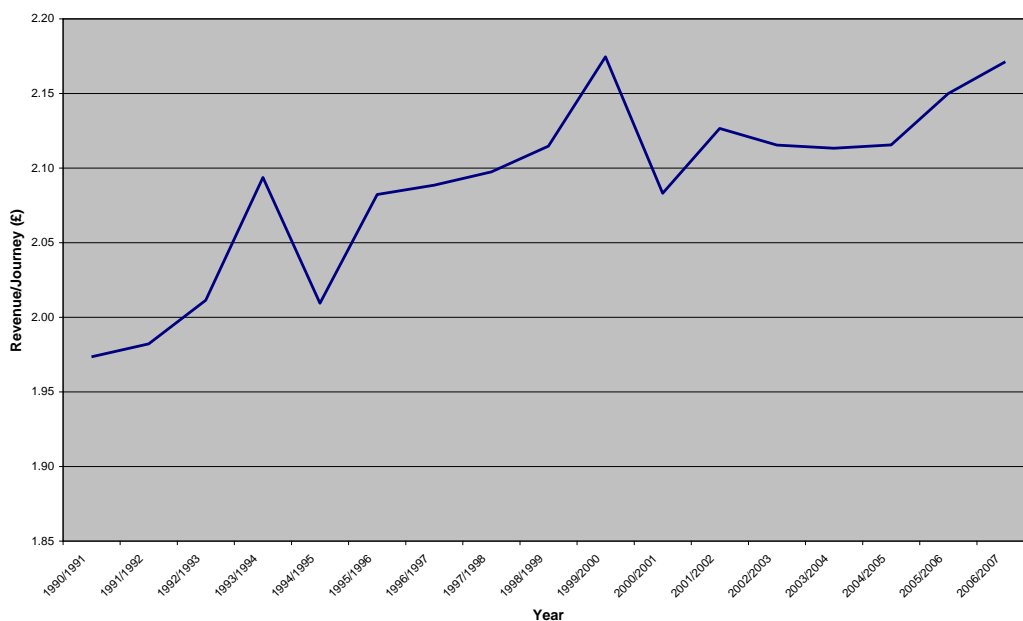
Source: National Rail Trends

4.6 Change in Average Revenue per Journey

The change in average revenue per journey is shown in Figure 4.12. Average yield does not reflect the impact of change in passenger demand given that revenue is linked to numbers of journeys and captures some behavioural response of passengers. Fares as an independent variable solely reflecting real change in fares would offer an alternative measure. However, the changes in ticket types and restrictions over time make it difficult to produce consistent time series data. The trend shows an increase of 10% in average revenue per journey since 1990/91, although with greater increases for 1993/94 and 1998-2000 followed by a decrease in the following year. These increases in average fare coincided with periods of inflation of below 2%. However, the recent trend in the last 2 years has been a return to higher growth rates with average revenue per journey exceeding £2.15 for the first time since 1999/2000.

It is noteworthy that the increase in average revenue per journey has only increased slightly in real terms, which is to be expected given the change in fares regulation from RPI-1 to RPI+1. Whilst the data does provide distinct changes in growth over time the dependent relationship between passenger journeys and revenue does not fully reflect the impact of fares changes. It should also be noted that the revenue TOCs receive from TfL sales is converted using assumed passenger journey ratios to generate journeys. The next section describing trends in revenue change by ticket type provides more insight into the changes in fare regulation by comparing the relative growth in revenue by ticket type.

Figure 4.12: Average Revenue (Real Prices) per Journey

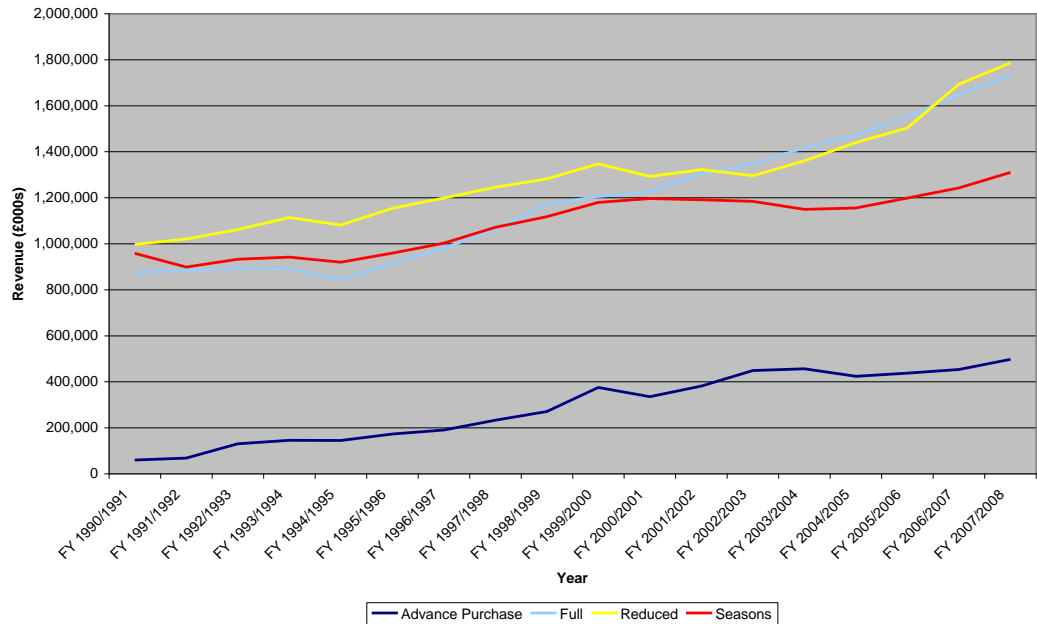


Source: National Rail Trends

4.7 Change in Revenue by Ticket Type

Figure 4.13 shows the change in revenue (£millions) by ticket type. Reduced tickets contributed the most revenue until 1999/2000 since when Reduced revenue growth has been matched by the growth in Full ticket revenue, although there have been changes in fares structure which saw some ticket types transfer from reduced to full. Season ticket revenue has shown less growth, and for a period between 1999/2000 and 2005/06, experienced a small decline. Advance Purchase revenue has increased eight fold since 1990/91 reflecting the growth in yield management and dedicated single leg tickets.

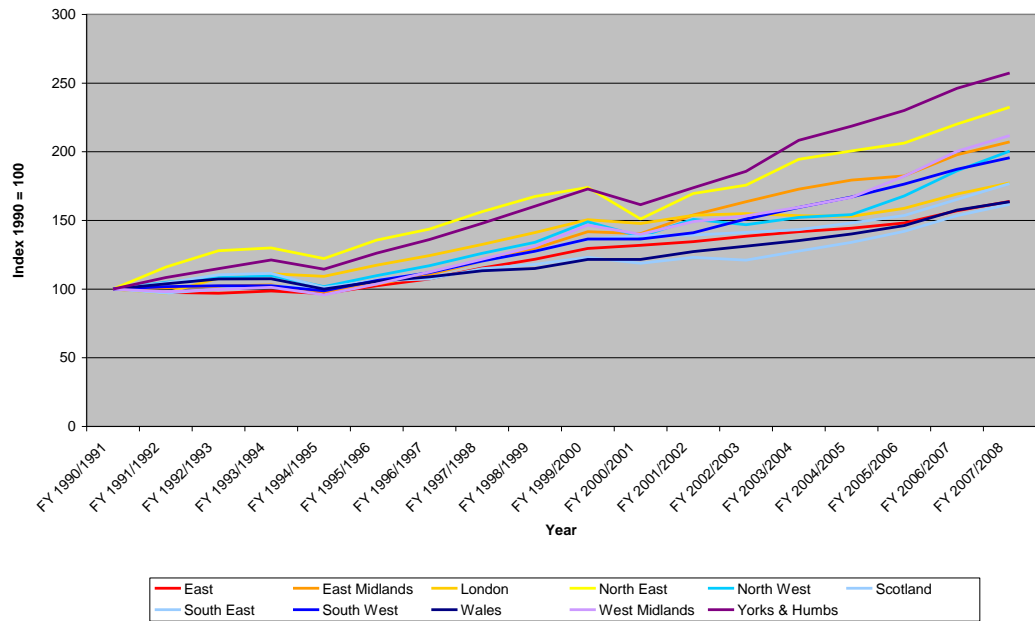
Figure 4.13: Change in Revenue by Ticket Type



Source: RIFF-Lite

Indexed revenue growth highlights the growth for Yorkshire and Humberside and the North East regions (Figure 4.14) as noted in Figures 4.5 and 4.7. Anecdotal evidence suggests that growth in economic activity (particularly in Leeds) and operator (GNER) yield management may together differentiate this region from others. A smaller contributory factor is likely to be the launching of open access services on ECML from 2000/01. Revenue growth has been lowest for Scotland reflecting different regulatory procedures and pricing strategies. Until recently rail fares increases in Strathclyde were set by SPT which kept fare increases at a lower level than elsewhere in Scotland. Also, in recent years ScotRail pricing strategy has been to hold unregulated fares increases at the same level as regulated fares.

Figure 4.14: Indexed Change in Revenue by Region

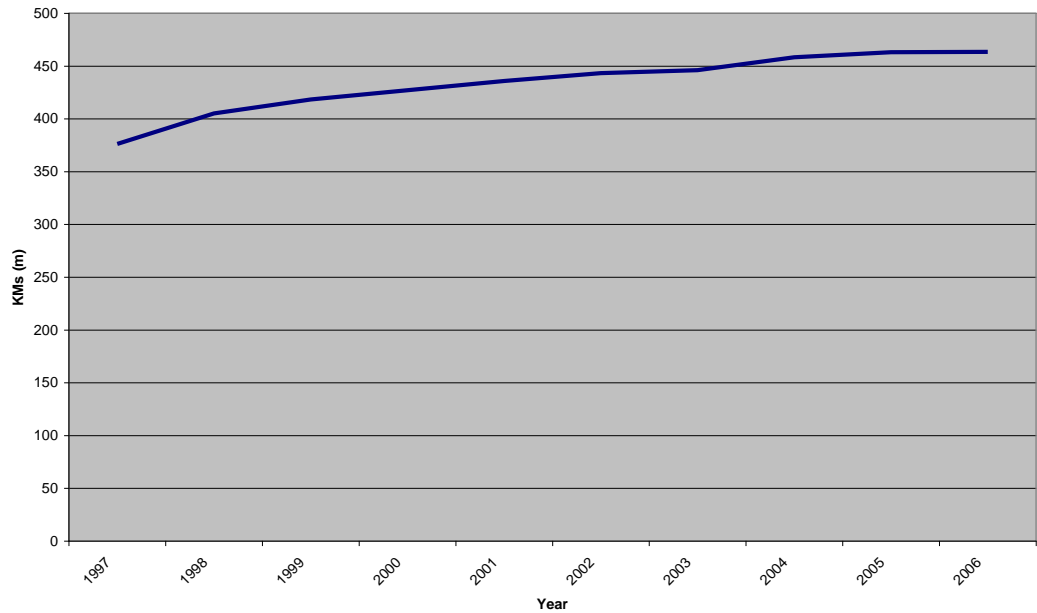


Source: RIFF-Lite

4.8 Change in Train-kms

The change in overall rail level of service is indicated by the change in train-kms (Figure 4.15). As can be seen the change in train-kms was greatest between 1997 and 2002 (annual average growth rate of 3.3%) with a subsequent reduction in the rate of increase, and in recent years, very little change in year on year train-kms (annual average growth rate of 1.1% between 2002 and 2006).

Figure 4.15: Change in Train-kms

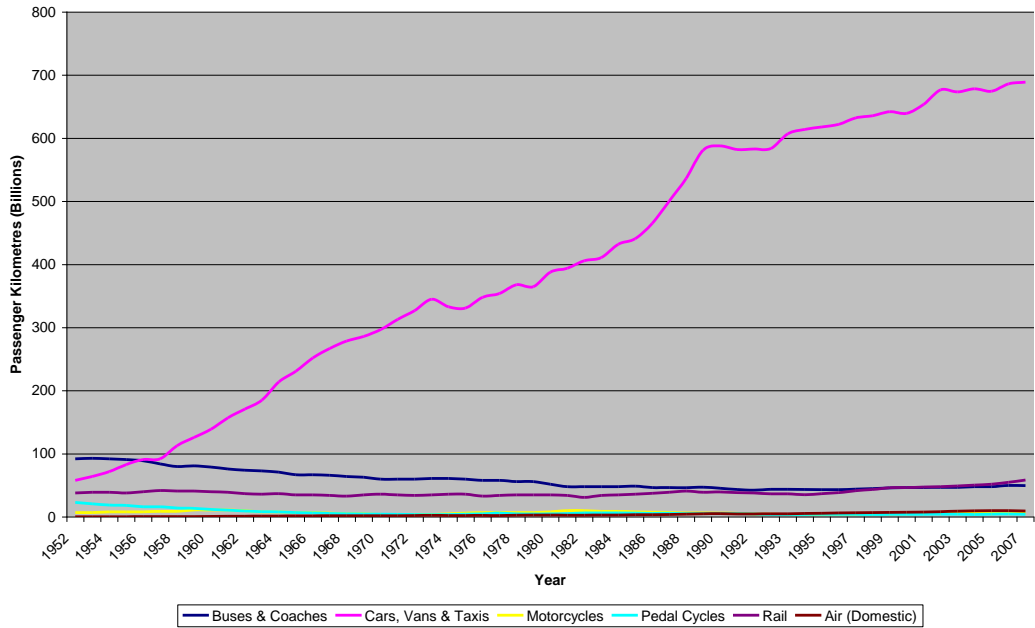


Source: TSGB

4.9 Rail Market Share

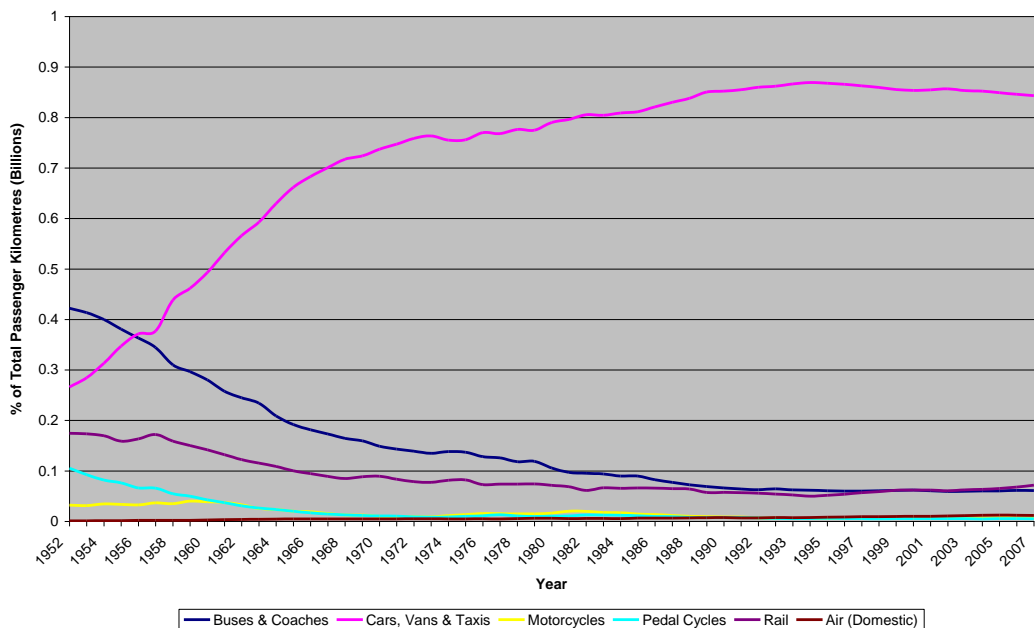
Figures 4.16 and 4.17 show the overall trend in passenger-kilometres market share by passenger transport mode and indicate that rail mode passenger-kms have increased by about 54% between 1952 and 2007. However, the rail mode share has declined by 50% as the transport market as a whole has increased. The key trend is the growth in the private car which accounted for 92% of all passenger-kms in 2007.

Figure 4.16: Growth in Passenger-kms by Mode of Transport: 1952-2007 (Billion Passenger Kilometres)



Source: TSGB 2008

Figure 4.17: Growth in Passenger-kms Change in Mode Share: 1952-2007

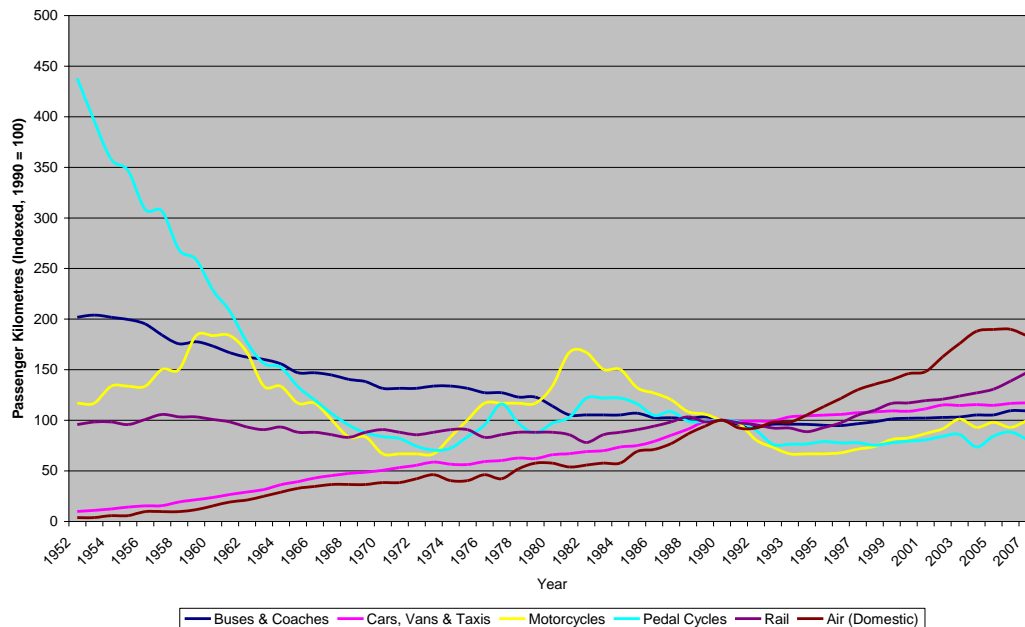


Source: TSGB 2008

Comparing growth rates by mode shows the increased growth of air transport responding to both increased GDP and the rise of low cost airlines since the mid-1990s (Figure 4.18). Rail also shows significant growth, although to a lesser extent, than air passenger demand.

However, there has been a recent reversal of this trend, with a decline in domestic air passenger kilometres, and a coincident increase in rail passenger kms. It is highly likely that some of the rapid rail growth is as a consequence of substitution from domestic air services. This trend is discussed further in section 5.6.

Figure 4.18: Indexed Growth in Passenger-kms by Mode of Transport



Source: TSGB 2008

4.10 Summary

This chapter has presented the key trends in the rail market since 1990. Rail passenger journey growth has been generally increasing over the period of assessment. However, the overall trend includes periods of different growth reflecting the impacts of both external and internal factors (economic recession and subsequent recovery, rail privatisation, and Hatfield) offering a spread of growth rates representing different conditions for use in the estimation of parameters.

Analysis of journey growth by ticket type has highlighted distinctive trends illustrated by the very marked increase in advanced purchase tickets between 1990 and 2000 both before and after rail privatisation and the more variable growth rates since 2000 which is not observed to the same extent for the other ticket types.

The impact of Hatfield is very evident for passenger journeys although there is some variation in the reduction in rail demand post Hatfield by geographical area and market sector. Rail usage growth shows that passenger-km and journey growth profiles are similar. At business sector level different trends become more apparent. Across all sectors there is a difference in the growth rates between the early-mid 1990s (recession), mid to late 1990s (rail privatisation and economic recovery) and post 2000 (Hatfield, economic growth). Each sector show different trends, an area of analysis to follow up in the next stage of the market analysis, particularly the change in growth rates in the regional sector from 2003/04 and the greater reduction in long distance rail travel due to gauge corner cracking post Hatfield compared with the other sectors.

There has been a small reduction equating to around 3% in average journey length since 1990 which is unexpected given the similar growth trends in passenger journeys and passenger-kms. It might be expected that the growth in central London employment and high growth rates in house prices from the start of the growth in economic activity in the late 1990s would have resulted in increased journey length as more travellers commute longer distances from home to workplace in the South East, but this is not evident from aggregate

analysis. A more disaggregate analysis may identify market specific changes in average journey length which will be investigated in the next stage of the market analysis.

A high level analysis suggests that growth in average revenue per journey has only been equivalent to a rate of growth slightly above the level of the Retail Price Index. However, this may include some behavioural response to changes in fare. For example, analysis of revenue growth by ticket type shows the rapid increase in Advanced Purchase revenue as a result of the increasing use of single leg tickets and yield management techniques after rail privatisation. Full ticket revenue has shown a steady increase in revenue since 2000 which is likely to reflect the close relationship between rail growth and growth in economic activity. Also evident from the data are the different levels of revenue growth by geographical region, for example the North East. This is likely to be a result of not only differential levels of growth in economic activity, but also the growth in the rail market through single leg ticketing and market growth due to new routes developed by open access operators. This analysis highlights the need for further investigation of the relationship between revenue and explanatory factors, geographically disaggregated, during the next stage of the market analysis.

A high level assessment of supply showed a small increase in train-kms operated between 1997 and 2006.

Since 1990, rail usage has increased significantly (apart from a short term decrease as a result of Hatfield) with the rate of growth increasing in recent years. The assessment period has also seen the rise of domestic air passenger demand although there is evidence of some decrease in air passenger demand since 2003. The private car usage growth rate has been fairly steady over the same period, but car usage growth rates have been significantly less than for the rail and air modes. The relatively low growth rate for car travel, may in part, be explained by the increasingly congested road network, particularly for commuting.

The emergence of low cost airlines in the 1990s underpins the air mode growth resulting in a general increase in demand for long distance travel, whilst the more recent decrease is likely to reflect the delays associated with additional security checks at airports. A key factor for further investigation in the next stage of the market analysis at a corridor/route level will be the relationship between increasing road congestion and the impact on demand for rail.

5 Forecasting Framework External Factors

5.1 External Factors

This chapter provides an assessment of a range of those external factors included within the current PDFH framework and their potential relationship to growth in rail demand. This is the core focus of the study as the external factors are key explanatory variables for the change in rail demand growth over time and by market sector.

5.2 Socio-Demographic Factors

The Passenger Demand Forecasting Handbook identifies socio-demographic factors (population growth) as one of the main factors driving the demand for rail.

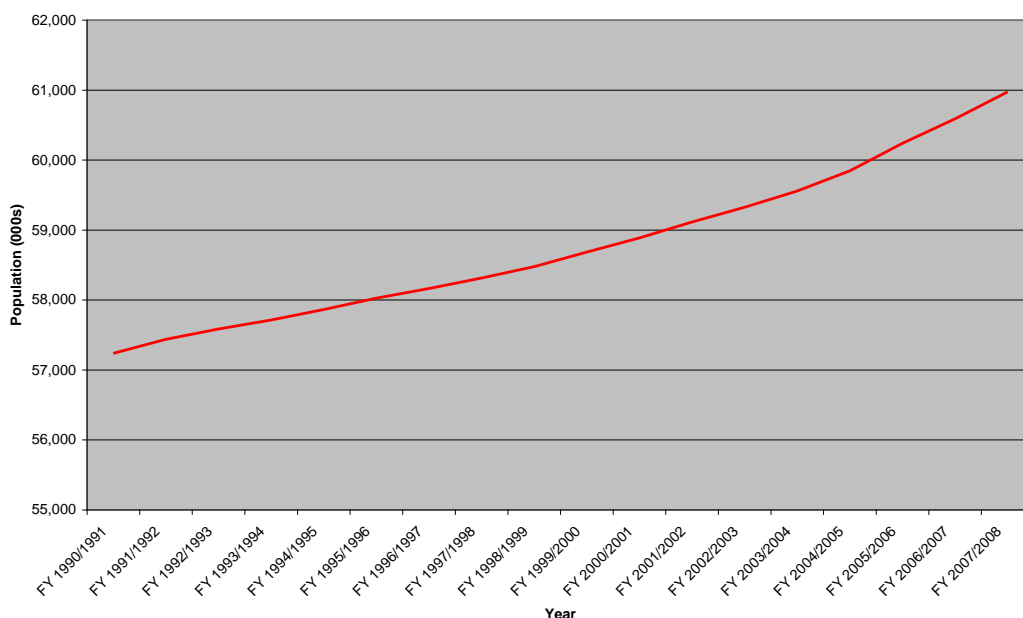
The existing forecasting framework provided the starting point for this market assessment of the potential for socio-demographic factors to influence rail demand. This chapter covers regional population trends, then focuses on key issues such as potentially higher population growth near to the railway network to take advantage of rail services.

Population growth can be expected to result in an increase in rail demand in absolute terms. The current Forecasting Framework provides guidance on population effects at a fairly aggregate level. A key issue for investigation is the degree to which population increase (or decrease) can have different impacts at a regional level.

5.2.1 National Trends and Regional Trends in Population Growth

The overall population growth trend for the UK is shown in Figure 5.1. The average annual growth rate was 0.4% per annum between 1990/91 and 2007/08 with the increase in growth rate attributable to the EU expansion of 2004.

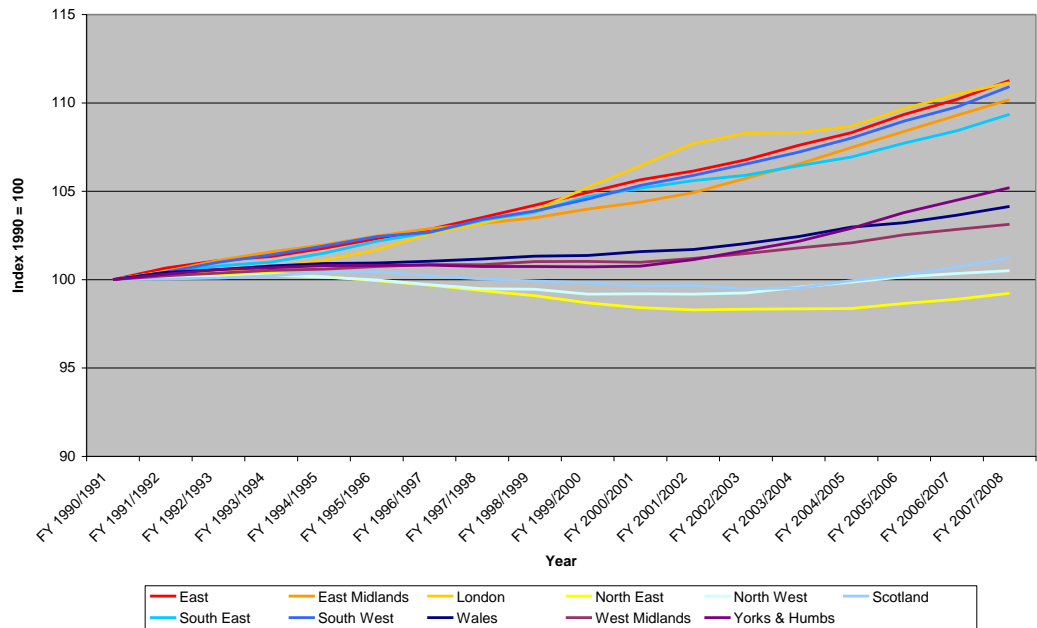
Figure 5.1: UK Population Growth



Source: ONS

The indexed change in population by Government Office Region of the UK since 1990 is shown in Figure 5.2. It can be seen that southern and central areas of the country have experienced population growth of some 10% or more from 1990/91. The trend for London shows a noticeably higher level of growth than surrounding regions between 2001 and 2004. In contrast, Scotland and the North West showed declines in population during the 1990s, which despite a more recent growth in population in these regions, has resulted in population levels not very different from levels in 1990/91. The North East's population has also declined and current population is below 1990/91 levels. Yorkshire and Humberside is noticeably higher than other regions with lower growth rates.

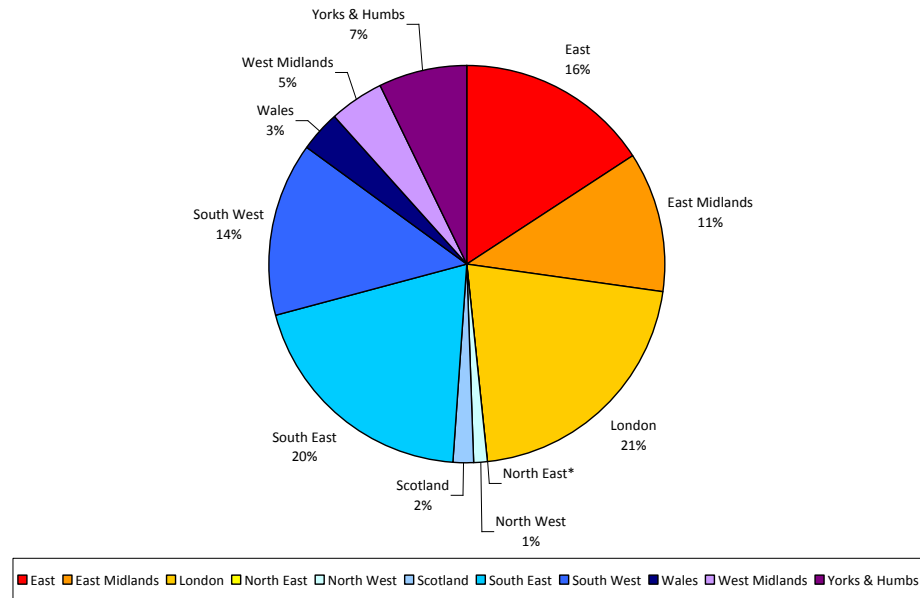
Figure 5.2: Indexed Change in Population by Region



Source: ONS

Comparison of the growth in population by region between 1990/91 and 2007/08 (Figure 5.3) highlights that London and the South East each accounted for 20% of the total growth in the UK's population. The contribution to national population growth was lowest for the northern areas of the UK. Scotland's population growth accounted for only some 2% of the total growth in UK population whilst the North West accounted for 1%. The North East experienced a small decline in population.

Figure 5.3: UK Population Growth (1990-91 to 2007-08) by Region

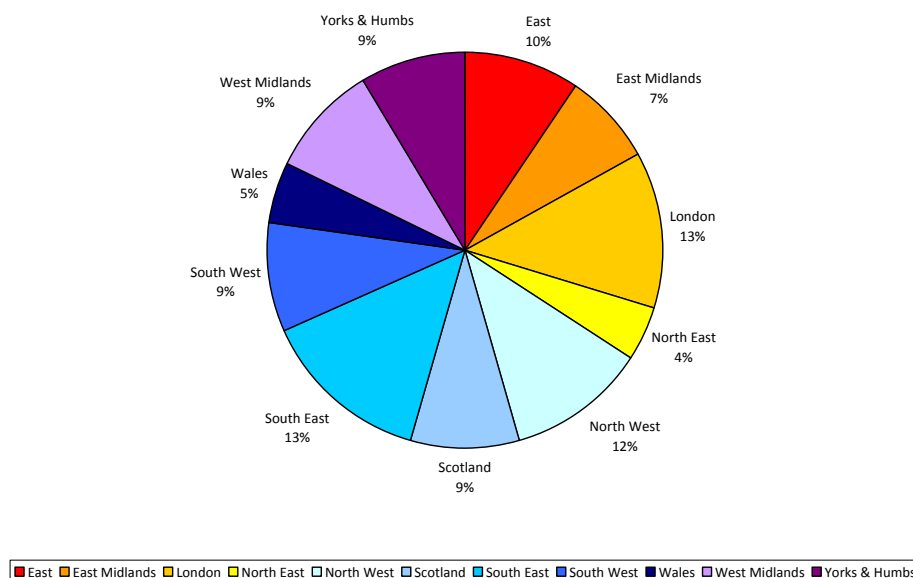


* North East experienced negative growth with a 20,000 reduction in population (1%)

Source: ONS

Figure 5.4 presents the 2007/08 population by Government Office Region. As can be seen the regions with the greatest population are London, the South East and the North West. The regions with the lowest proportion of the total population are the North East and Wales. When compared with Figure 5.3, this indicates that the highest rate of population growth (20%) has been in the regions accounting for the largest proportion of the national population, namely London, and the South East (13% respectively). In contrast, the North West which accounts for 12% of the total population has experienced a growth in population of only 1% between 1990/91 and 2007/08.

Figure 5.4: 2007/08 Population Distribution by Region



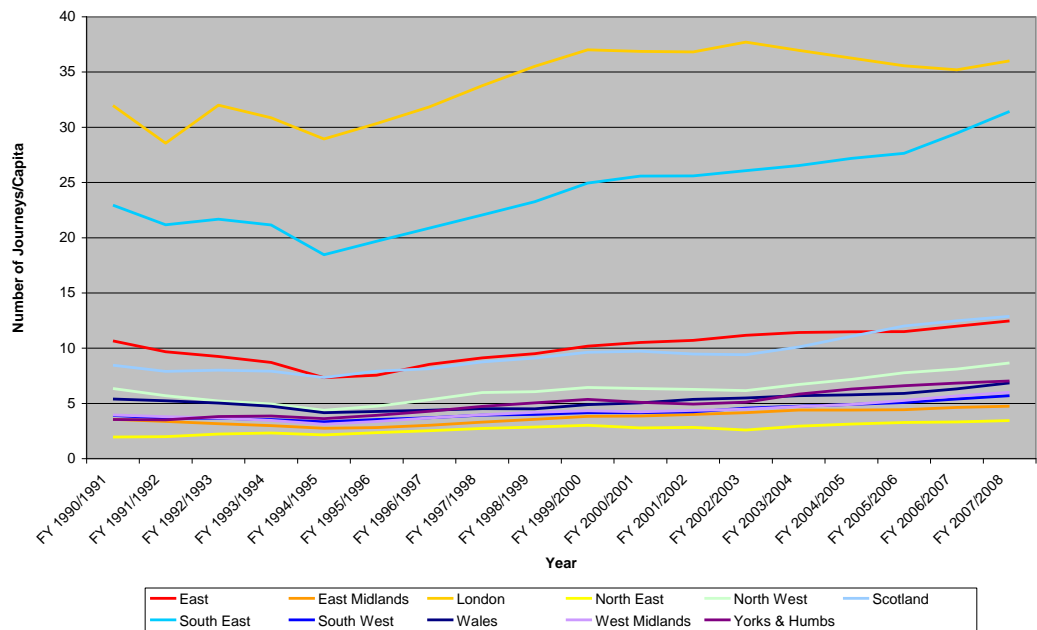
Source: ONS

5.2.2 Assessment of Rail Usage Per Capita

An assessment of the propensity to travel by rail with respect to rail journeys per capita of population was produced using total rail originating journeys by Government Office Region (Figure 5.5). London and the South East exhibit the highest number of rail journeys per capita. Although since 2003/04 the growth in London rail journeys per capita has declined. As rail journeys in London have continued to increase over the same period (section 4.3) this indicates that the growth in rail demand in London is being driven by the absolute growth in London’s population.

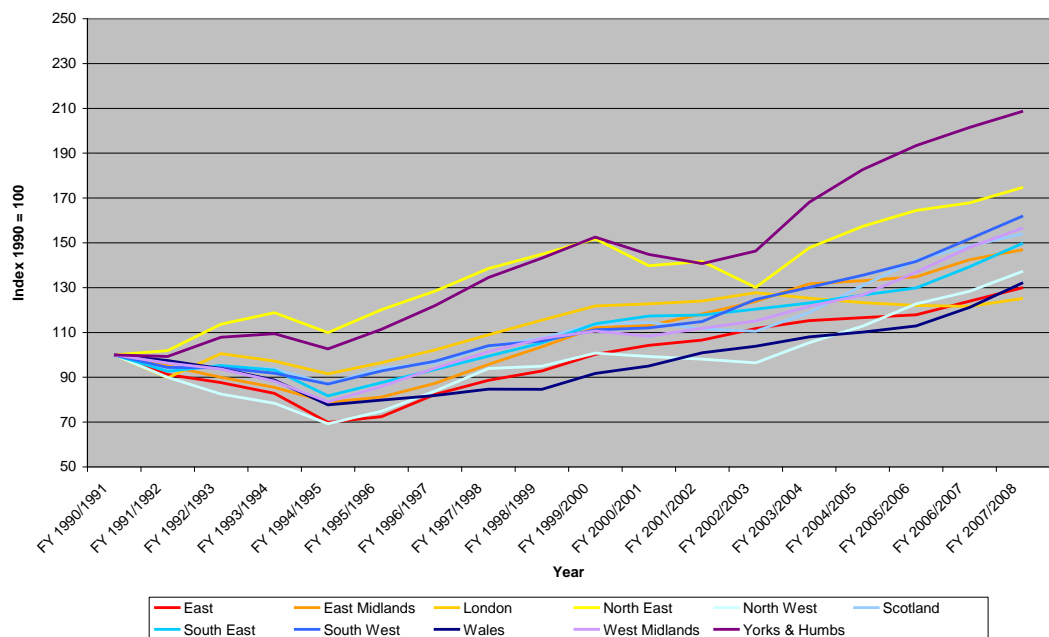
Whilst London and the South East show the highest numbers of rail journeys per capita, the rate of increase has been higher for other regions, in particular Yorkshire and Humberside and the North East (Figure 5.6). With respect to the relationship between population growth and rail demand, the market segmentation in the next stage of the market analysis will need to consider the disparity in rail demand growth rates at a regional level (Figure 4.4).

Figure 5.5: Rail Journeys Per Capita



Source: ONS and RIFF-Lite

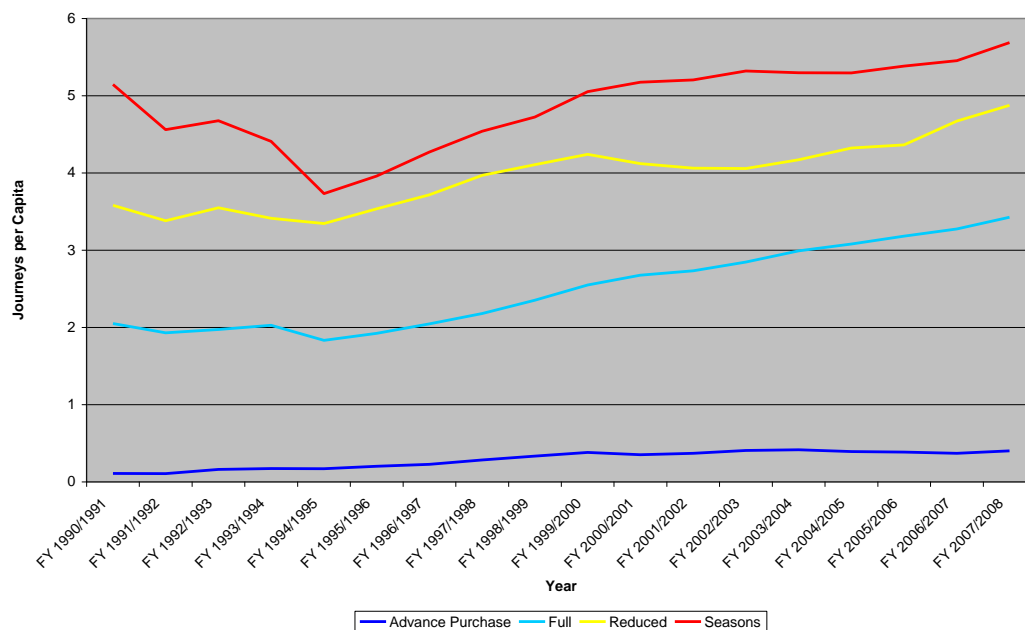
Figure 5.6: Indexed Rail Journeys Per Capita



Source: ONS and RIFF-Lite

An analysis of the relative per capita change by ticket type is shown in Figure 5.7 which shows the increased rail usage per capita, particularly for journeys undertaken on Full and Season tickets. As to be expected the per capita usage of season tickets is highest. A further trend is the increase in the average number of journeys using Advanced Purchase tickets.

Figure 5.7: Rail Journeys Per Capita by Ticket Type

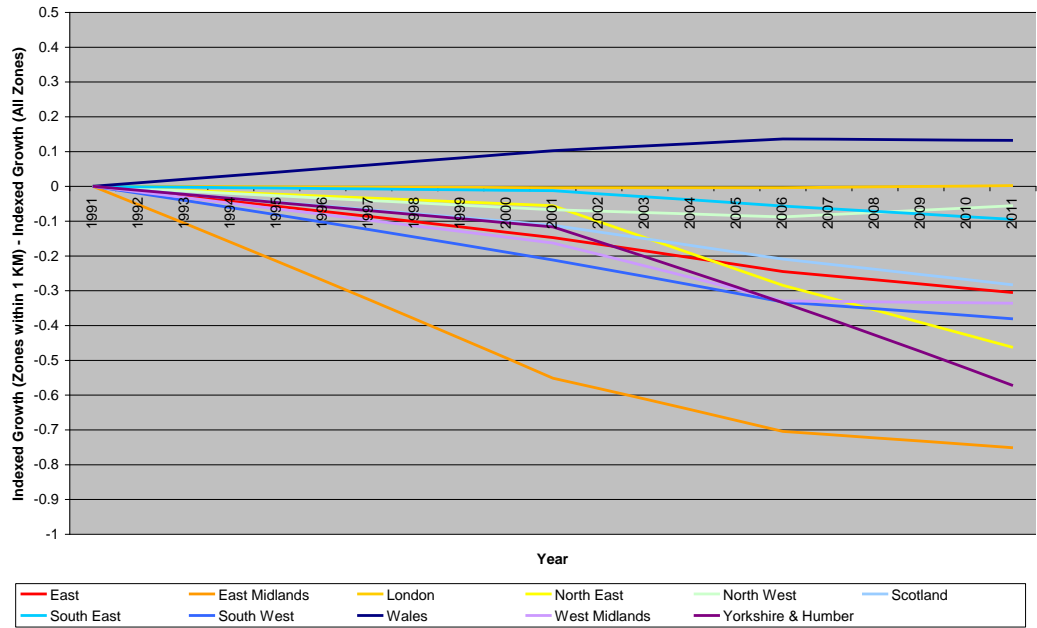


Source: ONS and RIFF-Lite

5.2.3 Population and Rail Catchments

To assess the relationship between population and proximity to railway stations, a rail catchment analysis was undertaken to assess the population within approximately 1km distance of major railway stations. This analysis was based on TEMPRO zones which intersect a 1km catchment area. Figure 5.8 shows a comparison of the indexed growth for areas within 1 km of stations compared with the total change in population for each region. It is apparent that there is little difference in population growth across most regions within 1km of stations. Indeed, the majority of regions show a negative trend implying that the general population in the regions is growing at a faster rate than the population within 1 km of stations. This is to be expected, as firstly, the areas around existing stations offer relatively less scope for residential development i.e. residential development around existing stations are likely to be well-established. Secondly, few new stations are being built. Wales is the only region to show some degree of higher population growth near to railway stations. An additional feature is the greater population growth rate for East Midlands as a whole compared to the areas of the East Midlands within 1 km distance of stations.

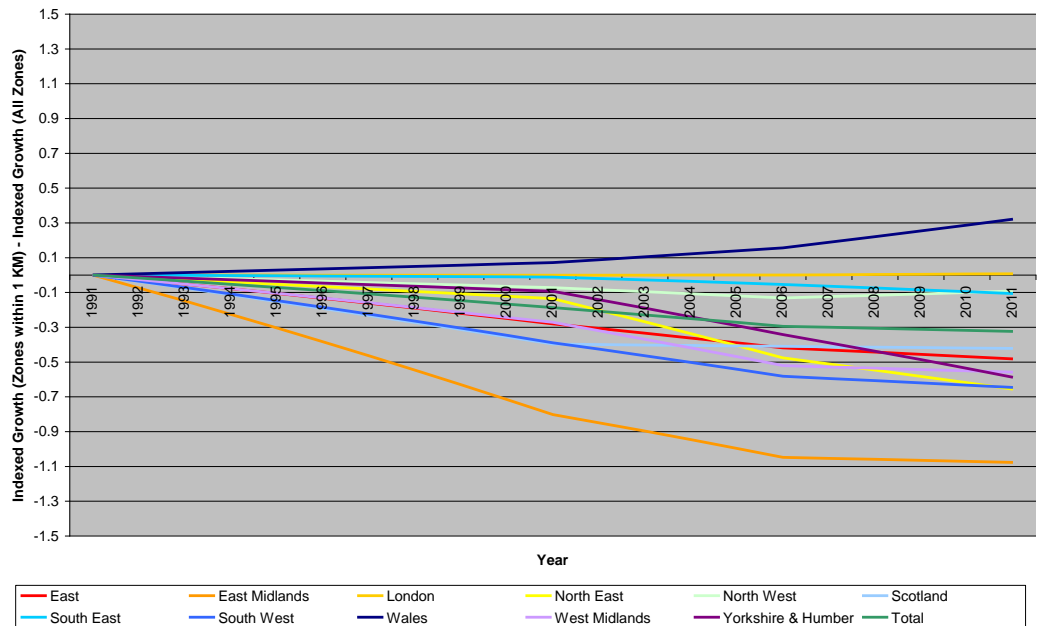
Figure 5.8: Population Growth in Rail Catchment Areas



Source: TEMPRO

Figure 5.9 shows a similar comparison of household growth rates within 1 km of railway stations compared with total growth rate for each region. This also shows that there the majority of regions' population growth rates do not show a strong relationship with railway station location. However, Wales shows a relatively higher growth rate in the number of households near to railway stations, a trend that has become more marked recently. In contrast, East Midlands shows a higher household growth rate for the region as a whole.

Figure 5.9: Household Growth in Rail Catchment Areas



Source: TEMPRO

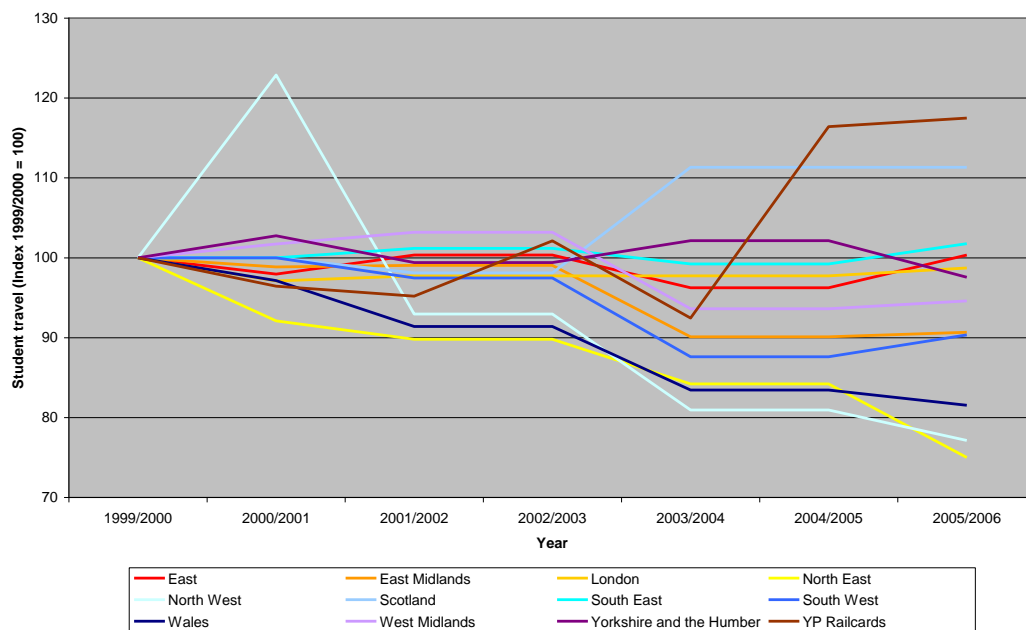
5.2.4 Student Travel Market

An analysis of the growth and distribution of the student population, which is likely to have a greater propensity to use public transport, and particularly rail, was undertaken using student attendance by education establishment from the Higher Education Statistics Agency. This data source provides data on students attending institutions by home location (region).

Figure 5.10 shows the trend in student travel based on the numbers of students who are studying outside their home region. The trend in usage of Young Persons Railcards is compared with the change in student travel. As can be seen, apart from Scotland, students are increasingly studying within their 'home' region. Interestingly, the relationship between student travel and usage of the 16-25 Railcard Railcards are similar with both declining compared to a 1999/2000 base. Analysis of ticket sales data over the last three years shows that there has been an increase in the number of rail journeys being undertaken using Young Persons Railcards, despite a continuing reduction in the numbers of students studying away from home. However, the 16-25 Railcard is not used exclusively by students.

A key issue for econometric estimation is the identification of a difference between the growth rates for education and commuting journey purposes. However, this data indicates that student travel has not increased in a comparable way to commuting, but the dataset is relatively limited in coverage of educational institutions and offers a limited time series.

Figure 5.10: Student Travel Index and Sales of Young Persons Railcards



Source: HESA

5.2.5 Other Socio-Demographic Factors

This report has focussed on key high level socio-demographic factors. There are other possible factors which may be of value in the econometric estimation, which will be followed up in the next stage of the market analysis, as follows:

- **Age Groups:** TEMPRO will enable a geographic segmentation by age group to be produced by region to assess whether certain age group bands have shown a greater change over time. This can be compared with the use of rail by different age group segments, the National Travel Survey being a prime source.
- **Senior Citizen demographic:** Another demographic of potential interest which can be compared readily with rail ticket data is the trend in old age pensioners' rail usage (Senior Citizens Railcards). A useful comparison is the usage of Senior Citizens Railcard data by region compared with per capita usage of rail and the relationship

between increased income for the OAP age group and increased non-car based leisure travel.

- **Ethnicity:** Anecdotal evidence suggests that ethnicity can have a bearing on rail demand with different ethnic groups having a different propensities to use rail. Data from NTS should provide a breakdown of rail journeys by ethnicity over time, although this will be at an aggregate level. The NRTS will be used to provide a more detailed cross-section snapshot.
- **Household Size:** Household size is an area for analysis to investigate whether single and multiple occupancy households show different propensity to use rail. Establishing whether rail demand growth is higher for these households using time series data is difficult. The Census is a key source, but will not provide significant time series, whilst TEMPRO yearly household data is based on an interpolation of Census data. NTS is an alternative potential source of household size data.

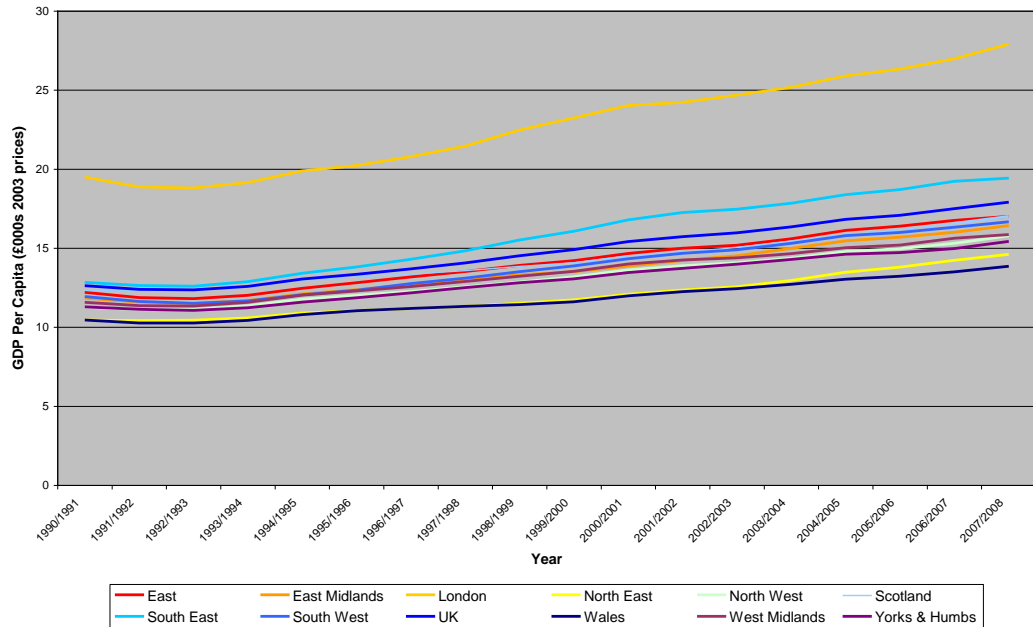
5.3 Income

In the current PDFH Forecasting Framework, income elasticities are used to forecast business and leisure trips. Change in GDP per capita is the basis for the application of income elasticities. Other potential income variables include income per household, and actual disposable income per household.

5.3.1 GVA per capita at regional level

GVA per capita growth at a regional level based on home (or individual) income shows that London GVA per capita is considerably greater than the next highest region, the South East. Over time the relative position on London is little changed (Figure 5.11).

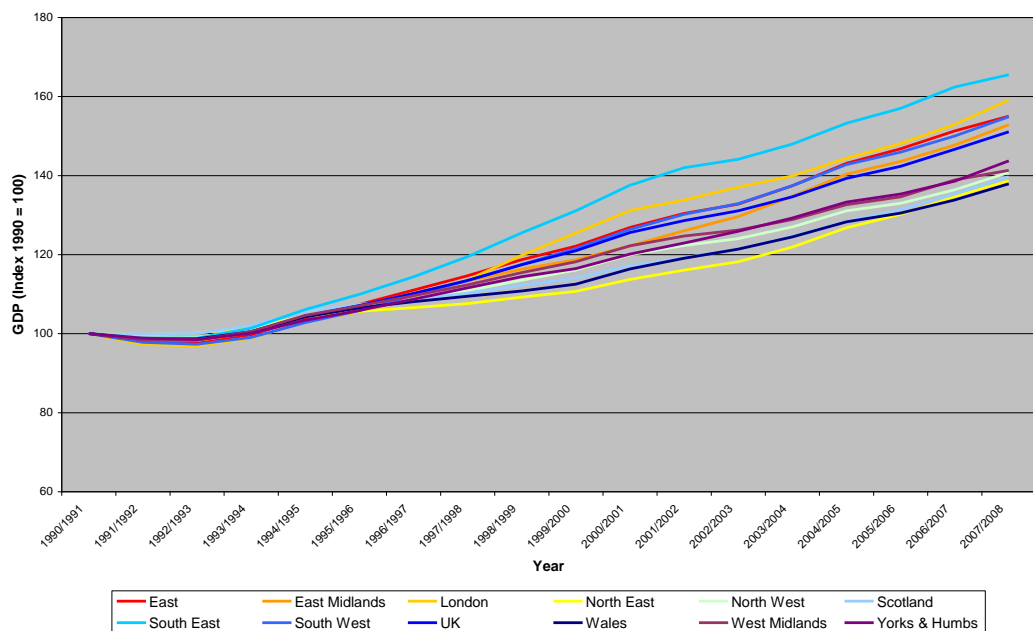
Figure 5.11: GVA per Capita Growth Rates



Source: OEF

Figure 5.12 shows the indexed growth in GVA per Capita. Compared with absolute growth in GVA per Capita, it can be seen that there is a relative increase in South East GVA per capita in recent years. The trend line for all the other regions shows far less variation over time.

Figure 5.12: Indexed Growth in GVA Per Capita

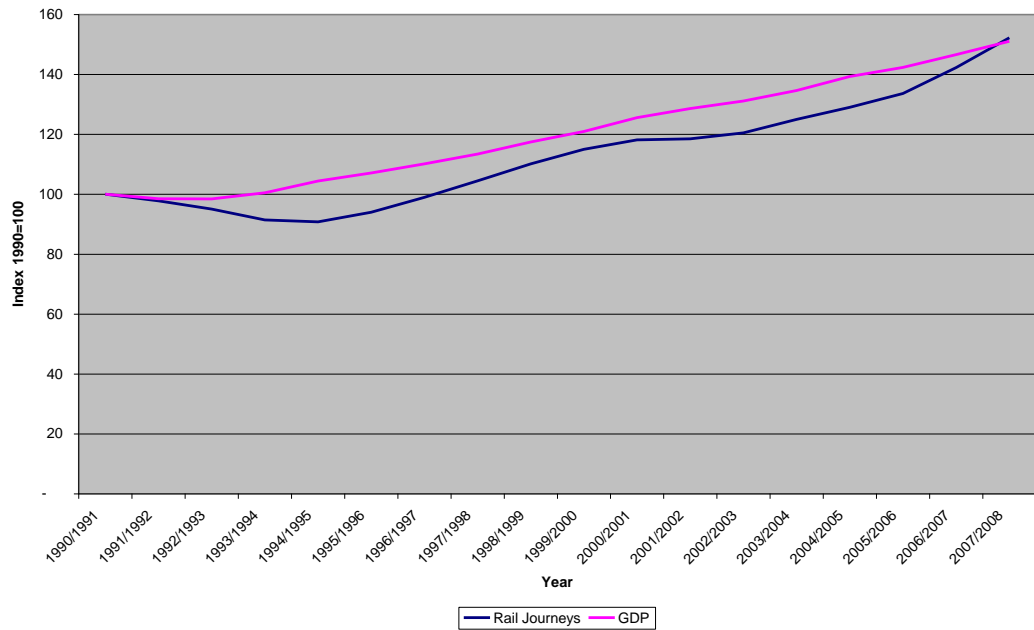


Source: OEF

Figure 5.13 shows a relatively close correspondence between growth in GDP and rail journeys, although there are periods where the growth rates are not aligned, firstly during the period of rail privatisation when rail growth is less than GDP, and secondly, in recent years, when rail growth has been higher than GDP growth.

With respect to the relationship between GDP growth and rail demand, the market segmentation in the next stage of the market analysis will need to reflect the disparity in growth rates at a regional level. Further analysis of origin-destination growth at corridor level may yield further differences, although this analysis will be limited by the availability of GVA data (Government Office Region and major cities).

Figure 5.13: Change in GDP Growth Compared with Rail Demand



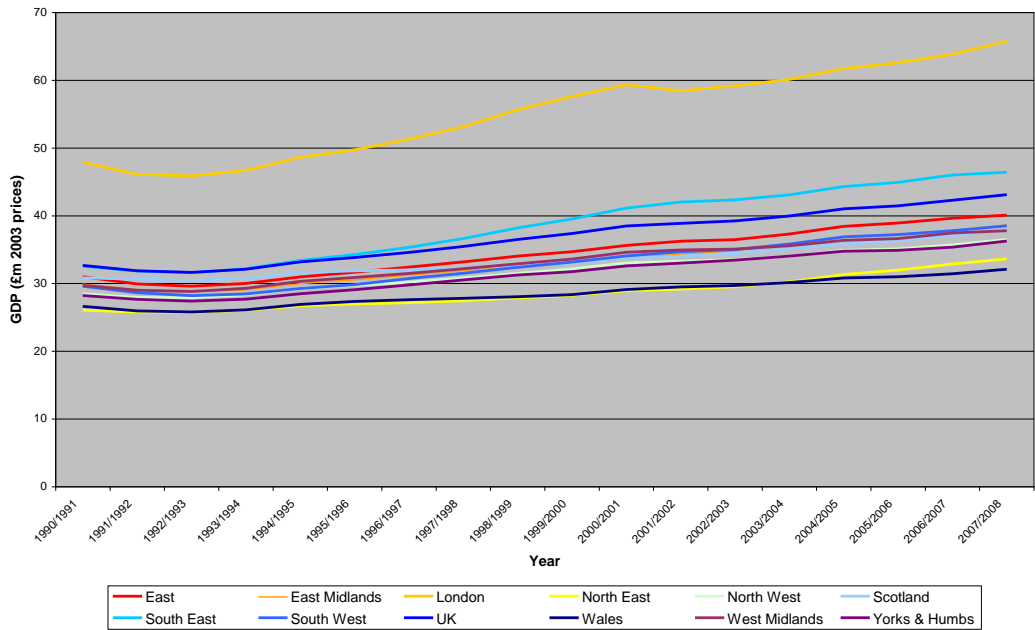
Source: OEF and National Rail Trends

5.3.2 GVA per household and expenditure on transport

GVA per household was assessed as an explanatory income variable to determine if a relationship exists between the household as a decision-making unit and rail demand growth. This relationship could potentially be significant for leisure trips. Rail marketing strategies have included initiatives to appeal to this market through reduced fares for group travel.

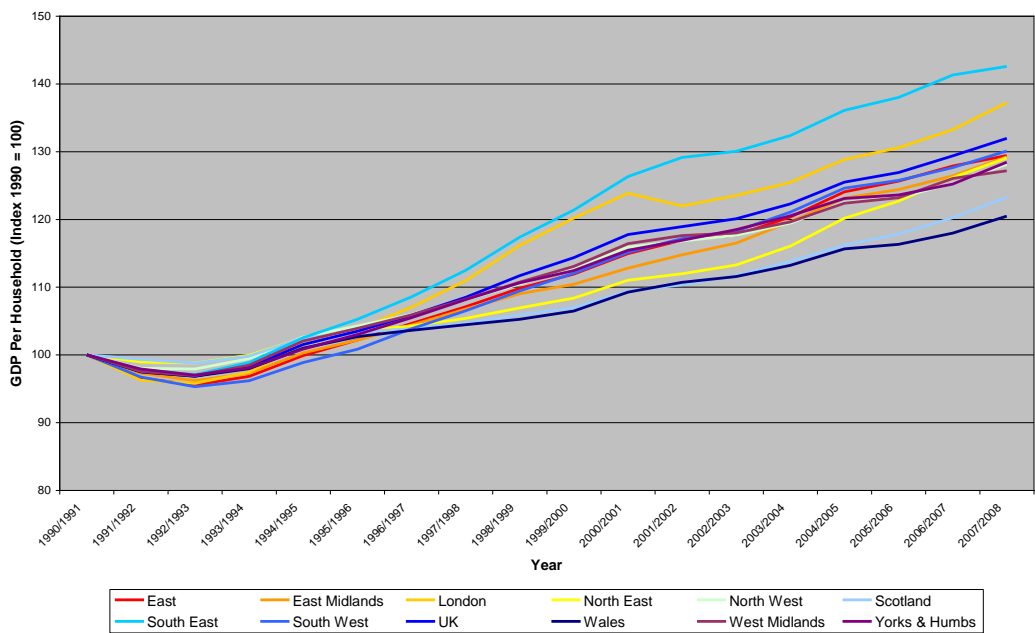
GVA per household produces a generally similar trend to GDP per capita, as shown in Figures 5.14 and 5.15. However, it is noticeable that the GVA per household for London shows a slower growth rate between 2000/01 and 2001/02.

Figure 5.14: GVA Growth Per Household



Source: OEF

Figure 5.15: Indexed Growth in GVA Per Household



Source: OEF

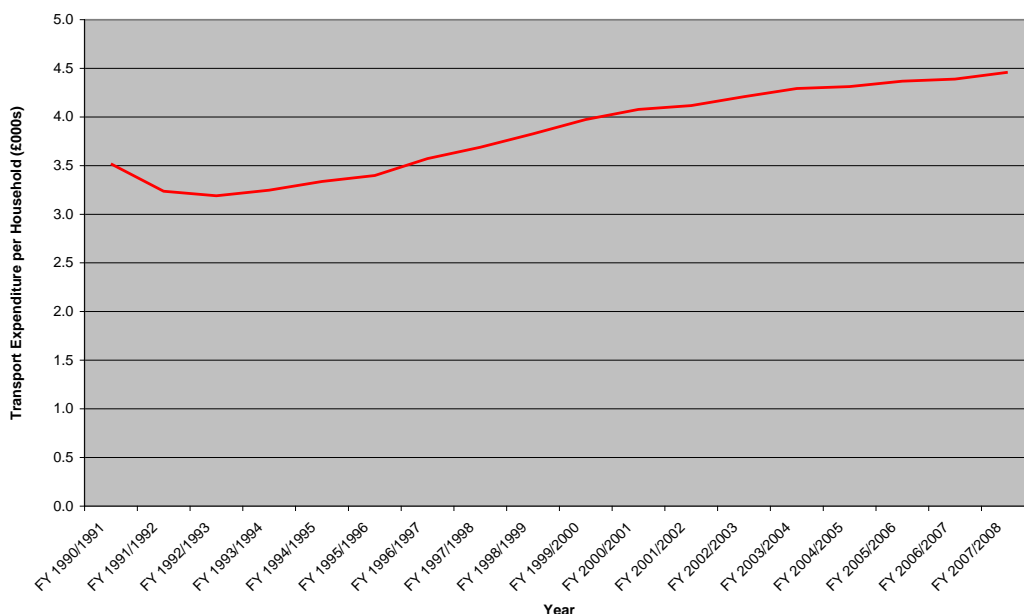
5.4 Transport Expenditure per Household

Transport expenditure per household has increased significantly since 1995/96, although the trend line has become flatter since 2003/04 (Figure 5.16). Transport expenditure by household has increased at a greater rate than GDP per household since 1997/98. There are a number of possible factors driving this trend towards an increase in transport expenditure.

Household transport budgets may be increasing due to real increases in the cost of travel. The relative change in costs of travel for rail and competing modes is assessed in sections 5.5 and 5.6. There has been a general increase in travel costs in real terms for car operating costs (although car purchase prices have been declining over time). Rail fares also show an upward trend although this is more recent given the change in fares regulation to RPI+1. The cost of domestic air travel has fallen significantly with the expansion of low cost carriers services.

The second possible reason for the increase in household transport expenditure is an increase in travel either through more frequent travel or longer journeys. As has been shown in sections 4.2 and 4.4 the growth trend in rail journeys and passenger-kms suggests that there has been some increase in rail usage with higher growth in passenger-kms. Trend data on car usage presented in Chapter 4 showed a steady increase in car passenger-kms. Despite the increase in car passenger-kms with increased car ownership, the trend in road congestion presented in section 3.7 suggests that it is highly likely that the average number of car trips is declining. The air market exhibits a different trend with a significant increase in air trips as the cost of travel has decreased with the expansion of low cost carriers. However, at an aggregate level when comparing with national trends in household disposable income, air demand represents a fairly small element of total growth in travel demand. In summary, the increase in household expenditure on transport is likely to reflect increasing travel costs rather than a marked increase in overall trip-making or longer trip lengths.

Figure 5.16: Transport Expenditure (Real Prices) Per Household

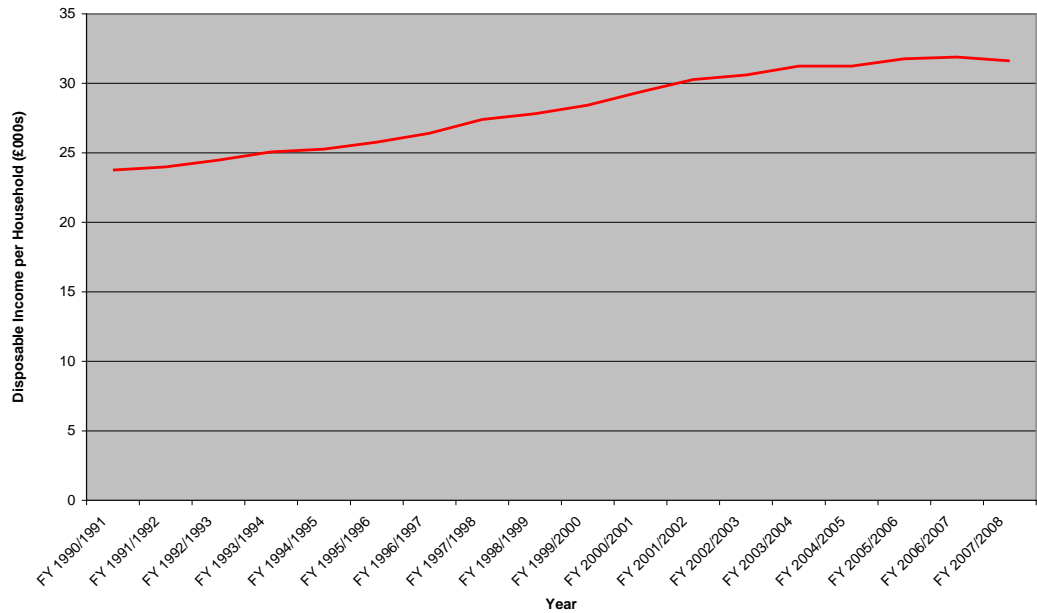


Source: ONS/FES

5.4.1 Disposable Income (Household and Individual)

There has been a 30% increase in UK disposable income since 1990/91 representing an average annual increase of about 2% per annum (Figure 5.17). Household disposable income is defined as money left after expenditure associated with income, for example, taxes and social contributions, property ownership and provision for future pension income.

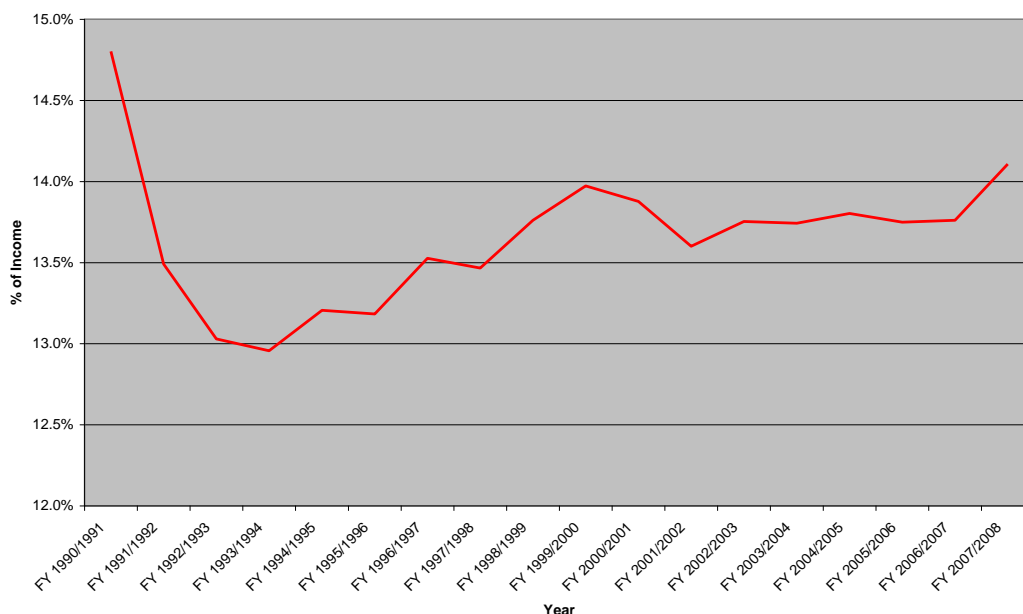
Figure 5.17: Growth in Disposable Income per Household (Real Prices)



Source: Expenditure & Food Survey, ONS

Household transport expenditure as a proportion of household disposable income has shown a decrease from over 14.5% in 1990/91 to 13% in 1993/1994 and then a subsequent increase to over 14% of household disposable income in 2007/08 (Figure 5.18). The relatively small change in transport expenditure compared with the greater increase in disposable income suggests that since 1993/94 the average household is spending relatively less on transport costs. The fall in transport expenditure between 1990/91 and 1993/94 coincides with the economic recession of the early 1990s. Household transport expenditure as a proportion of income was reduced due to increased pressure on household budgets due to the economic recession in the early 1990s. This resulted in less travel, as shown by the decrease in rail passenger journeys over this period and the flat trend in car passenger-kms as less travel, particularly leisure travel was undertaken.

Figure 5.18: Household Transport Expenditure as Proportion of Household Disposable Income

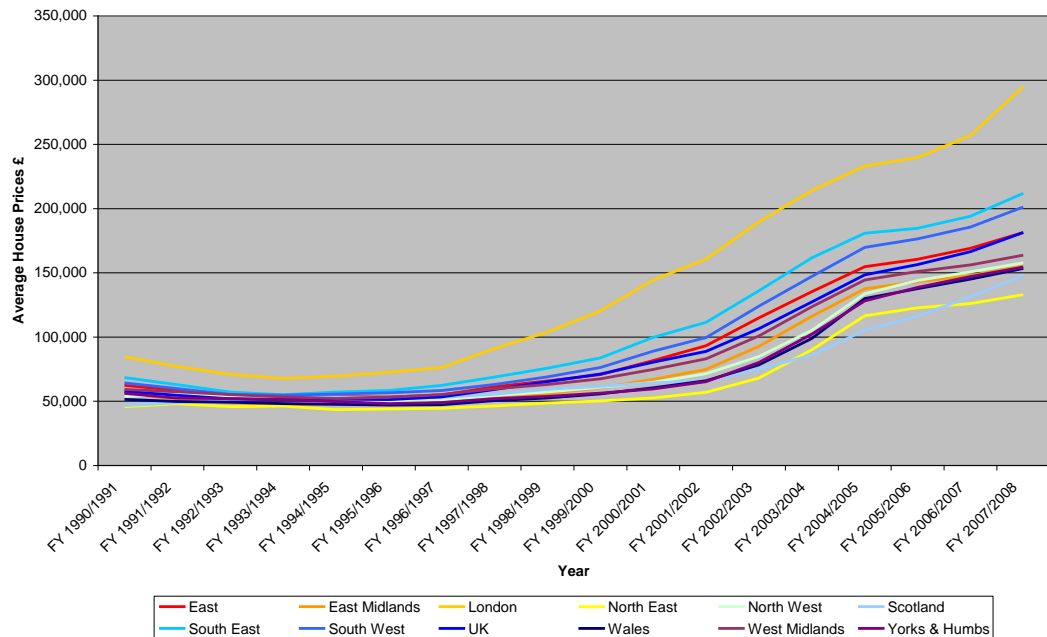


Source: ONS

5.4.2 House Prices

An analysis by region shows that average house prices have increased at a greater rate in London and (to a lesser extent) in the South East (Figure 5.19).

Figure: 5.19: Average House Price Changes

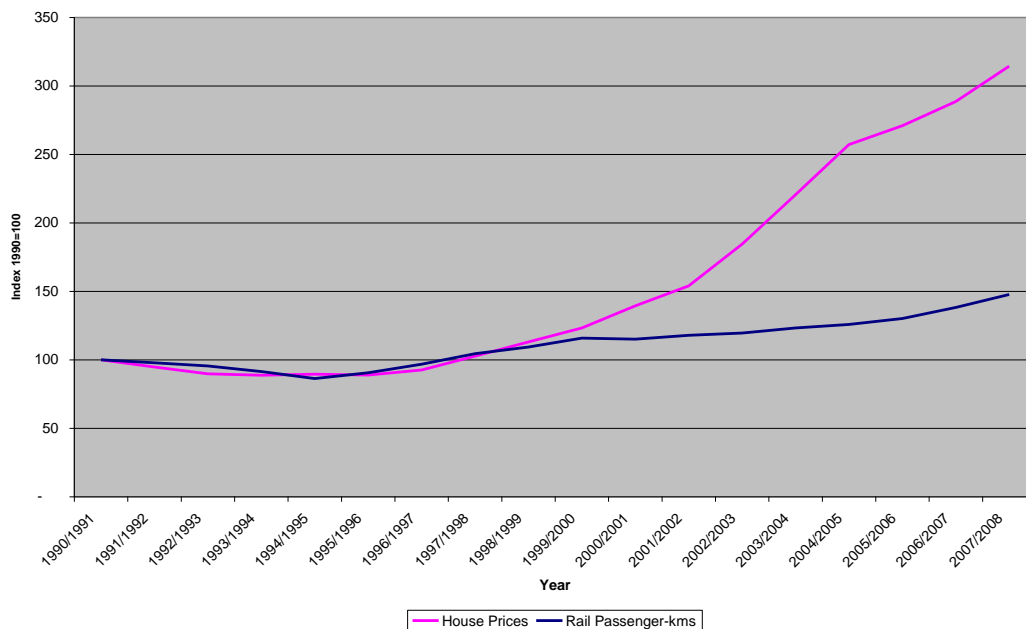


Source: OEF

This trend coincides with a significant increase in rail journeys, particularly commuting journeys from the South East region to London. The relatively higher house prices in London compared with the South East may be driving some of this trend which will be analysed in the market assessment. It should also be noted that the house price variable is closely linked to both income levels and employment changes.

Figure 5.20 shows a comparison of house prices and rail passenger-kms showing similar trend lines up to 1999/2000 then increasingly divergent trends as house prices increase to over 3 times the average house price in 1990. This analysis is at a national level so there may be some regional trends, particularly for increased London house prices resulting in London commuters purchasing homes in the less expensive South East region or further afield.

Figure 5.20: Change in House Prices and Rail Passenger-kms



Source: OEF and National Rail Trends

5.4.3 Income and Occupation

The ONS analysis of commuting patterns based on the CommuterView database was reviewed for cross tabulation of income and occupation.¹ However, this particular cross tabulation is unavailable from the database. A cross sectional analysis will be carried out using NRTS data for rail travellers in the next stage of the market analysis to determine a relationship between income/occupation and use of rail. For other modes the National Travel Survey will provide a source for other modes.

5.4.4 Single Income/Dual Income Households

Household data sources will be reviewed in the next stage of the market analysis to assess whether a comparison of single and dual income households' can be undertaken to identify any regional differences between household income level and likely use of rail.

5.5 Employment

5.5.1 Employment as an Explanatory Variable

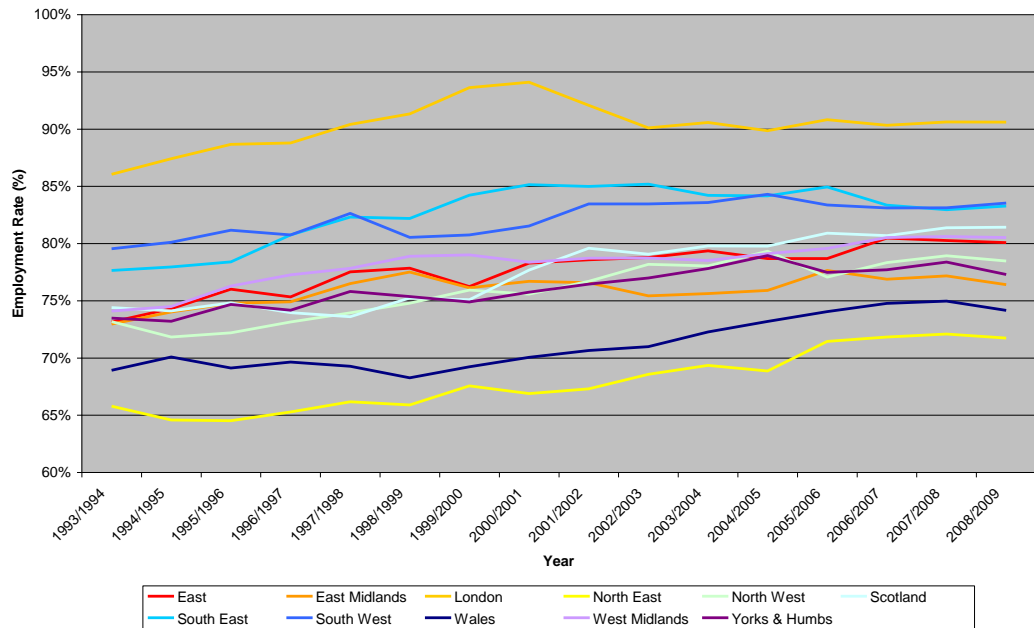
Employment is expected to be a core variable for assessing the growth in rail commuting demand. The existing forecasting framework applies employment elasticities for London and non-London market sectors. The elasticity for employment is unity or above, and could be higher if car competition is affected by significant road congestion.

¹ Commuting Patterns as at the 2001 Census, and their Relationship with Modes of Transport and Types of Occupation, ONS, 2008

5.5.2 Employment structural changes

Change in employment by region measured as the change in employment compared with the population of working age is shown in Figure 5.21. Whilst the overall trend has been an increase in employment over the assessment period, there are significant changes in the increase in employment levels both over time and by region. Many parts of the country show relatively low growth or indeed a decrease in employment levels in the mid to late 1990s as indicated for Wales. Other regions such as the South East and London performed better in the late 1990s with relatively rates of employment growth which have since slowed. It should be noted that London employment levels are the highest at about 90% reflecting the strength of economic growth in the capital.

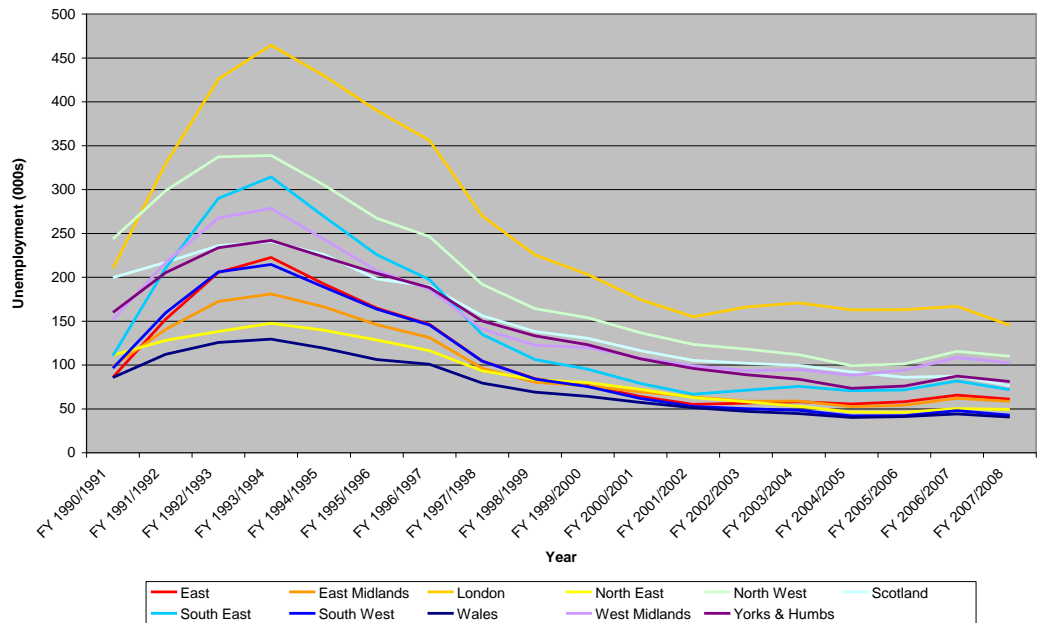
Figure 5.21 Employment Rate by Region, 1993-2008



Source: OEF

Overall change in unemployment by region is shown in Figure 5.22. There is a marked increase in levels of unemployment as a result of the economic downturn in the early 1990s and then a trend of lower unemployment as a result of increased economic activity (and marked increases in GDP) in the late 1990s. This trend is fairly similar across all regions with the greatest absolute fall in London.

Figure 5.22: Unemployment Levels by Region



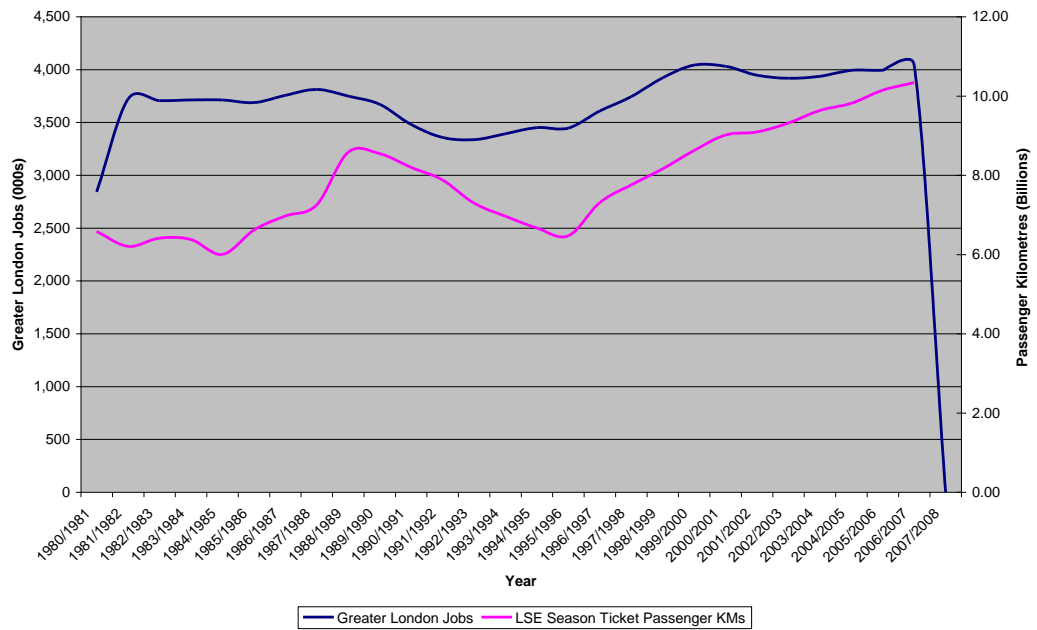
Source: OEF

A more thorough investigation of ONS data will be carried out in the market assessment phase to consider whether it is feasible to breakdown employment by sector and region (similar to the breakdown presented for central London in the following section).

5.5.3 London Employment

The overall relationship between growth in London employment and rail commuting demand is shown in Figure 5.23. As can be seen the number of jobs in London has increased over the assessment period, although with a significant decline coinciding with the economic recession of the early-mid 1990s. Growth in rail demand has followed a similar pattern, but it is noticeable that the growth in rail season ticket passenger-kms has been at a greater rate than the growth in London employment since 2000/01. This coincides with a higher growth rate in rail journeys from the South East to London indicative of an increase in longer distance commuting discussed in section 5.4.2.

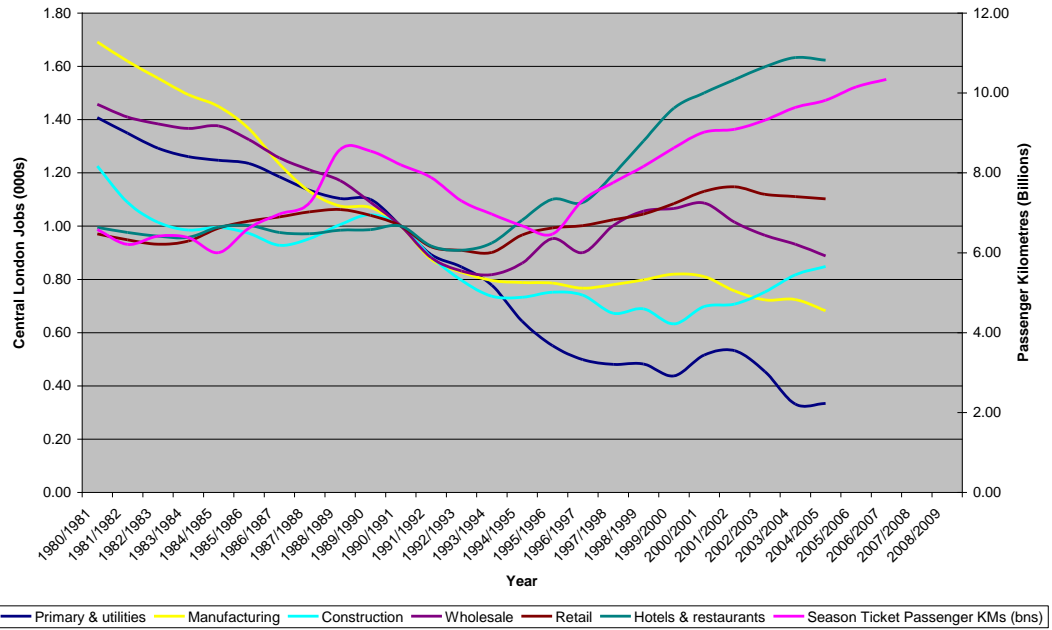
Figure 5.23: Growth in London Employment and London and South East Season Ticket Rail Passenger-Kms



Source: OEF and RIFF-Lite

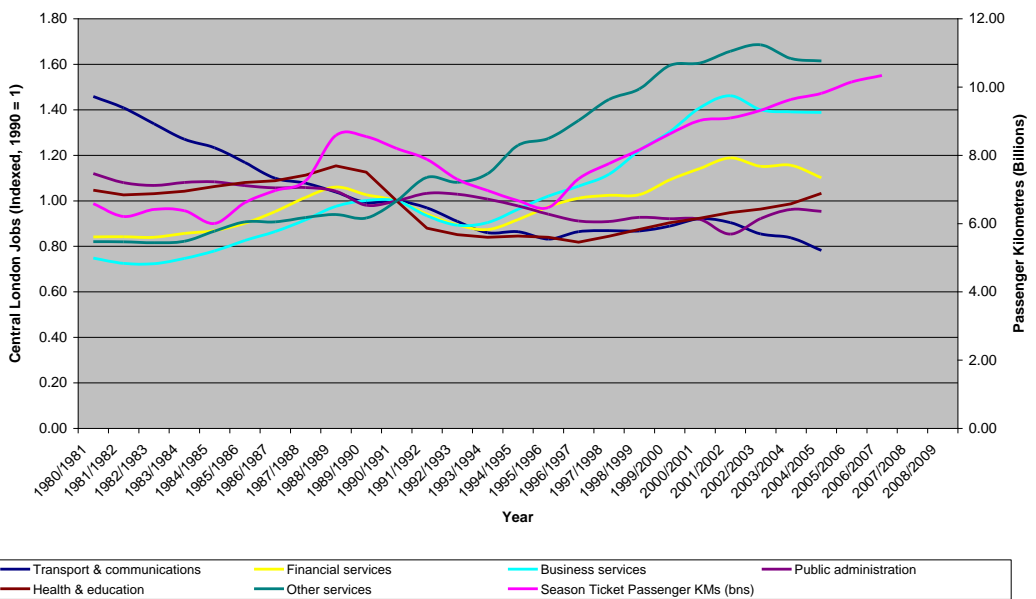
A breakdown by central London employment sector is shown in Figures 5.24 and 5.25. There is significant variation in employment growth by sector with the business and financial services sectors being most closely aligned with the trend in rail passenger-kms.

Figure 5.24: Growth in Central London Employment by Sector (Blue Collar) and Rail Passenger-Kms



OEF and RIFF-Lite

Figure 5.25: Growth in Central London Employment by Sector (White Collar) and Rail Passenger-Kms

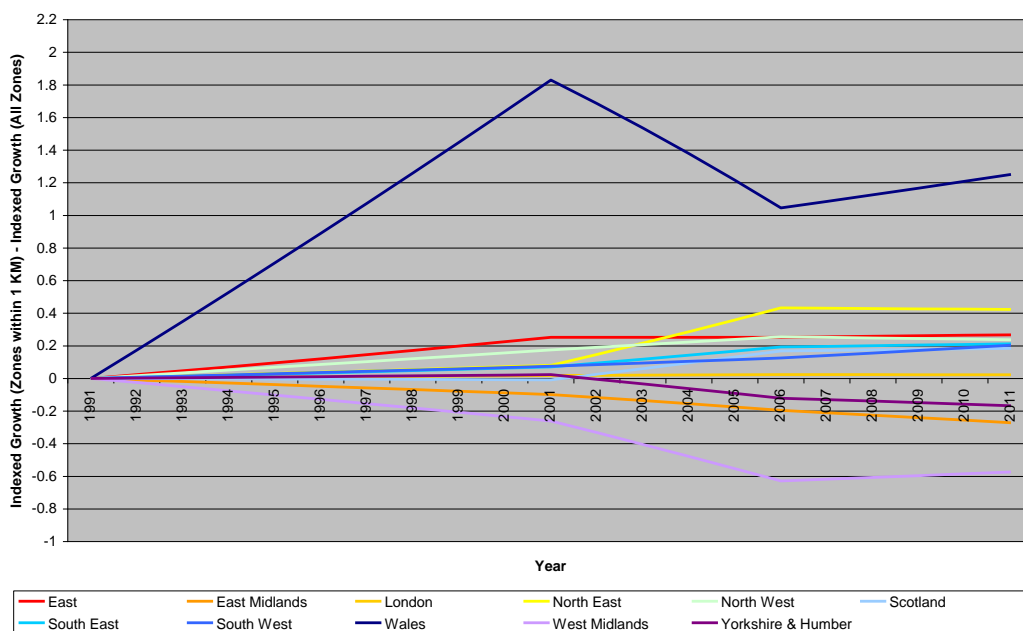


Source: OEF and RIFF-Lite

5.5.4 Employment Catchments for Rail

Increasingly, anecdotal evidence suggests new employment in city centres is located near to the railway network. One measure of the impact of this employment trend, particularly with respect to the service sector, is the percentage of jobs near to the railway network. Figure 5.26 shows the results of an analysis of the number of jobs within a 1km distance band of National Rail stations, approximately 2,700 stations in total. The chart shows the degree of variation in jobs by Government Office Region. The relative change in growth in jobs within 1 km of railway stations is greatest for Wales which may, in part, reflect city centre redevelopment such as Cardiff Bay. However, the principal trend is that the majority of regions show little difference in the change in jobs within 1 km of stations and the total jobs growth for the regions.

Figure 5.26: Jobs Growth in Rail Catchment Areas



Source: TEMPRO

5.5.5 Employment Driven Change in Journey to Work

There is some evidence that there has been a growth in longer distance journey to work travel by rail both from the analysis in this report and the work reported in the PDFC Journey to Work study. A more extensive analysis of the change in longer distance commuting will be assessed in the next stage of the market analysis with respect to the relationship between average journey length by season ticket and employment growth.

5.5.6 Unemployment Changes

Research undertaken by the DfT has investigated the level of change in employment and unemployment. Two distinct trends were found. During the 1980s and 1990s a linear trend was evident with a reduction in unemployment matched by a similar increase in employment levels. This trend changed after 2000 with a sevenfold decrease in jobs for every additional unemployed person. The likely reason for this change is the significant increase in employment due to workers arriving from the EU Accession states increasing the total numbers in employment. This current trend is unlikely to continue with the current economic recession reducing the numbers of migrant workers in the UK.

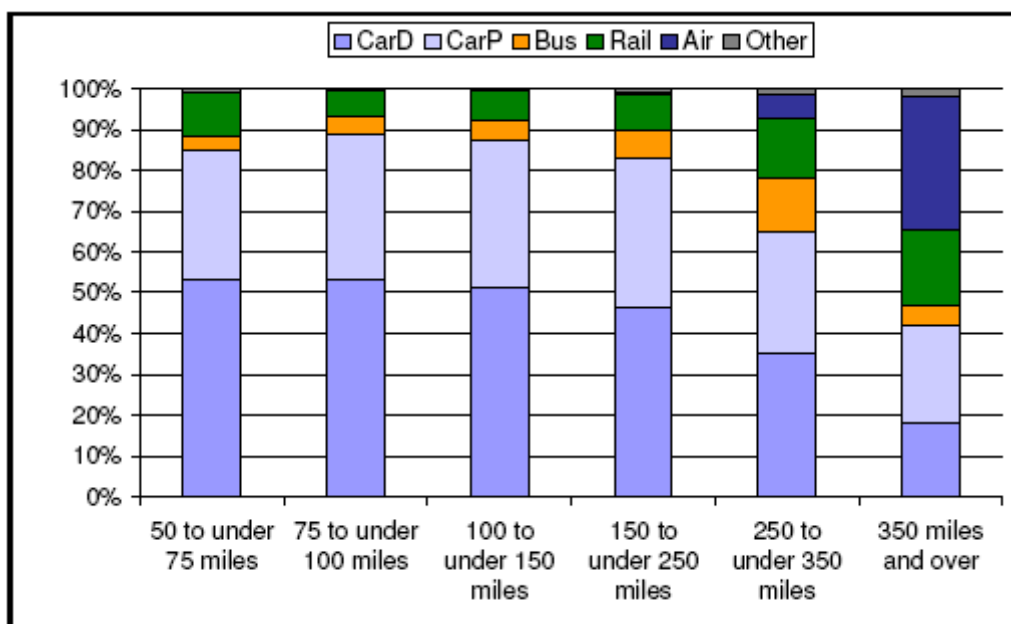
This work then assessed the annual change in employment levels and unemployment claimants which indicated that there was a strong negative correlation implying that for a given change in unemployment levels there would be a greater change in employment levels.

Unemployment change is to be assessed on a regional basis in the next stage of the market analysis. The indicator represents a distinct measure of economic activity compared to jobs growth as it reflects those unemployed actively searching for work and those who are inactive.

5.6 Competition From Other Modes

A snapshot of long distance travel market mode share is shown in Figure 5.27. Rail mode share is greatest for shorter distance journeys of 50 to 75 miles and for longer distance journeys greater than 250 miles. Further analysis of competition from other modes will be included in the next stage of the market analysis. A subset of the NTS data set for long distance travel was used excluding Underground and DLR.

Figure 5.27 Long Distance Journeys Mode Share by Distance Band



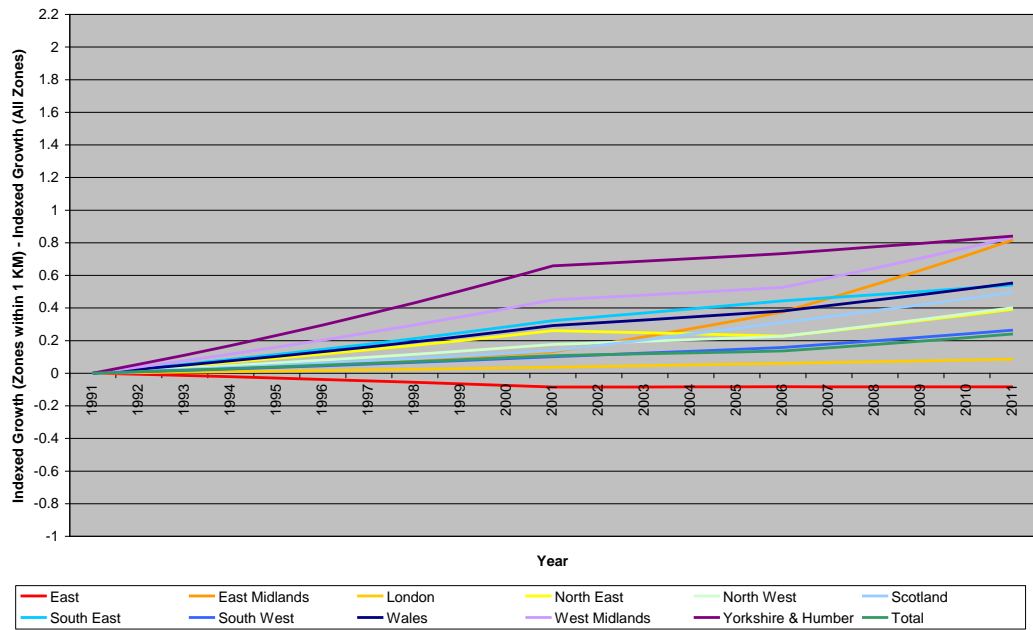
Source: NTS data reported in Modelling Longer Distance Demand, Feasibility Study – Final Report, Scott Wilson, June 2008

5.7 Private Car Competition

5.7.1 Car Ownership Growth

Car ownership per household was examined with respect to the rail catchment areas, defined as the households being within 1 km of rail stations (Figure 5.28). The figure once again shows that there is a significant difference between those households within 1km of a train station and overall growth rates by region. In particular, Yorkshire and Humberside and West Midlands have experienced slightly higher relative growth in car ownership within 1 km of rail stations. However, it should be noted that the car ownership data is based on modelled data and is subject to the accuracy of the model driving these forecasts.

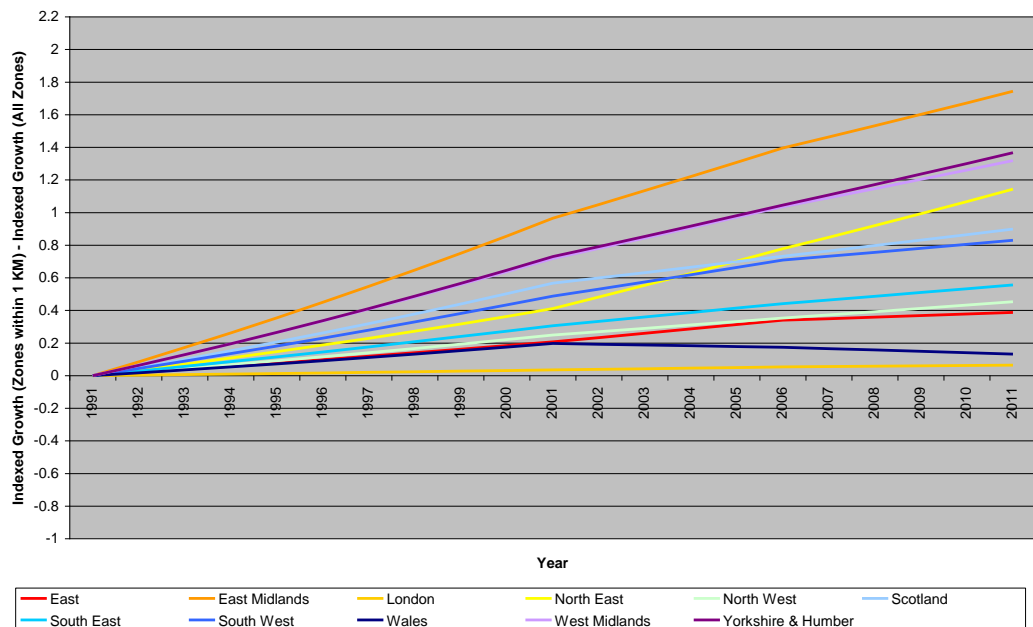
Figure 5.28 Car Ownership Growth Rates in Rail Catchment Areas



Source: TEMPRO

Figure 5.29 provides a similar analysis, but in terms of car ownership growth rates by household. Yorkshire and Humberside and West Midlands together with East Midlands show greater car ownership growth rates per household, although all regions show greater increases in car ownership growth rates within 1km of rail stations. It should be noted that the longstanding relationship between car ownership and car usage is likely to be changing with increasing road congestion slowing the growth in car usage. There is also a trend towards higher car ownership per household reflecting higher incomes, but not necessarily more overall car usage. A related factor, which will be considered in the next stage of the market analysis, is the relationship between car ownership costs and disposable household income.

Figure 5.29 Car Ownership Growth Rates Per Household in Rail Catchment Areas

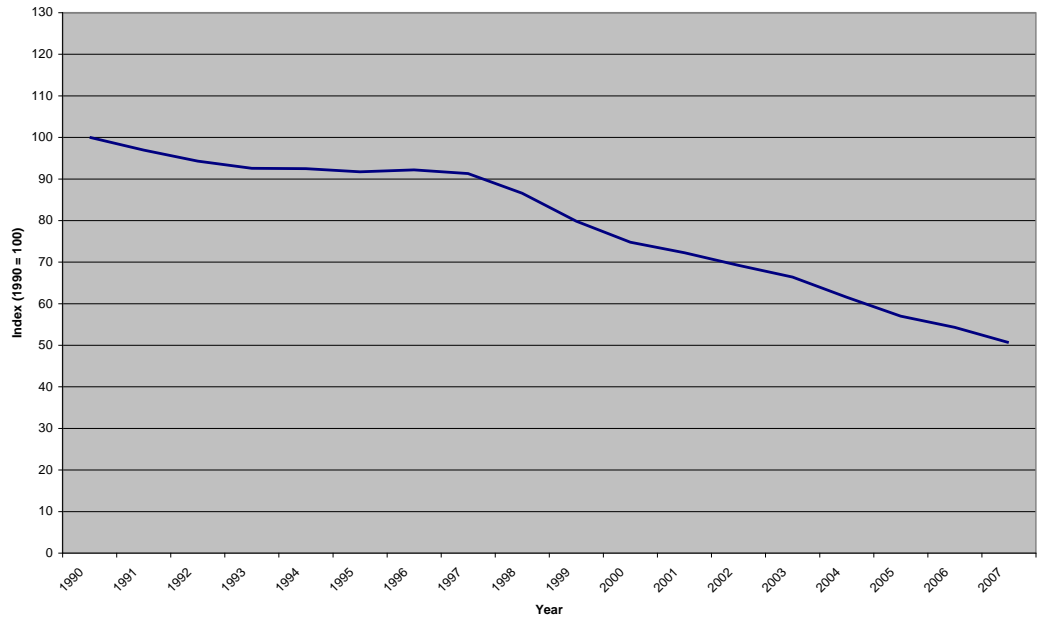


Source: TEMPRO

5.7.2 Car Purchase Prices

Figure 5.30 shows the trend in car purchase prices over the assessment period showing that the average car purchase price has decreased by about 50% since 1990 in real terms. This trend contrasts with the change in car operating costs described in section 5.7.3.

Figure 5.30: Indexed Change in Average Car Purchase Price (Real Prices)

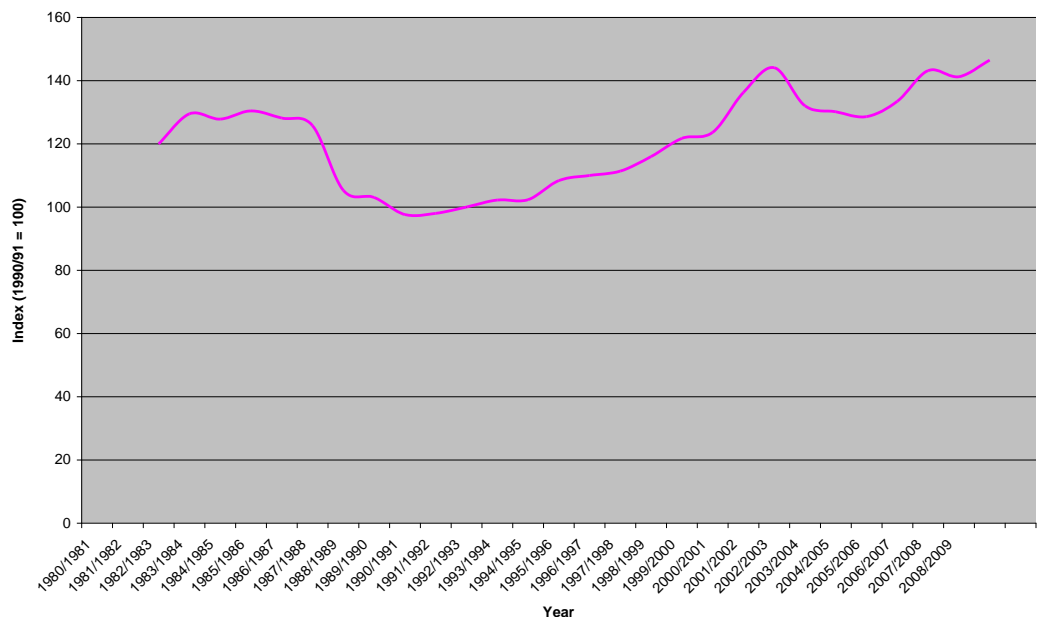


Source: ONS/MVPI

5.7.3 Car Fuel Costs

Figure 5.31 shows the indexed change in car fuel costs. There are two distinct trends in car fuel costs with a reduction in real terms during the 1980s and then a steady increase with fuel costs some 40% higher in 2000/01 compared with 1990/91. Between 2000/01 and 2003/04, car fuel costs show a significant fall of about 10%, but since 2003/04 car fuel costs have remained at similar to the levels experienced in 2000/01.

Figure 5.31: Indexed Change in Car Fuel Costs (Real Prices)

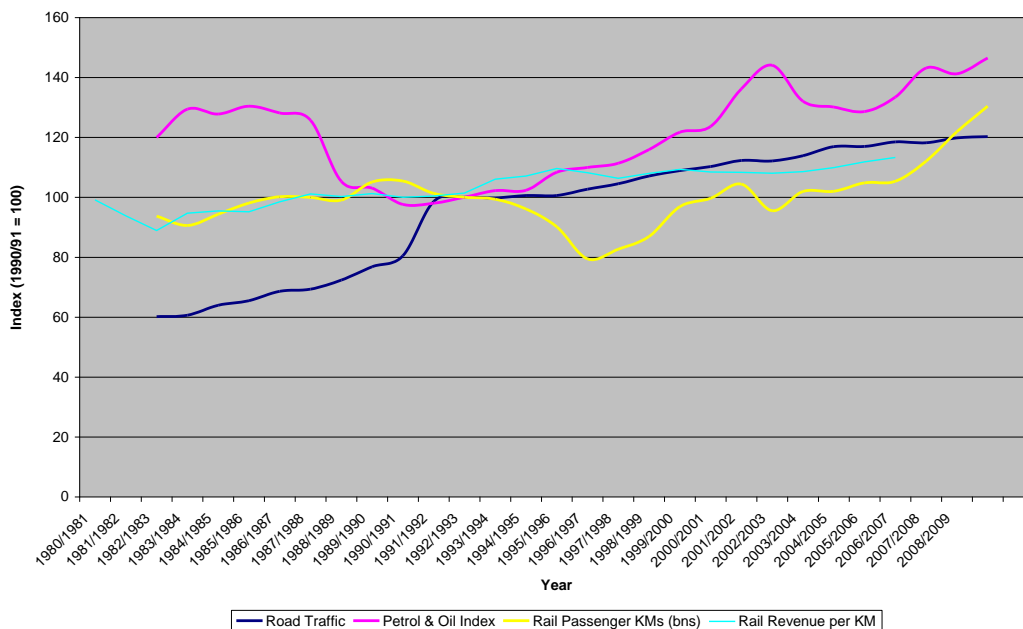


Source: OEF

5.7.4 Car Usage

The trend in road traffic growth shows less variation with a steady increase in road traffic from 1990/91 to 2007/08 (Figure 5.32). Over the same period, rail revenue per km shows more variation, falling during rail privatisation. There was a period of significant growth before the Hatfield incident, then a resumption of significant growth after Hatfield which in recent years has exceeded the rate of growth in road traffic.

Figure 5.32: Comparison of Car Usage and Fuel Costs with Rail Usage (Indexed)



Source: OEF and TSGB

A high level breakdown of car usage using standard usage measures (vehicle-kms and /passenger-kms) is presented in the comparison of mode share trends in Chapter 4. A more disaggregate analysis will follow in the next stage of the market analysis. In order to carry out this analysis highway data has been requested from the DfT and the Highways Agency.

Origin-Destination demand data on road-based trips is available from NTM for 2004 although this is a synthesised matrix. Application of appropriate indices of changes in traffic volumes will provide a means of deriving change in traffic volumes at origin-destination level for corridor analysis. Journey routings in NTM will also enable a mapping of road and rail origin and destination pairs to provide a basis for modal comparison.

5.7.5 Car Journey Times

Car journey times are available from the 2007/08 Trafficmaster origin-destination journey time matrix. This will enable a cross-sectional analysis to be undertaken with equivalent rail flow journey times on a corridor basis in the market assessment.

5.7.6 Road Congestion

Road congestion data is available from the PSA journey time reliability analysis although this is only for a limited time series. There is also speed data from 1999 by route/count site. These data sources will be analysed as the basis for an assessment of the effects of road congestion. As suggested in Chapter 3, an increase in road congestion is a reason for the fairly low rate of growth in car use in recent years.

5.7.7 Other Car Variables

A number of other car variables were identified as follows:

- **Average parking costs:** a review of available data sources has indicated that insufficient car parking data is available for trend analysis. Although a potential source

to investigate is local authority parking receipts as a means to assess change in car parking levels, the disparate state of this data may make a meaningful analysis difficult.

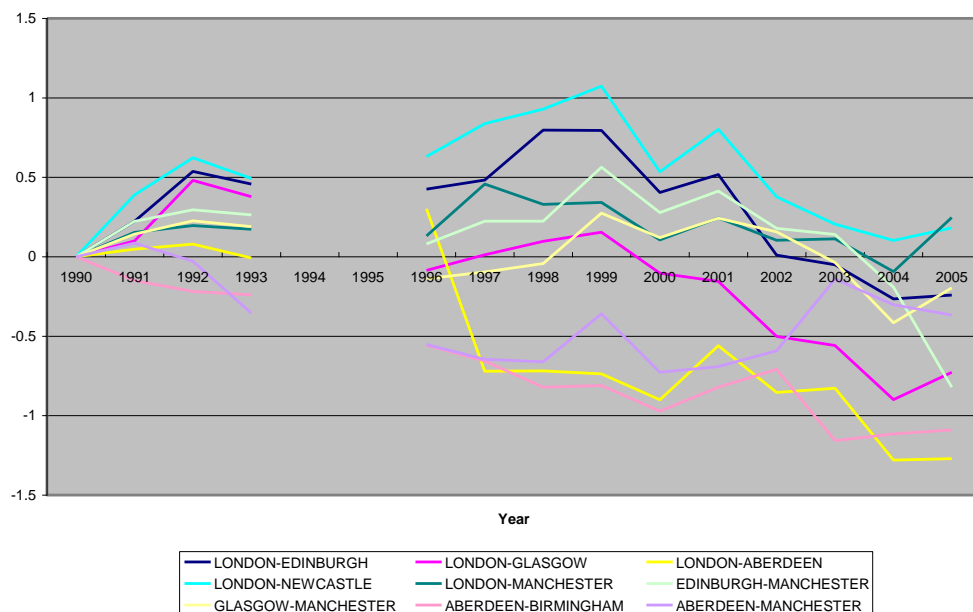
- **Road user charging and road capacity charging:** possible data sources have been reviewed, but little data is likely to be available for use in the study; and
- **Company car availability:** company car data is to be reviewed in the next stage, although indications are that there is unlikely to be sufficient data to undertake a trend analysis.

5.8 Air Competition

5.8.1 Key Air Demand Flows Analysis

To assess the market trends in domestic air travel, CAA demand data for key airport-airport flows was reviewed. Figure 5.33: presents a comparison of the growth rate indices for rail and air demand on selected corridors. A line above zero on the x-axis indicates that rail has increased mode share relative to air whilst a line below zero on the x-axis represents a decrease in rail mode share. It should be noted that there was no CAA data available for 1995 and no rail data for 1994. In general terms, rail mode share has been falling steadily since the mid 1990s with two regional flows being most affected by air competition, namely Glasgow-Manchester and Aberdeen-Birmingham. Growth in rail demand on the London-Newcastle route has been consistently greater than equivalent growth rates in air demand on the route. The quality of the rail service on the ECML for journeys within the 200-300 mile distance band and the competitive pricing of single leg tickets are factors in the relative strength of rail in this market. In comparison, London-Aberdeen and Aberdeen-Birmingham have shown rail growth rates significantly lower than air growth rates.

Figure 5.33: Comparison of Change in Rail and Air Demand Growth Rates



Footnote: no rail demand data for 1994 and no air passenger demand data available for 1995

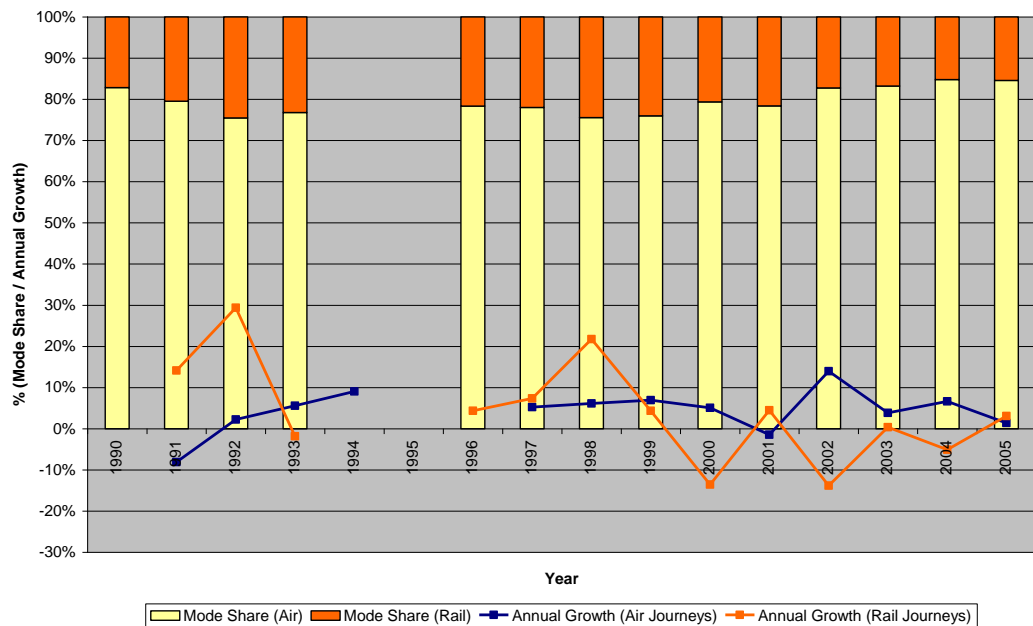
Source: CAA and LENNON

Figures 5.34 to 5.36 show the trends in the demand for rail and air demand for each of the key markets where rail competes for rail. The rail/air mode shares trend for the London-Edinburgh long distance market (Figure 5.34) shows the increasing air mode share compared with rail. Interestingly, a comparison of growth rates shows that the air growth rate has been decreasing in recent years. The London-Manchester medium distance market (Figure 5.35) where rail can offer very competitive journey times for city centre to city centre travel shows a much higher rail share of about 50%. This share has not changed

significantly since 1990. However the latest year presented is 2004 prior to the line speed enhancements on the WCML route. The third route shown is a regional route —Glasgow-Manchester (Figure 5.36).

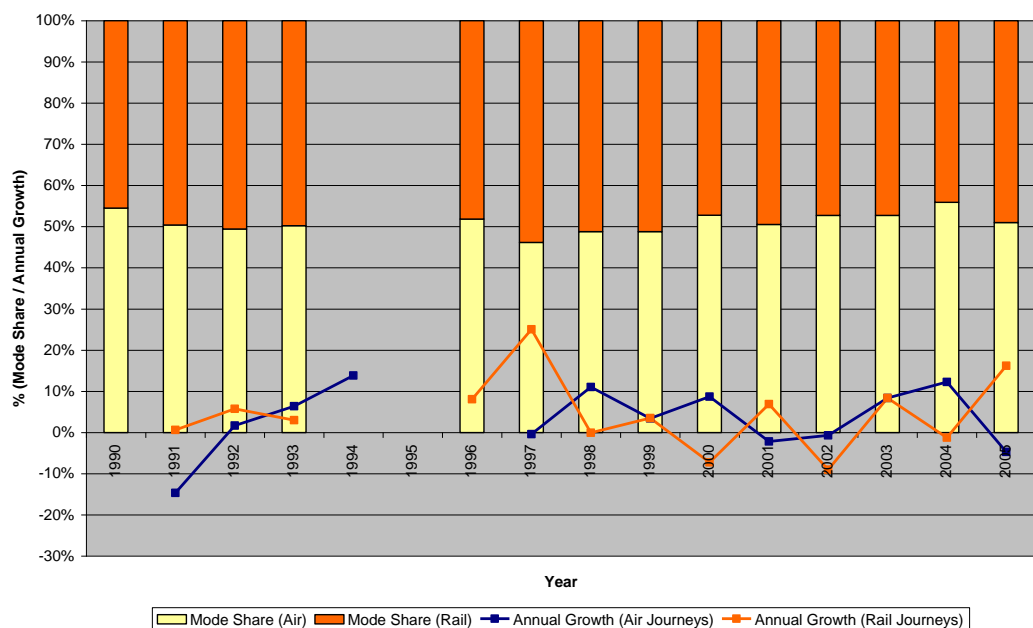
Figure 5.37 shows a comparison of the indexed change in average single air fares since 1997 between London Heathrow-Edinburgh/Glasgow and London Heathrow-Manchester. There has been a trend of decreasing average air fares since 1997 and particularly on the Scottish routes. These trends highlight the impact of the low cost carriers and the competition between carriers resulting in lower air fares. Interestingly, the trend has shown a small increase in fares on the Glasgow and Manchester routes between 2006 and 2007, possibly to maintain average yields.

Figure 5.34: Rail/Air Modal Competition – London-Edinburgh



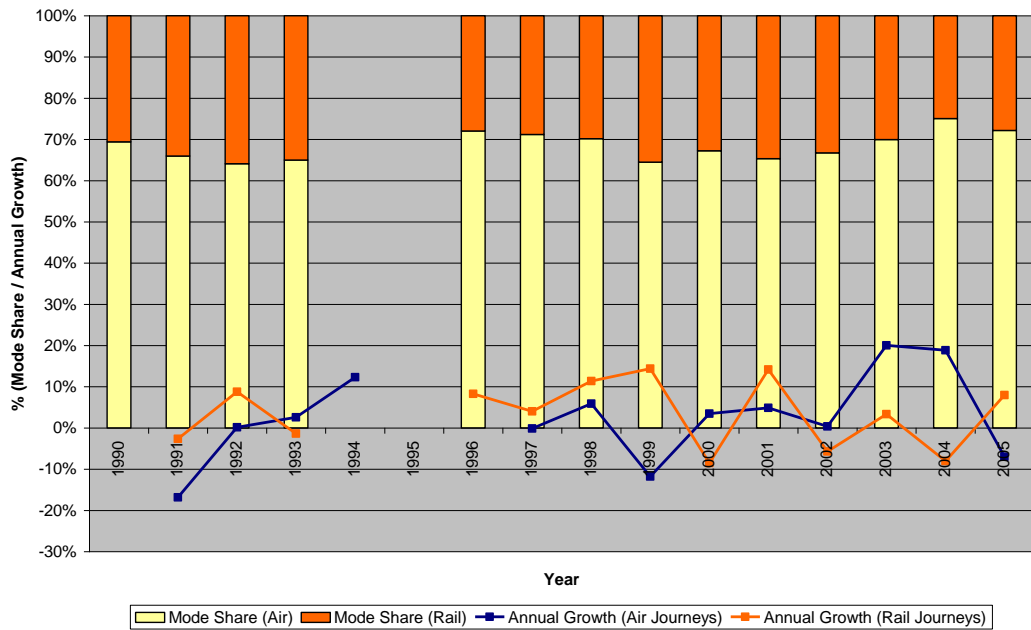
Source: CAA and LENNON

Figure 5.35: Rail/Air Modal Competition – London-Manchester



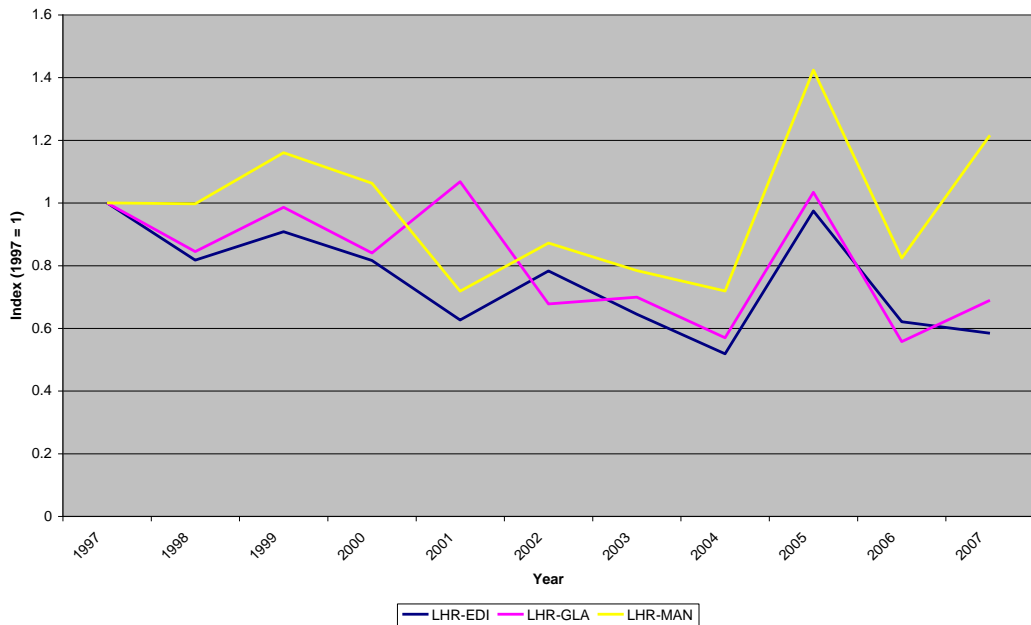
Source: CAA and LENNON

Figure 5.36: Rail/Air Modal Competition – Glasgow-Manchester



Source: CAA and LENNON

Figure 5.37: Change in Domestic Single Air Fares by Route



Source: CAA/DfT

5.9 Bus/Coach Competition

5.9.1 Bus/Coach Usage and Fares Indices

Bus/coach competition data is limited. DfT has some time series data from PSV surveys by which will provide some operator-based information including vehicle-kms, passenger-kms and reliability data.

5.10 On-Rail Competition

On-rail competition will form part of a case study analysis in the next stage of the market analysis. This case study will assess the changes on the ECML as a result of the start of open access operator services between Hull and London.

5.11 Performance of Competing Modes

The performance of competing modes is dependent on available sources of data. For example, CAA data will need to be reviewed to assess whether cancellation data is available. This will be a task for the next stage of the market analysis.

5.12 Key Trends and Issues for the Market Assessment

This chapter has presented the key trends in those external factors affecting rail demand which are included in the current Forecasting Framework. The factors reviewed fall into a number of groups: socio-demographic factors, income factors, employment factors and competing modes.

- Population change is a key socio-demographic variable which is expected to have a strong relationship with rail demand growth. Over the period of assessment, population has grown at the greatest rate in the South East and at the lowest rate in Scotland and the north of England. In recent years, London has shown particularly high population growth.
- Rail usage per capita was reviewed to determine the strength of the relationship between growth in population and rail demand. Whilst the highest rates of rail use per capita are in London and the South East reflecting rail's role as the main commuting mode to central London, analysis of the growth rates in rail use per capita showed highest growth rates in Yorkshire, Humberside and the North East, the areas which have experienced significantly less change in population than London and the South East. The next stage of the market analysis will need to investigate further within the market segmentation the different rates of growth in rail demand per capita and by ticket type using flow level data.
- Population and household catchment analysis was undertaken to determine if those living within a 1km catchment of the rail network showed different characteristics from the general population. This analysis using TEMPRO data did not find a significant difference at a regional level between population and household growth within rail catchments and general population and household growth. An explanation for this similarity is that areas close to rail stations are generally less likely to offer scope for new development and relatively few new stations are built. However, regeneration of city centres is known to have increased city centre population density and in particular the number of single occupant households. The level of data analysis may not reveal these more geographically defined population changes.
- The student population sub-market was analysed to establish if a relationship could be found between change in student study location and growth in demand for rail (Young Persons Railcard). However the data, which is relatively limited in scope, suggested that although students were increasingly likely to study closer to home, there was growth in the use of Young Persons Railcards.
- Income is a key external factor affecting growth in rail demand. London and the South East have experienced the greatest increases in GDP per capita. This disparity between London and the South East and other regions will need to be reflected in the segmentation for the next stage of the market analysis. Comparison of GDP growth and rail journeys shows that whilst GDP growth rate has been generally linear, rail journeys growth has varied over time which will need to be taken into account in the econometric estimation.
- A comparison of household expenditure and expenditure on transport showed that transport expenditure was reducing over time as a proportion of total household expenditure.
- Analysis of house prices increases and rail usage shows that house prices related closely to the growth in rail demand up to 2000. There has since been an increasing

divergence with house prices increasing far more rapidly than rail usage. Whilst house prices are related to income as an explanatory variable, the rapid increase in house prices implies that this variable is not closely related to growth in rail demand.

- Employment is a key external factor affecting growth in rail demand. Analysis of employment mirrors the changes in the growth in the economy over the assessment period, although with some regional variation. Central London employment growth was compared with the growth in rail passenger kms at an aggregate level and also by employment sector which showed that central London employment has grown at a lower rate than the growth in rail passenger kms. The trend suggests that the growth in non-commuting rail travel has been significant in recent years. The growth in jobs within rail station catchments was analysed which indicated that there was little difference between rail catchment areas and the overall growth in employment by region.
- Trends in growth in competing modes were analysed. Rail generally has a greater market share for short distance travel of 50-75 miles and for longer distance travel greater than 250 miles.
- A similar comparison of car ownership per household in relation to rail catchments indicated greater growth in car ownership within the rail catchment areas although there was significant variation between regions.
- User operating costs of car travel were also analysed which showed that whilst fuel costs have increased there has been significant fluctuations over time compared with the steady increase in car usage nationally.
- Comparison of air and rail modes showed that the rail market share varied significantly by route, for example, rail growth was greater than air on the London-Manchester route, a market response reflecting the quality of rail service.

In the market assessment phase of the study, particular issues highlighted in this chapter will be taken forward for further analysis, as follows:

- Further investigation of the differential rates of growth in rail demand per capita and by ticket type and journey purpose using flow level data.
- More disaggregate analysis of the population and household data with respect to station catchment areas.
- Examination of demographic factors including age group, Senior Citizens, ethnicity and household size using TEMPRO data.
- Further investigation of the relationship between GDP growth and rail demand growth using regional/city level GDP trends for a more disaggregate analysis. Further analysis at a flow/corridor level may yield further differences.
- Disaggregate analysis of longer distance commuting by rail and the relationship with house prices, particularly in the South East.
- Analysis of the relationship between income and occupation using NRTS data for rail travellers and NTS for other modes.
- Investigation of the relationship between change in employment and change in rail demand by employment sector at a regional/corridor level. Also, further consideration of the relationship between rail demand and unemployment trends.
- More disaggregate analysis of competing modes including a comparison of rail and car travel times/costs using Trafficmaster, NTM data, PSA journey time reliability data and car purchase price changes, a flow level comparison of rail with air modes and a review of bus/coach data for undertaking a comparison of rail and coach competition.
- Review of data on the performance of competing modes and a possible comparison of performance trends by mode

- Analysis of on rail competition which will form part of the case studies analysis focussing on the ECML corridor.

6 Other External Factors

This chapter considers other external factors which are not currently included in the PDFH Forecasting Framework. These variables will in some cases be covered by variables in other sections of the report. For example, land use trends also overlaps with the effects of employment and demographics and the impact of new road projects, whilst the principal analysis of access mode data is described in the chapter on internal rail industry factors.

Many of the factors identified in this chapter will be the subject of analysis in the next stage of the market assessment as the availability of data is assessed.

6.1 Access Modes

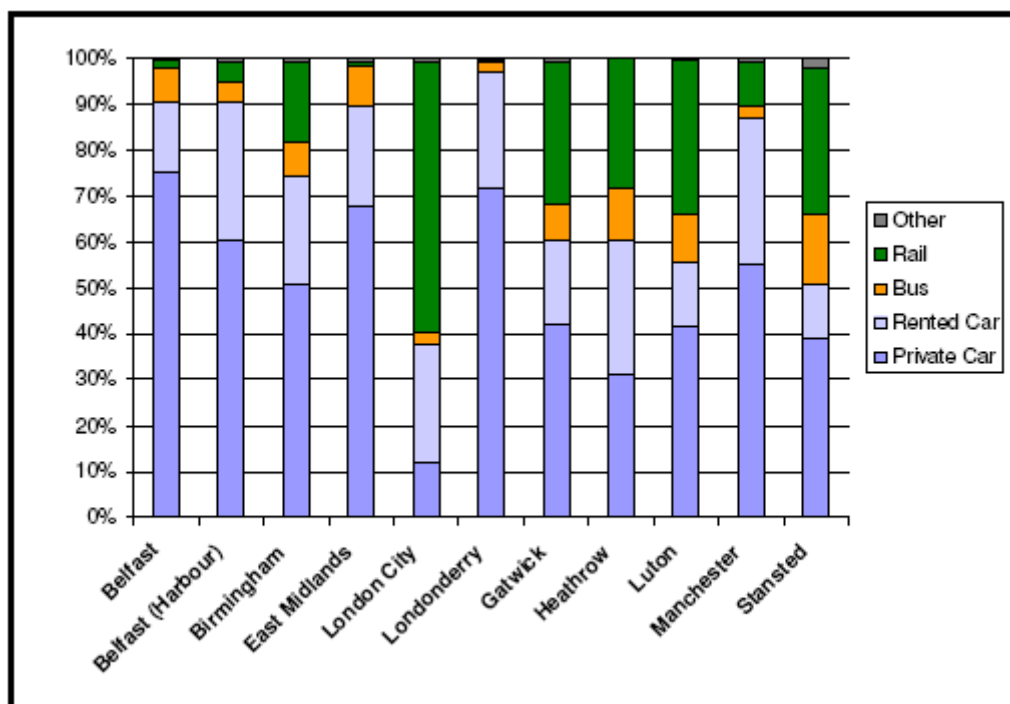
Access modes are not currently included within the forecasting framework. This is a key factor for consideration given that the overall door-to-door journey time is included in the passengers' decision-making process. Whilst time series data will ideally be obtained, a key source providing snapshot data is NRTS. The latter is a larger sample and provides origin-destination data for access and egress modes. NTS will also be assessed during the next stage of the time series analysis, although the use of NTS is constrained by the very small sample size.

Key issues for the access mode variable are the as follows:

- Access to rail (described in section 7.7) where car is used as a complimentary mode and the impact of increased road congestion for station access
- Rail as an access mode to airports – CAA data can be used to estimate rail market share for airports

Figure 6.1 shows the access mode shares to UK airports produced by the CAA. Rail is a significant mode (30% share) for the London airports as private car access is restricted either by road congestion or limited car parking availability or parking costs. Another feature of the data is the dominance of car for access to Manchester airport (over 85% share).

Figure 6.1: Access Mode Share to Airports, CAA 2005



Source: CAA

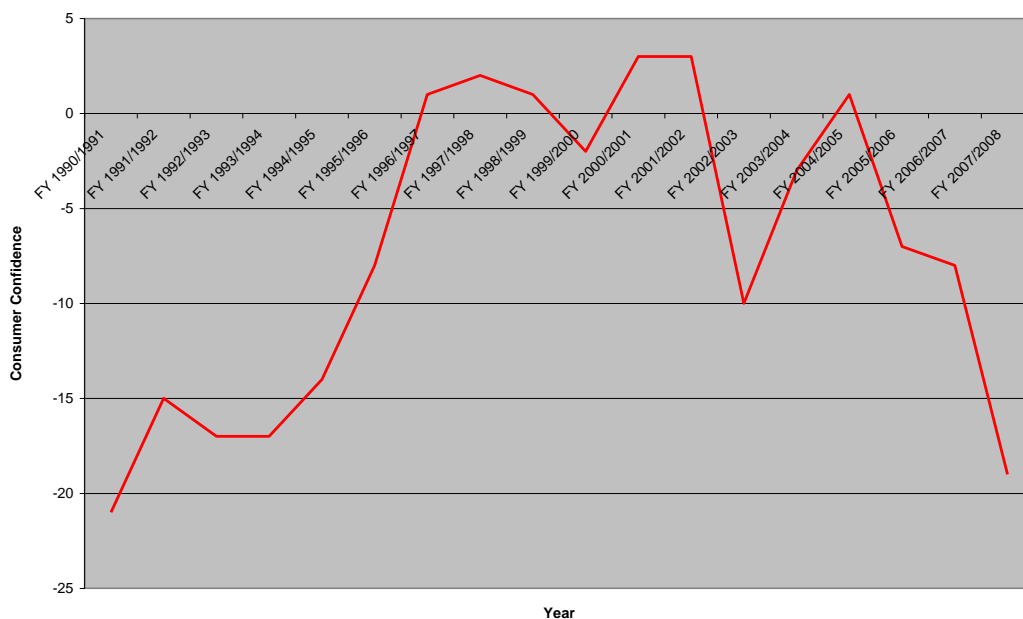
6.2 Lifestyle Choices

Lifestyle changes (increase spatial separation of home and work, home-working, increase in single occupant households, shorter/more frequent holidays) were considered as possible explanatory variables. The key issue is the availability of historic data which can be used for the assessment of trends in these variables and the future availability of data to be used in applying the Forecasting Framework. Home-working information is available from the NTS which can be used at a high level and will be reviewed in the next stage of the market analysis.

6.3 Consumer Confidence

Whilst GDP and employment are specific factors representing economic activity's impact on rail demand, consumer confidence provides a broader measure of general economic activity on rail demand. Consumer confidence is marked by a period in the early to mid 1990s of negative confidence followed by a period of fairly positive views on the economy (Figure 6.2). It is interesting to note that consumer confidence has not been strongly positive even during the periods of economic growth up to 2007/08 which coincided with significant increases in rail demand. Average net consumer confidence in the UK is below zero i.e. there is some inherent pessimism.

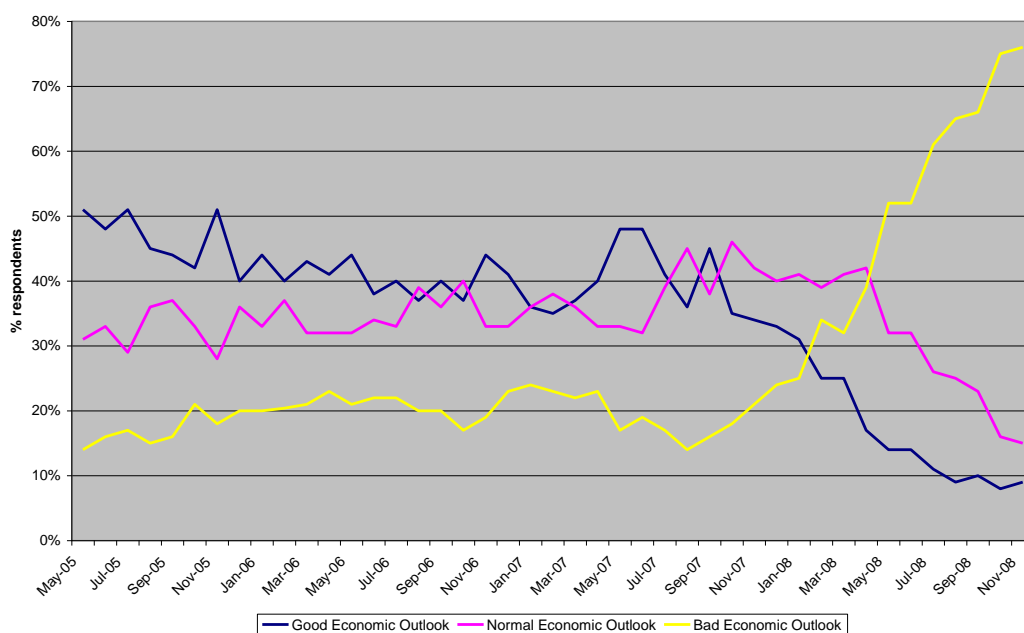
Figure 6.2: Change in GfK UK Consumer Confidence Index



Source: GfK Consumer Confidence Indicator

The Nationwide Consumer Confidence Index (Figure 6.3) presents the rating of consumers' confidence in terms of views on the current economic outlook when surveyed. This index shows that since May 2005 there has been a steady trend towards a more negative view of economic conditions, with a significant downward shift since August 2007.

Figure 6.3: Change in Nationwide Index of Consumer Views



Source: Nationwide Consumer Confidence Index

6.4 Growth in internet usage

The review of internet usage (and ticket distribution channels) is described in section 7.2.

6.5 Land Use Characteristics

Land use characteristics and their impact on rail demand will form part of the next stage of the market analysis. Key land use factors which are expected to have a relationship with rail growth trends are

- Relocation of organisations to regions; and
- City centre regeneration

These two land use factors are not mutually exclusive with relocation to regions often representing an aspect of the regeneration of city centres. In each case, these factors reflect a more general move towards service sector employment. A key issue for this analysis discussed below is the availability of appropriate land use data. An initial outline of the land use factors is given below.

6.5.1 Relocation to regions

There has been a trend towards the relocation of public sector organisations from London and the South East to other parts of the country. For example, the relocation of parts of the BBC to the regions e.g. Manchester (Salford Quays, Trafford Park) and Glasgow. The Mediacity development in Salford will represent a significant addition to employment in Manchester with some 10,000 jobs. In general, these developments are located to provide good accessibility to rail services. We will assess the available data to establish the agencies/organisations that have relocated and whether these are likely to be meaningful as a percentage of total activity.

6.5.2 City centre regeneration

In recent years there has been considerable city centre regeneration across the country. This has been represented by two major trends: increasing the number of city centre residents and the investment in new retail developments with limited access for the car both for employees and visitors. For example, Liverpool city centre has seen a large increase in

retail space with the opening of the Paradise Street shopping development whilst the Salford Quays area of Manchester has been a focus for new city centre residents.

The city centres of Manchester and Leeds have seen the development of high density apartment developments aimed by developers at a younger, relatively affluent, demographic market. Anecdotal evidence suggests that this market is more likely to use public transport and not own a car. The hypothesis to be tested is to assess the extent and location of significant city centre regeneration characterised by a substantial increase in apartment dwelling. Sources for data include TEMPRO population and household size data. A further potential measure is the increase in residents employed within key city centres. By increasing the resident population in city centres there is likely to be a reduction in rail commuting, although there may be some 'reverse' commuting to other employment centres. However, the increase in city centre residents generally representing a relatively affluent demographic is likely to have increased the demand for rail as a leisure mode. Moreover, the impact of the downturn in the economy on the occupancy and construction of apartment developments has been substantial.

6.6 Other External Factors

There are a number of other external factors which are likely to have an effect on rail travel. The Rapid Growth study identified other factors implicitly included in the forecasting framework and new factors which are not included in the current framework. The employment and socio-demographic and mode competition factors (implicitly within the framework) suggested by the Rapid Growth study were reviewed in Chapter 5. The assessment of other non-framework external factors in this chapter has identified a number of key additional external factors likely to impact on rail demand encompassing the quality of access modes, lifestyle changes including internet usage and home-working, consumer confidence and land use changes, (in particular changes in household and employment location).

This section reviews other possible external factors including the environmental factor identified by the Rapid Growth study. A discussion of these factors is provided below. The data sources will be reviewed and analysis undertaken in the next stage of the market analysis. A key issue for the analysis of the impact of each of these factors is the availability of appropriate data. The difficulty in identifying an evidence base for some of these factors was acknowledged in the Rapid Growth study with particular reference to changes in household and employment structure and location, and environmental trends.

6.6.1 Passenger perception of modes

Passenger (and non-passenger) perception of rail and competing modes is a potential external factor. As the Forecasting Framework considers the use of rail at the margin, non-users perception of rail is clearly a potential explanatory factor. This perception may be based on limited use of the mode or the perception could be influenced by friends and family feedback. Passenger perception of rail service quality is available from NPS data and is included in the following chapter on internal rail industry factors. The emphasis in this analysis will be to establish passengers' relative perception of the competing modes to identify any linked trends e.g. perception of rail/air service attributes by route corridor in terms of perhaps comfort/reliability of journey. Passengers are particularly aware of change in performance which is reflected in satisfaction levels (often followed by demand lags following periods of poor reliability). Indeed, recent Passenger Focus data has highlighted reliability as a key impact on rail passenger perception together with availability of a seat and sufficient customer information on travel disruptions. CAA survey data will be reviewed for air passengers' perceptions of journey attributes.

6.6.2 Impact of New Road Projects

The impact of new road projects improving the relative service quality of road-based modes compared with rail will be a potential external factor. This analysis will be informed by the highways data request submitted to DfT and will be presented in the next stage of the

market assessment. Subject to appropriate data on the addition of new road infrastructure, an assessment will be undertaken using usage metrics (vehicle kms and passenger kms) for major road/rail corridors. It will also be necessary to identify any improvement in the rail mode over the same period, suitable measures being train kms and generalised journey times from MOIRA. This analysis will be informed by the *a priori* market segmentation. The impact of these local/regional road projects will be compared with general growth in car travel demand over time to assess whether a specific impact of new road project can be found. New road projects will include, where data is available, the use of motorway hard shoulders.

6.6.3 Other Modes Disruption Factors (airport security, road-works)

Major disruptions to the operation of other modes will have bearing on rail demand. The analysis in section 4.10 showed that the air demand growth rate has slowed in recent years. Whilst this is likely to be a result of a number of factors including rail competition on some routes which was analysed in section 5.8, it is likely that the increase in airport security since 2001 has resulted in some decrease in air passenger demand. There is some overlap between this analysis and 'passenger perception of mode' and the analysis of air competition in Chapter 5. A source identified for use in evaluating this factor is CAA passenger survey data which will provide passengers' perception of increased security and the consequent impact on the quality of domestic air travel. Another factor affecting the relative competitiveness of other modes is the impact of major road-works such as the works associated with M1 junction widening.

6.6.4 Environmental Factors

As perception of environmental issues and sustainability becomes more important there is a likelihood that this being reflected to some extent in peoples choice of mode for certain journeys. However, there is a difficulty in identifying these changes in the demand for rail over time. Moreover, this perception amongst travellers is fairly recent and may not yet be a important factor in changes in rail demand growth rates.

7 Internal Rail Industry Factors in the Framework

7.1 Rail Industry Factors

The objective of this chapter is to analyse potential explanatory rail industry variables which, through changes in the rail level of service, can affect the demand for rail. The current PDFH Forecasting Framework has detailed advice on the appropriate elasticities to be applied although the market segmentation is at an aggregate level. The focus of the market assessment phase of this study will be to provide recommendations for the econometrics which covers all the key fare characteristics within an appropriate market segmentation.

The internal rail industry factors currently in the forecasting framework are:

- Ticketing and Fares
- Crowding
- Performance
- Journey Time
- Quality Perception
- Station Facilities and Quality
- Access/Egress to Rail Services

Some of these factors have long been recognised as important internal drivers of rail demand. Other factors, for example revenue yield management, have become increasingly important since the privatisation of the rail industry in the mid 1990s.

7.2 Ticketing and Fares

Ticketing and fares includes many possible explanatory variables. It should be noted that the ticketing and fares analysis overlaps with other sections of the report in terms of cause and effect.

The analysis in this chapter provides an assessment of time series trends in ticketing including types of ticket purchased (First/Standard/Full/Reduced/Season), use of Railcards, awareness of the ticket products and ticket distribution channels. The ticketing analysis includes the impact of fares regulation and changes to the fare structure, particularly the increasing importance of single-leg ticketing and operators' own dedicated fares. Where data is still to be reviewed this is noted and will taken into account in the market assessment.

Figure 7.1 presents an overview of the growth in net ticket receipts over the period 2003-2008 split by ticket group. This analysis was based on a specific LENNON time series dataset providing a disaggregate breakdown of ticket types.

The largest and most impressive growth rate has been in Standard Class Advance Purchase (AP) ticket types (excluding First Class AP which is included in the First ticket type) where net receipts have grown by 91% over five years. Within this category there has been a decline in Return tickets and a significant growth in single-based AP tickets, dating in particular from 2005/6.

First Class has also grown more than average at just under 58%, although this disguises a lower than average growth in First Class Open and Day returns. The main reasons for the overall growth in First Class are the growth in the First Advance Single and the First Single, which together explain almost all the growth in this category. The emergence of single tickets shows the importance of single leg pricing where rail passengers demonstrate increasingly sophisticated purchasing patterns through 'mixing and matching' single leg

tickets that best suit their requirements (and budget), and area of ticketing change highlighted in the PDFC study into single leg pricing ²

Above average growth in Standard Full tickets is principally down to the Standard Day Return (SDR) rather than to the Open Return. The rise of the SDR is likely to be due to a number of factors including above average pricing by London and South East TOCs, the growth in commuting for fewer than 4-5 days a week where the season may not be economical, a shift of Cheap Day Return tickets to become SDR (changing fare restrictions) and the creation of the All Day Travelcard in 2002 (which has proven revenue generative).

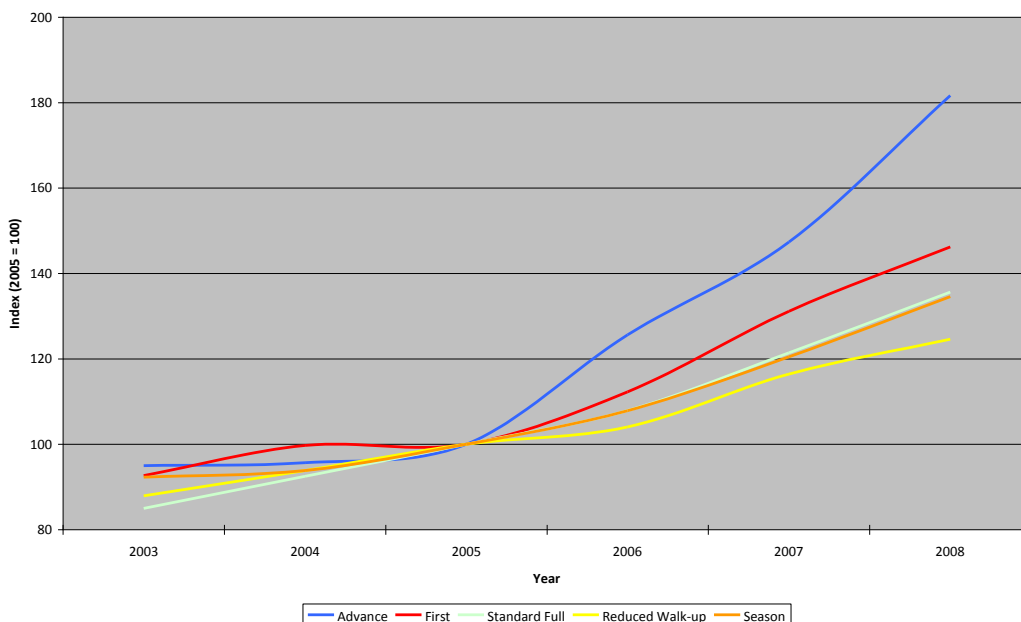
The Reduced Fare segment still accounts for the most revenue although it's growth is likely to have been dented by the rise in cheaper Advance Purchase. Both the Cheap Day/One Day Travelcard and the Saver have grown at less than the average rate over the period of analysis.

Finally, within season tickets, there has been more growth in the weekly season (both First and Standard seasons). The relative pricing structure of season tickets has not changed significantly. It is likely that the growth in weekly seasons reflects changes in work patterns such as the growth in shorter term contracts and more flexible working patterns.

Within the London travelcard area there has also been some shift from travelcards to season point to point tickets which has affected revenue yields. A further feature of revenue in London noted by ATOC has been the increased use of Oyster cards which has resulted in a reduction in train operators' revenue income with a shift of sales from stations to TfL outlets. Although the mitigation agreement between the TOCs and TfL results in the TOCs receiving their revenue allocation, there is a time lag associated with this reallocation.

The impact of the London bombings of July 2005 will also have had an effect on fares receipts which will be investigated as a part of a more disaggregate analysis of fares in the market assessment phase i.e. a decrease in revenue in the London and South East sector and the discretionary travel market segment.

Figure 7.1: Growth in Net Receipts by Ticket Group, 2003-2008



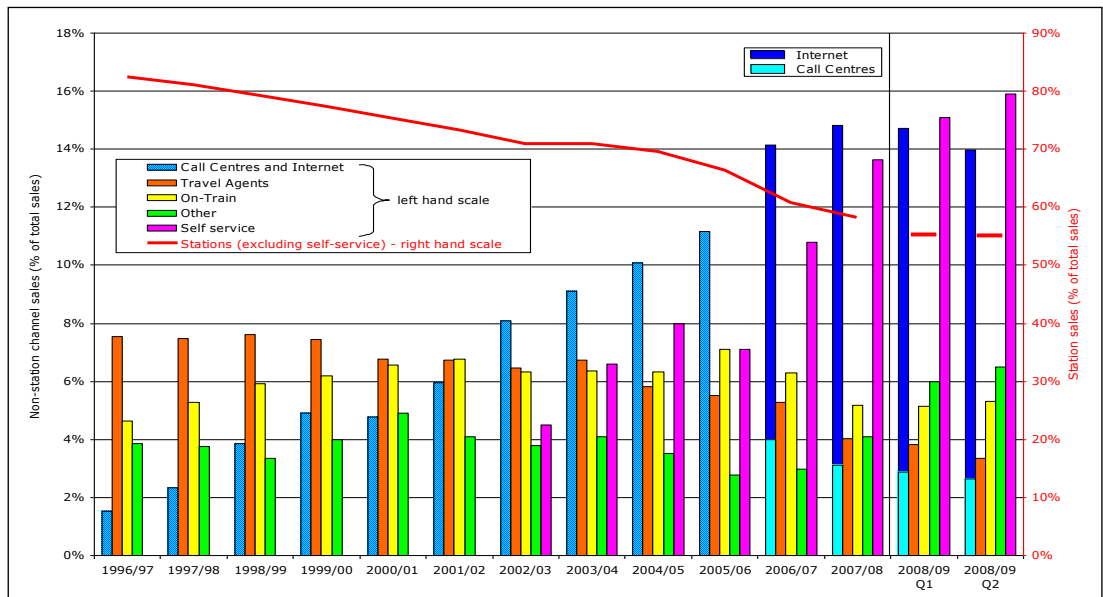
Source: LENNON

Figure 7.2 shows trend data for the use of different retail channels to purchase rail tickets. There has been a significant shift from station purchases to self-service ticket machines and call centre/internet. Station ticket office sales have declined from over 80% in 1996/97 to

² The Effects of Single Leg Pricing on Rail Demand, Faber Maunsell, July 2008

about 55% of sales in 2008/09. In contrast, call centres/internet usage has increased from 2% to 14% over the same period. This change may to an extent be a one-off step change in ticket purchase trends as season ticket users are more likely to continue to purchase tickets at station ticket offices, setting a lower limit to a further reduction in station ticket sales. In 2007/08 about 42% of all ticket sales were season tickets. This suggests that there may still be some further reduction in station ticket office sales, particularly as some train operators are promoting online season ticket purchase to current season ticket holders a more convenient means of ticket purchase, although tickets still requires collection at stations. On the other hand the introduction of smartcards may provide a further stimulus to online ticketing. An area for further investigation is to use NRTS cross-sectional data to determine possible relationships between sales channels and passenger demographics and ticket types used.

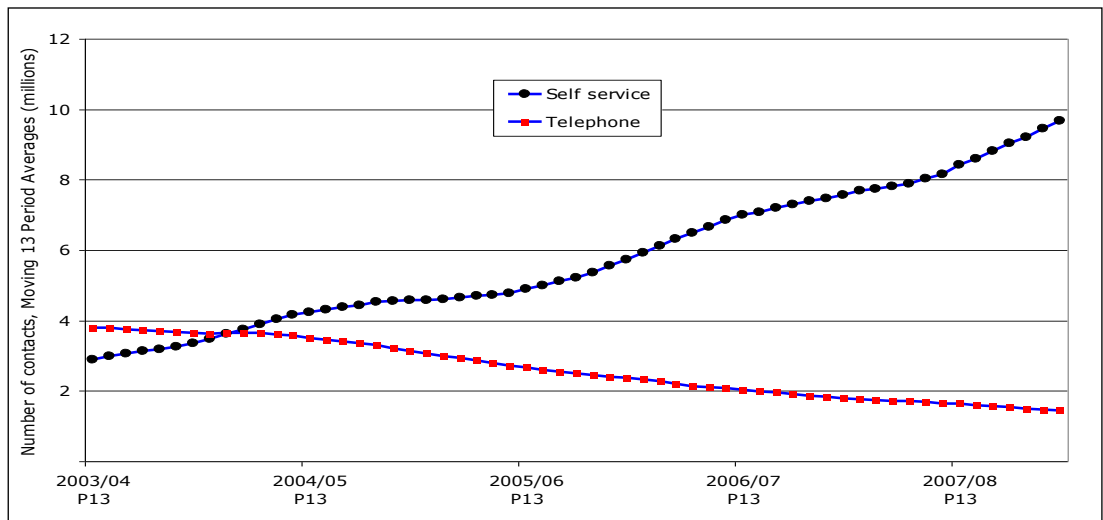
Figure 7.2: Distribution Channels for Ticket Sales



Source: ATOC

The increased usage of the internet is also demonstrated in Figure 7.3 which shows the split between National Rail Enquiries self-service and telephone enquiries since 2003/04. Although this is a short time series analysis it is very evident that there has been a major shift in customers' use of NRE to self-service (internet-based) services.

Figure 7.3: NR Enquiries: Comparison of Self Service & Telephone Enquiries



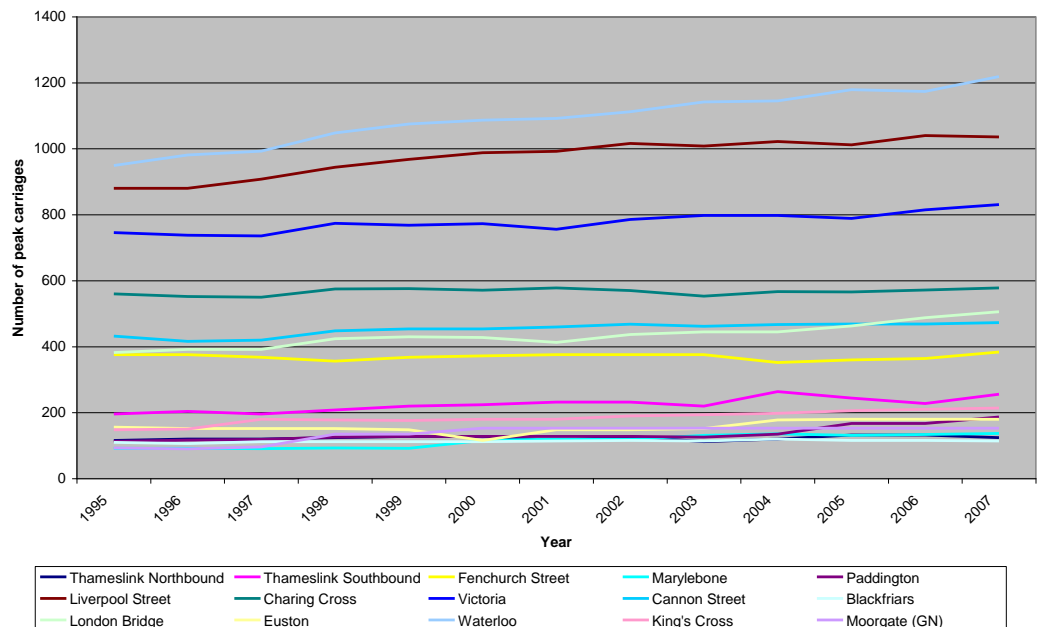
Source: ATOC

7.3 Crowding

Crowding is a key internal service quality explanatory variable of rail demand. Train passenger count data (Green Books) enabled a time series of changes in demand and supply to be assessed for rail corridors into London. Data has also been collected for other conurbations. However, a review showed that the data for other conurbations was not able to provide a consistent time series for comparative purposes.

Figure 7.4 shows the AM Peak carriages into London terminus in 2007. Waterloo, Liverpool Street and Victoria are served by the greatest capacity with Blackfriars and Marylebone having the least capacity. The time trend shows some variation with Waterloo and Victoria showing a steady increase in capacity over the assessment period. In contrast, most of the other termini including Victoria and Charing Cross showing little change in capacity between 1995 and 2007.

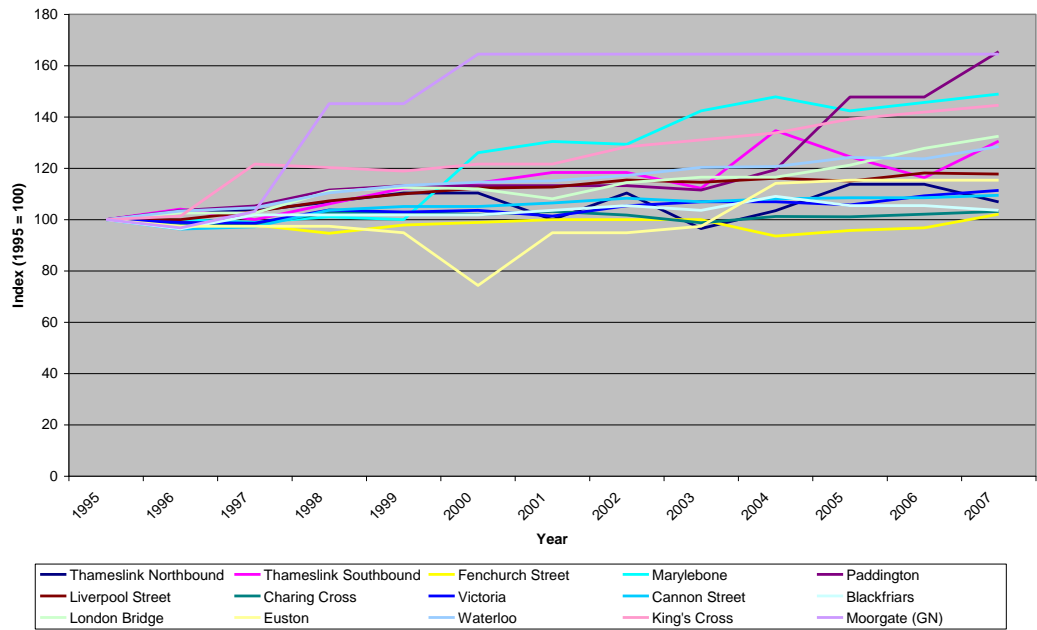
Figure 7.4: Number of AM Peak Carriages into London Termini



Source: Green Book Counts

Figure 7.5 provides a comparison of the indexed capacity by terminus. Capacity has increased on all routes, more so on routes north of the River Thames, including Euston services which fell to a low in 2000 due to the loss of Tring services. The increase in capacity at Marylebone reflects the impact of Project Evergreen. The impact of Project Evergreen II is evident from the most recent increase in capacity.

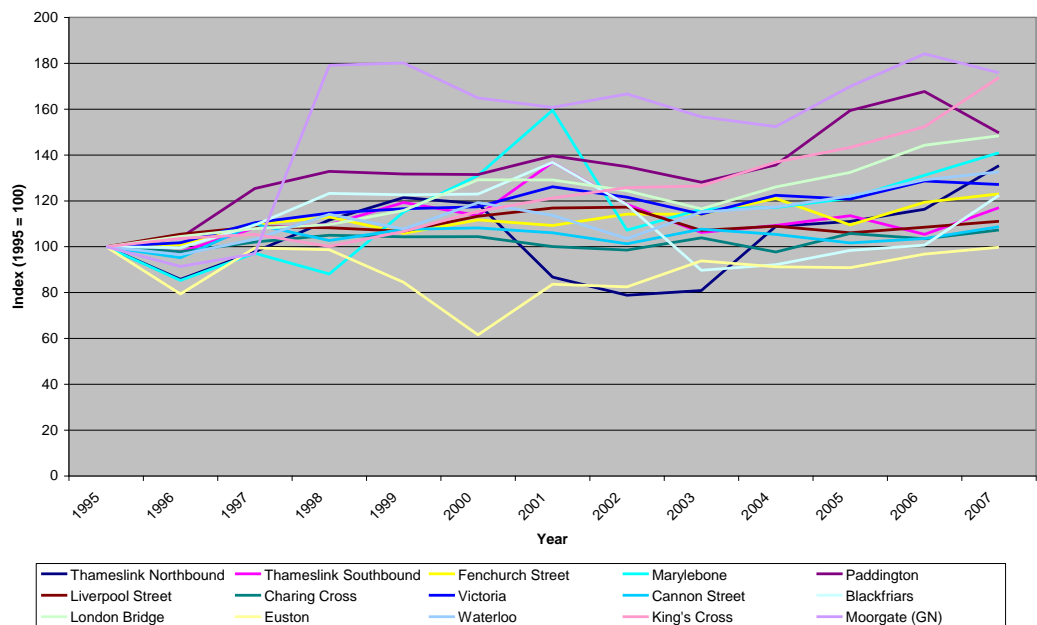
Figure 7.5: Indexed AM Peak Capacity into London Termini



Source: Green Book Counts

Figure 7.6 provides a comparison of the loads passing at the critical point on each route into the London termini during the AM peak. In general, demand on all routes into London has changed in line with capacity, with significant demand increases north of the Thames. There are interesting trends for individual termini; AM peak load into Marylebone, in particular, show a slight lagged effect between the increase in capacity due to Project Evergreen and a subsequent increase in peak demand starting in 2000. However, the growth in demand then declined whilst capacity continued to increase reflecting a possible stabilisation of the relationship between demand and supply. In comparison, the step change in capacity into Moorgate was matched by an increase in demand. Since 2000, this relationship is less apparent as capacity has remained very similar, yet demand has shown some variation implying that these effects are not related to capacity changes.

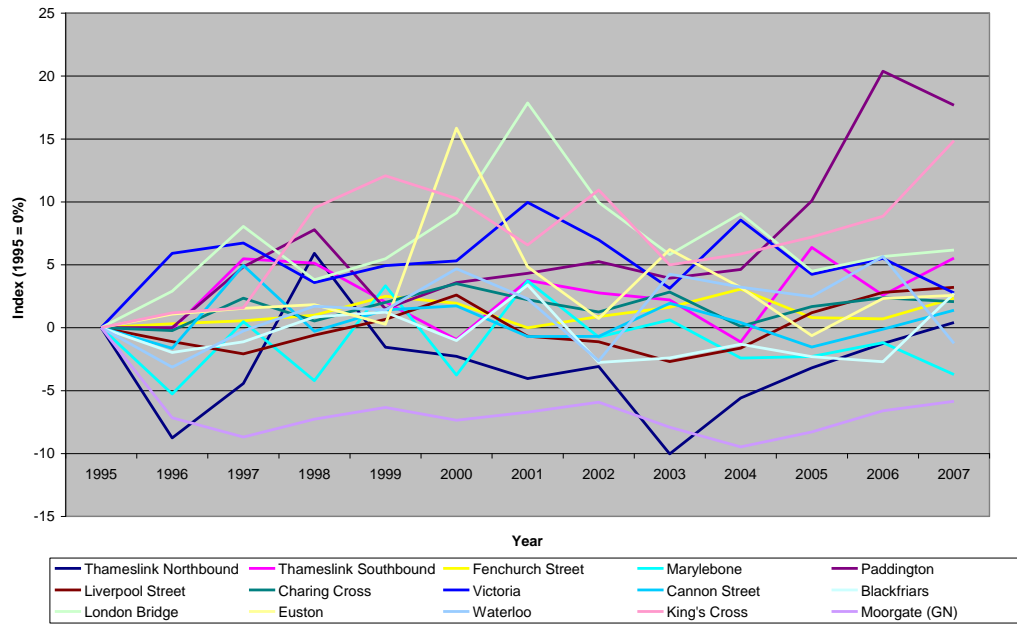
Figure 7.6: Indexed AM Peak Loads at Critical Points into London Termini



Source: Green Book Counts

Figure 7.7 shows an indexed comparison of PIXC (Passengers In eXcess of Capacity) at the critical points into each London terminus. In general, PIXC has remained relatively consistent since 1995 on most routes,. At Paddington and Kings Cross, where there have been significant increases in capacity, the increase in PIXC suggests that increasing demand is outstripping supply, or the new capacity is not being targeted at the busy trains, in contrast to Moorgate where the increased capacity has led to a decline in PIXC despite a significant increase in demand.

Figure 7.7: Indexed AM Peak PIXC at Critical Points

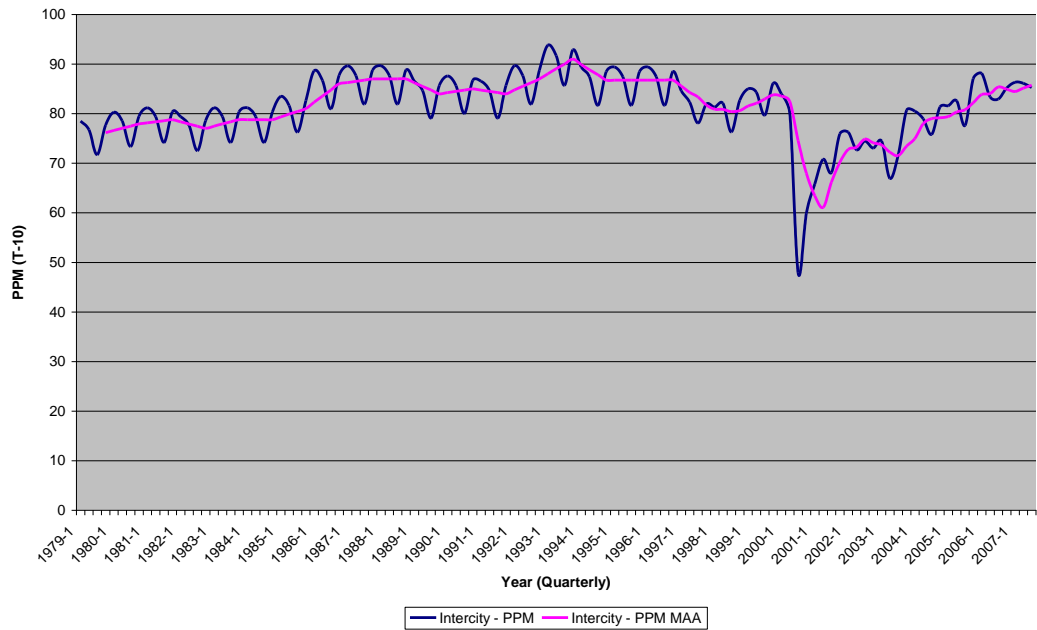


Source: Green Book Counts

7.4 Performance

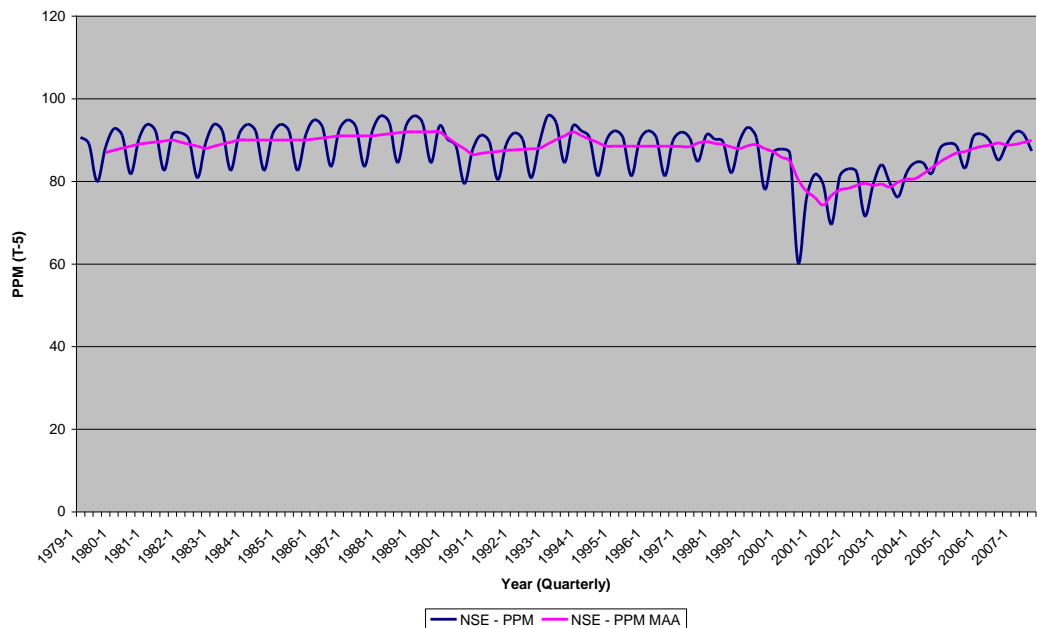
Rail performance time series data by quarter is presented in Figures 7.8 to 7.10 for the Inter-City, London and South East and Regional sectors. The Public Performance Measure (PPM) shows similar levels of performance across all three sectors. The impact of the Hatfield incident is evident from the sudden deterioration in performance in 2001 and the subsequent upward trend towards pre-Hatfield performance levels. However, the similarity of performance data when compared at a sector level in these diagrams highlights a need to assess the performance measure at a more disaggregate level in the market assessment phase. Another performance measure available is Average Minutes Lateness (AML) which will be reviewed in the market assessment work to establish if more variability in performance can be identified.

Figure 7.8: Inter-City Performance



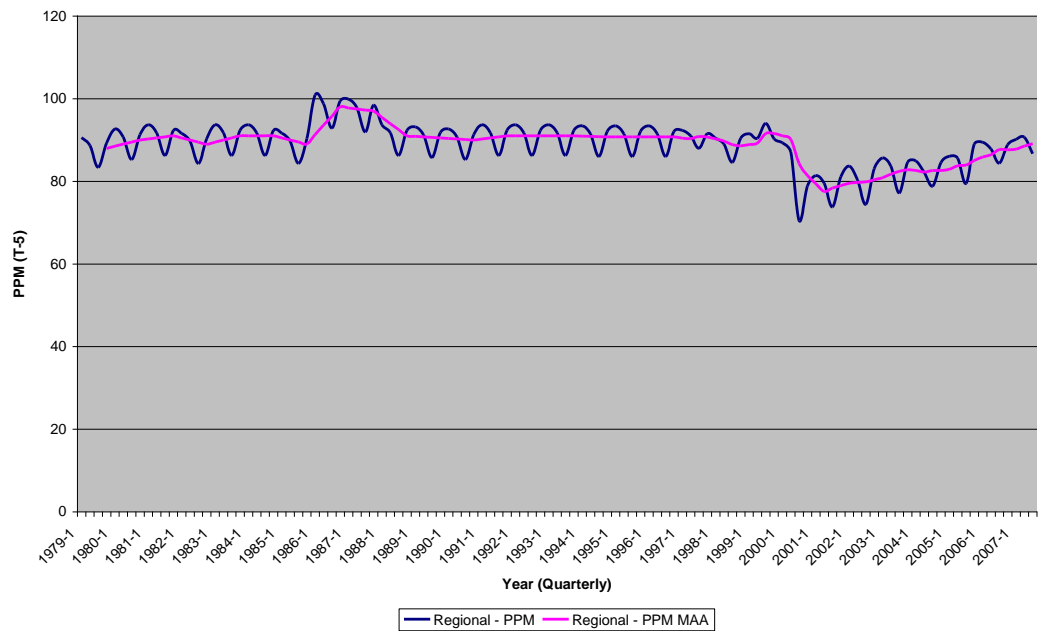
Source: DfT/ORR

Figure 7.9: London and South East Performance



Source: DfT/ORR

Figure 7.10: Regional Performance



Source: DfT/ORR

7.5 Journey Time and Speed

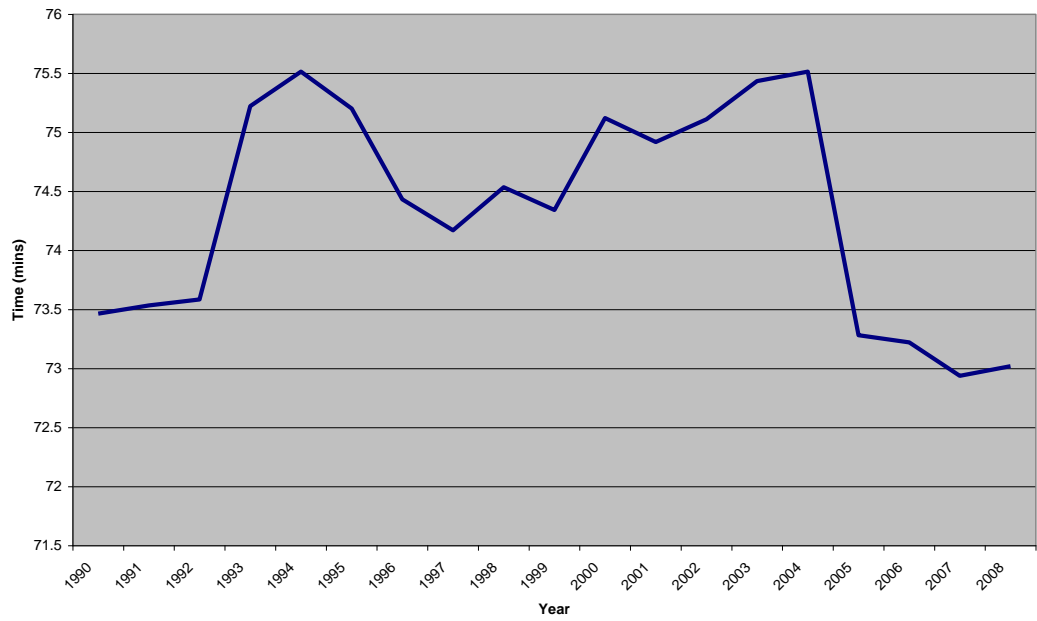
The change in average journey times and average speeds for 100 principal revenue flows is shown in Figures 7.11 and 7.12. These revenue flows are a representative sample of short, medium and long distance flows across the country. As to be expected change in average journey time is mirrored by the change in average speeds.

There is some variation in average journey time although the relative changes are small. Average journey times increased in the mid 1990s. There is also an increase in average journey time in 2001 coinciding with the Hatfield incident and the subsequent speed restrictions on the network. More recently average journey time has significantly reduced to lower levels than at any point since the early 1990s.

The trend in average speeds is closely aligned with the journey time chart i.e. an increase in journey time is matched by a decrease in average speed. It is evident that there was an average speed reduction between 1993 and 1995. This also coincided with a significant increase in average journey time which may be attributable to the privatisation strikes in 1994 and the process of privatisation.

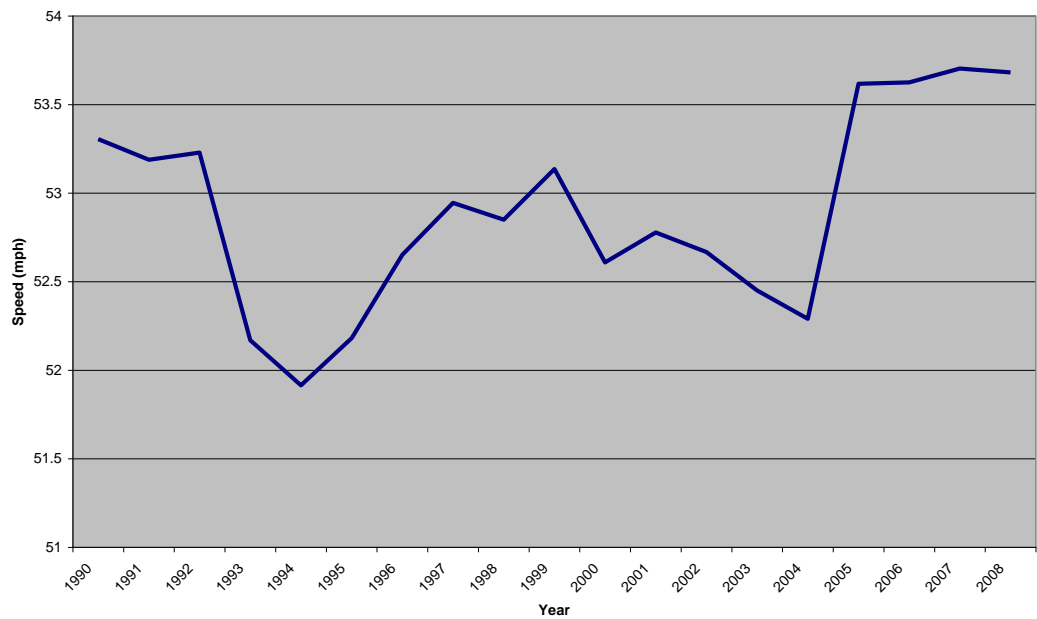
Journey time and access/egress times and modes will be analysed using time trend data from MOIRA in the market assessment. This data will provide a basis for a comparative modal assessment at a more disaggregate level.

Figure 7.11: Change in Journey Times



Source: MOIRA

Figure 7.12: Change in Average Journey Speeds

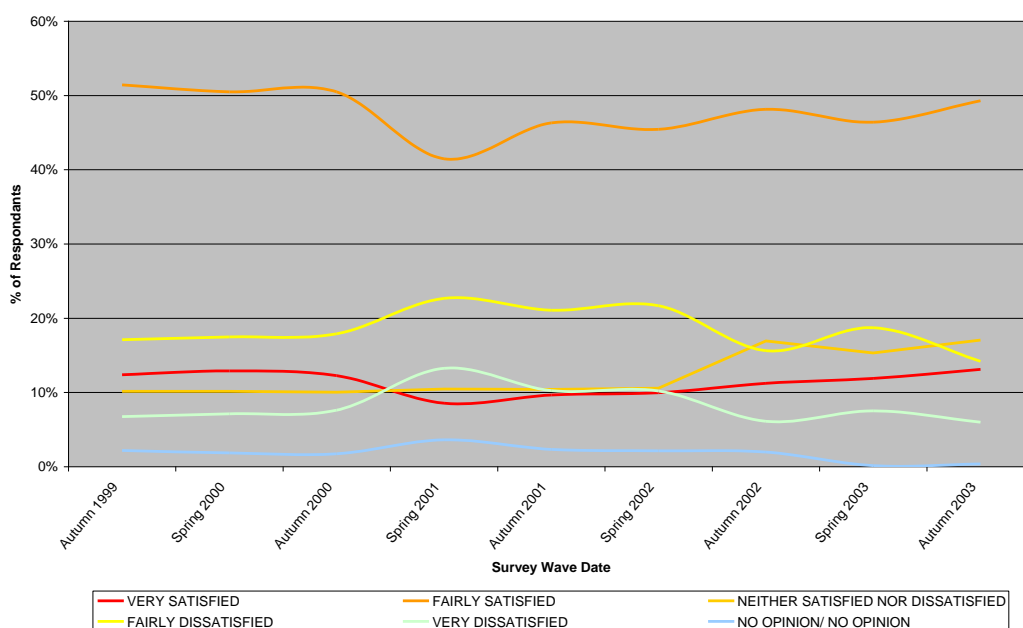


Source: MOIRA

7.6 Quality perception

Passengers' perception of the quality of rail services is a key factor in explaining the demand for rail travel. The National Passenger Survey (NPS) provides a rating of overall service quality. Figure 7.13 shows the overall service quality ratings between autumn 1999 and autumn 2003. It should be noted that since autumn 2003 the surveys have not included a question on passengers' overall perception of service quality. Nevertheless, it can be seen that passengers' satisfaction with train service quality has been affected by the Hatfield incident described in section 7.4. The most marked trend post-Hatfield is the increase in the proportion of passengers neither satisfied nor dissatisfied. There was a corresponding decline in both the 'very dissatisfied' and 'fairly dissatisfied' groups over the same period. Further analysis will be undertaken to assess the relationship between travel attitudes and travel behaviour, for example whether there is a correlation between crowding levels and passenger perception of crowding levels.

Figure 7.13: NPS –Overall Satisfaction with Train Service Quality

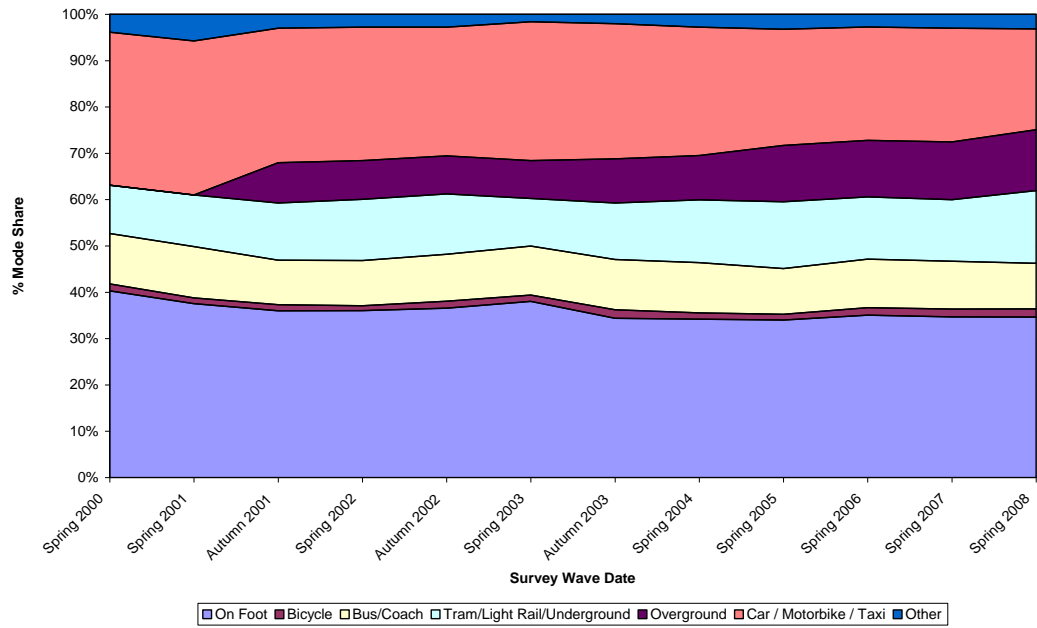


Source: NPS

7.7 Access/Egress Modes to Stations

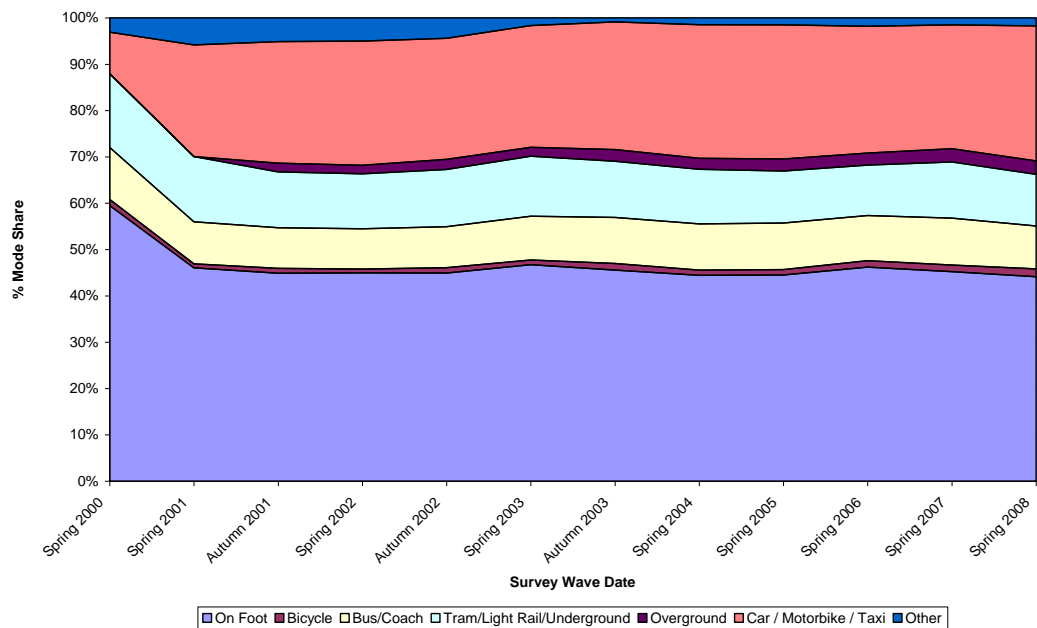
Passengers' access modes to stations using NPS data are shown in Figure 7.14 whilst egress modes are shown in Figure 7.15. The most popular access mode is walking to stations with some decline (6%) in this mode since spring 2000. Overground and underground show significant relative increases as access modes. Car as an access mode is defined as car, kiss and ride and car parked at/near stations. The egress mode changes over time show an apparent increase in car as an access mode which contrasts with the decline in use of car as an access mode.

Figure 7.14: Access Modes to Stations



Source: NPS

Figure 7.15: Egress Modes from Stations



Source: NPS

7.8 Station facilities and quality

Data on station facilities and quality is available from NPS data. This will be reviewed in the next stage of the market analysis.

7.9 Summary

This chapter has reviewed some of the key internal rail industry explanatory factors which are likely to have affected growth in rail demand. Further analysis of internal factors will be included in the next stage of the market analysis.

A review of trends by ticket type highlighted the rapid growth in advance purchase tickets since 2003. Within First Class ticket types, the growth in First Advance Single accounted for

a significant amount of the total growth in First Class ticket products and demonstrates the emergence of single leg pricing over a relatively short period of time. Standard ticket growth trends include the growth in Standard Day tickets reflecting higher than average pricing of London rail and a shift in the travellers' working patterns as more people commute less than 4-5 days a week. Growth in reduced walk-up tickets has shown less than average growth as a result of increasing purchase of advance purchase tickets. Season tickets have seen more growth in weekly seasons reflecting changes in work patterns with a likely increase in short term contractual working.

A key trend for ticketing has been the rapid increase in internet/call centres for the purchase of tickets as sales at station ticket offices have declined. In the next stage of the market analysis further investigation of the possible relationships between internet use and passenger demographics and ticket types will be carried out.

Crowding is a key service quality factor influencing growth in rail demand. Train passenger count data for services into London termini was assessed to determine the change in crowding over time. Comparison of trends in load factors by termini shows significant variation in the trend reflecting service capacity enhancements on some routes. Further assessment will be required in the market analysis to differentiate the contributory factors by route.

Performance measured by Public Performance Measure highlighted the effect of Hatfield across Inter-city, London and South East and Regional sectors with a post Hatfield recovery in performance levels similar to the long term trend over the last thirty years.

Quality of rail service in terms of the change in journey time showed that average journey time on the rail network has varied since 1990 with an increase in average journey time in the mid-1990s and a further increase post-Hatfield as a result of speed restrictions on the network. With improvements to the infrastructure average journey times have decreased at the same time as average journey speeds have increased, although this trend has stabilised in the last couple of years.

Passengers' perception of service quality dipped as a result of Hatfield and has subsequently improved. There has been a significant increase post Hatfield in the proportion of passengers neither satisfied nor dissatisfied.

Analysis of time series NTS data for access/egress modes highlighted walking to stations as the most used access mode. More extensive analysis of access/egress modes will be undertaken in the next stage of the market analysis using NRTS.

8 Other Factors Internal to the Rail Industry

8.1 Other Factors Internal to the Rail Industry

The objective of this chapter is to cover other factors internal to the rail industry, but which are not currently included in the Forecasting Framework. These factors have been split into measurable and less measurable factors. Measurable factors identified include: group size, new ticketing channels and revenue protection. Less measurable factors include the effect of integrated ticketing, marketing, impact of new rail projects on levels of demand and disruption to rail services. In identifying these factors reference was made to the additional explanatory variables discussed in the Rapid Growth study.

In the next stage of the market analysis a review will be undertaken of the availability of data and where feasible an analysis of the factors will be carried out. These factors will include trends related to more recent, but increasingly important changes, such as the growth in the internet for both obtaining information on rail services and fares and the purchase of e-tickets. These other factors include:

- **Group travel:** key to this analysis is to identify whether the data will enable the travel characteristics of group travel to be identified for rail together with comparison with other modes. A possible source of competing mode group size is TEMPRO which provide information on car drivers and car passenger trips.
- **New ticketing channels:** this analysis will overlap with the investigation into trends in internet usage for ticket purchase.
- **Revenue protection:** some information on the gating of stations may be available, but comprehensive data on gating phasing will be needed. Also, with respect to the Forecasting Framework the future application of this variable will be limited as the scope for further gating is reduced over time.
- **Integrated ticketing** (travelcards, Plus Bus and integrated domestic/international ticketing): NRTS will provide cross-sectional data on integrated ticketing and LENNON ticket sales data is also a source of data on travelcard usage.
- **Marketing** initiatives by operators – sources of data for this variable may be difficult to obtain.
- **Industry change** (privatisation, open access, new services, community rail): this is a series of factors with overlap with other factors including fares and ticketing, service quality and passenger perception.
- **Train service quality factors** (staff, catering, media perception, safety/crime): NPS will offer a data source for this analysis, but may need to be assessed at a high level.
- **Impact of new rail projects:** The impact of new rail projects will be addressed with regard to the geographic segmentation in the next stage of the market analysis. One key rail infrastructure project, WCML Upgrade will be the subject of a case study). Other new rail projects such as the Evergreen Project on the Chiltern Line will also be reviewed. The impacts of the new rail projects are likely to cover a range of independent variables ranging from performance and journey time changes to changes in passenger demand and revenue.
- **Disruption to rail services:** this represents the quantifiable impact of rail service disruption on rail passenger demand and revenue with and without the period of disruption together with passengers' perceptions of disruption. This will be investigated in the next stage of the market analysis and will be of particular relevance for the WCML case study.

9 Overall Conclusions

9.1 Introduction

This Rail Trends report represents the first major deliverable of the “Revisiting the Elasticity Based Framework” research programme. The purpose of this report was two-fold:

- to review, at a relatively aggregate level (national or government office region) the major trends in and affecting rail travel over the study period (broadly speaking since 1990); and
- to provide a commentary on those trends together with a discussion of how they should be treated in the subsequent work.

These overall conclusions are designed to summarise the report, but with more emphasis on the second bullet above.

9.2 Recent Developments Affecting the Rail Industry

Over the study period, there have been a number of significant changes in the rail industry. Broadly speaking, they can be grouped as follows:

- Privatisation and the attendant reorganisation;
- Hatfield and its consequences;
- Major projects; and
- Changes in competitive modes.

The changes around privatisation spanning the mid-1990s: as well as the complete shake-up of the rail industry were direct effects on passengers, notably the signallers' strikes in 1994. Hatfield and the subsequent disruption to rail services also depressed demand. The Long Time Series study³ noted these effects on demand. Each of these effects will need to be recognised in the econometrics work.

The two most significant major projects are the upgrades of the East Coast and West Coast main lines, although the former was more or less finished by 1990. These will be dealt with explicitly as a case study.

Over the period since 1990 there have been important changes in the competing modes. The introduction of low cost airlines triggered a modal shift from rail to air, which was to some extent reversed by the increased security following 9/11. On the roads, following a considerable amount of road building activity in the 1990s, there has been a reduction in the provision of new roads and average traffic speeds have been falling.

Competitive modes are a central part of the Framework: the challenge for the econometrics will be to develop a service measure (be it speed, congestion level, frequency etc) that is measurable, reflects customer perception and can be projected forward for use in forecasting.

9.3 Rail Market Trends

At the highest level, demand for rail travel over the study period shows an underlying growth across the period. There is a fall in demand in response to the last recession in the early 1990s, followed by a rapid growth between the time of privatisation and the Hatfield crash, which checked demand growth. Since then demand has been increasing strongly, although there is at least anecdotal evidence that this growth is softening as a result of the current economic recession. At present there is insufficient data available to analyse the impact of the current economic recession, but it may be possible to revisit this later in the study when more data (including 2008/9 full year) is available.

³ Econometric Analysis of Long Time Series Rail Passenger Demand Aggregates, MVA, November 2008

The more interesting trends appear when the analysis is disaggregated. At a product level there have been significant shifts in usage, driven, primarily, by the increased use of advance purchase tickets. Whilst initially these were aimed at the most price-conscious segment of the market, and were sold as return tickets only, the switch to single-leg ticketing has seen their use increase across all market segments, which is an important issue for future analysis, and in particular the market segmentation where the relationship between journey purpose and ticket type is key.

As would be expected, there are also significant geographical variations. London and the South East are dominant, but there has been differential growth between other regions: for example, Yorkshire and Humber has experienced a significantly higher rate of growth than other regions. For the next stage of the work it will be important to understand whether this is due simply to differential changes in economics and demographics, or whether there is a genuine difference in the way in which demand behaves between these areas, which would imply differences in forecasting parameters.

At an aggregate level, the ratio indicators of average journey length and average journey yield have remained relatively stable on average, with the former falling very slightly, and the latter increasing only very marginally above RPI. However, these national indicators will mask significant variations by sector and market segment: For example, significant increases in First Class fares will have been offset by the increased use of Advance Purchase tickets. This will be brought out in the market assessment with a more disaggregate consideration of rail market segmentation using cross-sectional data from the NRTS to provide the basis for geographic rail market segmentation by flow and corridor.

Similarly, a high level analysis of some potential external factors has indicated the importance of a more disaggregate analysis for the market assessment phase. For example, anecdotal evidence on house prices suggests that longer distance commuting in the South East of England has grown as out-migration from London has taken place to the rest of the South East. Further disaggregate analysis will enable a assessment of whether the housing variable can provide the basis for forecasting longer distance commuting or whether the current income variable provides the preferred basis for forecasting for this market segment.

Disaggregate analysis of rail's competitive position compared with car travel, using origin-destination data to compare relative journey time and cost for individual flows by mode will be a key aspect of the next stage of the market analysis work.

The availability of appropriate data both for undertaking time series analysis and for use in the future application of the Forecasting Framework is a further issue that has been highlighted by this report. Similarly, the report has reviewed factors such as ticket sales distribution channel changes, which represent a step change in a service attribute, but which may not have a long lasting impact on rail demand growth in the future.