

**Planning and Regulation**



**Route Planning**

**New Lines  
Programme**

# **Stated Preference Survey**

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CAR USER QUESTIONNAIRE AND SP CARDS

# 1 Background and Objectives

## Context

- 1.1 Network Rail has commissioned Steer Davies Gleave to investigate whether there is a strategic business case for building one or more new line(s) as additions to the national rail network.
- 1.2 The study geography is bound by the five 'classic line' route corridors that radiate in an arc to the west and north of London. These are the:
  - I Great Western Main Line (GWML)
  - I Chiltern (Marylebone to Birmingham via High Wycombe)
  - I West Coast Main Line (WCML)
  - I Midland Main Line (MML)
  - I East Coast Main Line (ECML)
- 1.3 The structured programme of work culminated in a recommendation as to whether to progress to a more detailed investigation of one or more new lines as a next phase of work.
- 1.4 The programme found that there is a case to take a new high speed line forward for further investigation and that the preferred corridor for such a line would be the London to North West & Scotland corridor.

## Stated Preference Survey

- 1.5 As part of the New Lines project, Steer Davies Gleave has been commissioned to undertake Stated Preference surveys to re-estimate relative importance given by passengers to various characteristics of their journey such as in-vehicle time, headway, mode and time or mode to access the rail station for the new service.
- 1.6 Initial weights for these parameters had been estimated as part of the research undertaken in 2002 for the development of the Planet Strategic Model (PSM). The aim of these surveys was to provide more up to date data to confirm, and potentially re-estimate these parameters.
- 1.7 Stated Preference surveys were conducted for air, rail and car users between November 2008 and February 2009. This report presents the surveys and their key outputs. Chapter 2 presents how the surveys were organised, where and when they took place. Chapter 3 details the analysis of the sample and finally Chapter 4 present the updated parameters from the Stated Preference exercises and compares them with PSM parameters.



## 2 Organisation of the Surveys

- 2.1 The purpose of Stated Preference (SP) Studies is to assess how respondents' choices vary in different hypothetical situations. SP is a survey technique concerned with measuring and understanding the preferences underlying people's stated choices, based on how they respond to hypothetical situations. In SP research respondents are presented with choices between hypothetical but realistic alternatives, with each alternative being described in terms of their characteristics or "attributes". By varying the values of these attributes in a carefully controlled way (using an experimental design with appropriate statistical properties), we can learn about how much importance people attach to each attribute on the basis of the choices they make. It is also possible to estimate choice probabilities for given choice alternatives similar to those studied.
- 2.2 The SP survey collected stated choice data that will be used to estimate discrete choice models of transport choice and will form a key input to the demand model. People eligible for the survey undertook a recent journey either by car, air, or rail of at least two hours between any pair cities on each of these 3 routes:
- | London and Manchester (business and leisure trips); and
  - | London and Glasgow (business and leisure trips).
- 2.3 People travelling by coach are out of the scope of this study.

### Fieldwork

#### *Pilot*

- 2.4 The pilot phase was split into 2 phases: the first part, conducted on Thursday 13th November and Friday 14th, surveyed rail and car users and the second part, undertaken at the end of November on Thursday 27th and Friday 28th interviewed air users. A second pilot took place on January, 15th at Manchester airport.
- 2.5 Rail interviews took place on-board Virgin trains between London and Manchester and questionnaires were self-completed. Car interviews were undertaken at the service station next to Northampton on the M1 and were face to face interviews. The pilot phase of air interviews took place at Gatwick rail station and consisted of face-to-face interviews.
- 2.6 Respondents for each mode answered a paper questionnaire that had been tailored to each mode, although broadly similar.
- 2.7 Each respondent were shown two Stated Preference exercises. The first SP exercise was a three way choice between 3 long-distance modes. For the second SP exercise, all three answered the same access/egress exercise.

New Lines Programme: Stated Preference Survey

2.8 The following summarises each of the three interview types:

TABLE 2.1 STATED PREFERENCE EXERCISES SEEN PER RESPONDENT

Current main mode	SP1	SP2	SP3
	Mode choice	Mode choice	Access mode choice
	Classic Rail - HSR - Air	Classic Rail - HSR - Car	Rail - PT - taxi
Rail	X		X
Air	X		X
Car		X	X

*Main*

- 2.9 The main phase was based on the pilot questionnaire. There were no changes to either of the SP exercises however there were minor changes to the wording and options for some of the extra questions. These changes were made to increase the clarity and simplicity of the questionnaire.
- 2.10 The main phase was split into 2 phases:
  - | Rail: 5<sup>th</sup> - 12<sup>th</sup> December and 13<sup>th</sup> - 17<sup>th</sup> January 2009;
  - | Car: 5<sup>th</sup> - 12<sup>th</sup> December and 5<sup>th</sup> - 25<sup>th</sup> January 2009; and
  - | Air: the air fieldwork took place between Monday 19<sup>th</sup> January and Wednesday 4<sup>th</sup> February.
- 2.11 Rail and car interviews were undertaken in the same way. Air interviews were carried out at Manchester airport: the interviews were undertaken airside.
- 2.12 The fieldwork was initially planned to take place late in the autumn with all modes being interviewed at the same time. Unfortunately obtaining authorisations to survey at the airports proved to be very difficult. BAA would not accept surveys at any of their airports (Gatwick, Heathrow, Glasgow or Edinburgh).
- 2.13 An initial pilot phase was undertaken at Gatwick Rail station this would have been combined with a programme of interviewing passengers accessing the airport by car. In the meantime, the discussions with Manchester Airport were more fruitful and eventually authorisations were granted to interview airside in December 2008.
- 2.14 It was decided to delay the fieldwork in order to interview airside rather than conducting the interview at Gatwick rail station and Gatwick car park. Unfortunately, this meant that the subsequent SP analysis was delayed, with results becoming available in early March. However, this did provide sufficient time for the core result (New lines modal preference) to be incorporated into the forecasts and strategic business case analysis.

## Questionnaire

- 2.15 The first part of the questionnaire asks the respondents to describe their current journey and it includes questions on the following:
- | Journey's origin and destination;
  - | Journey Purpose;
  - | Journey duration;
  - | Access and egress mode and cost;
  - | Whether the respondent was travelling with luggage;
  - | Whether the respondent was travelling with children;
  - | Type of ticket the respondent was travelling on; and
  - | Who was paying for the respondents' journey.
- 2.16 The second part of the questionnaire describes the New Lines scheme briefly and asks whether the respondent would choose the new service or not, and which factors would influence their decision.
- 2.17 The third part of the questionnaire is the Stated Preference (SP) exercise, in which the respondent is shown cards for the mode-choice and access-egress SP and is asked to make decisions on varying attributes and their levels.
- 2.18 The final part of the survey asks the respondent whether there was a car available for the journey, the frequency of similar journeys, and respondents' socio-economic profile. The survey signs off with a request to the respondent to give further comments if they wish to.



### 3 Sample Profile

#### Presentation

- 3.1 The number of total respondents with their journey purpose and the number of respondents excluded for every mode are given in table Table 3.1.

TABLE 3.1 NUMBER OF RESPONDENTS BY JOURNEY PURPOSE

	Rail	Air	Car
Business	246	203	162
Leisure	207	48	191
Total (before exclusion)	453	251	353
Excluded	5	1	3

#### Current Journey

- 3.2 Respondents were asked to describe their current journey or a recent journey that they have undertaken in the corridor within the past month. The following paragraphs detail how these journeys vary by mode and purpose.

#### *Cost of the journey*

- 3.3 Table 3.2 presents one-way costs. This does not include access costs to the station or airports. Single way air or rail ticket could go up to £200 for business travellers.

TABLE 3.2 AVERAGE ONE-WAY COST

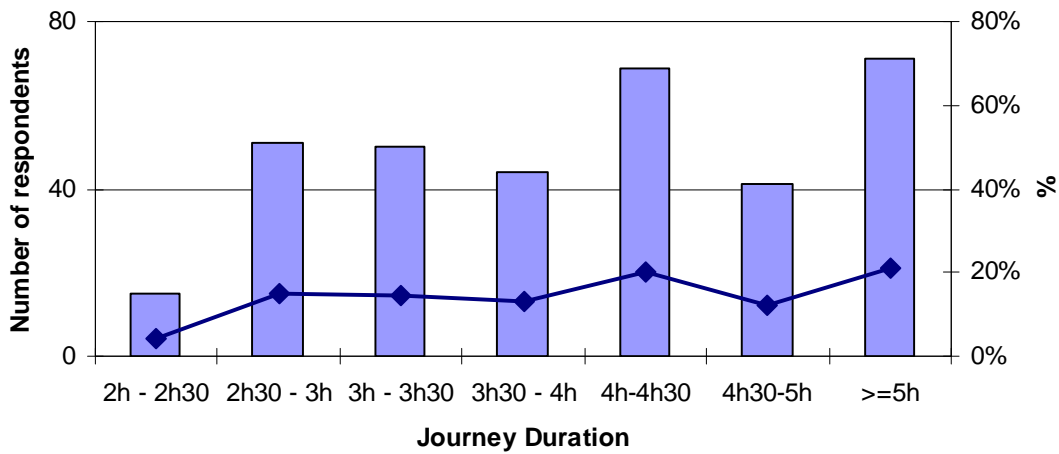
	Rail	Air	Car (excluding parking costs)
Business	£67	£82	£36
Leisure	£27	£48	£38
All purposes	£49	£77	£37

#### *Journey duration*

- 3.4 Figure 3.1 depicts the journey times in minutes for car distributed with respect to the journey purpose. For car, most people had journeys between 4 hours and 4.5 hours.

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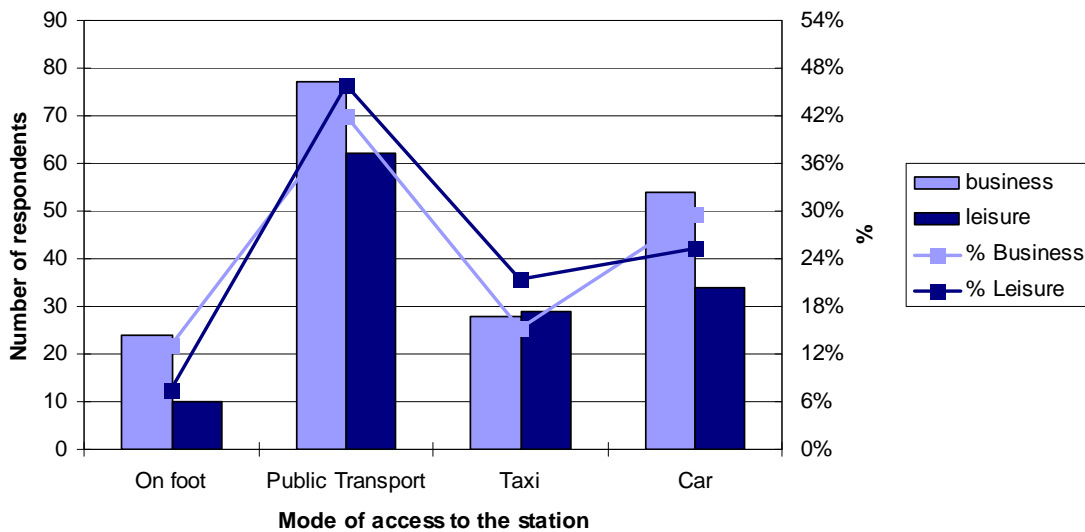
FIGURE 3.1 JOURNEY DURATION - CAR



*Mode of access and egress*

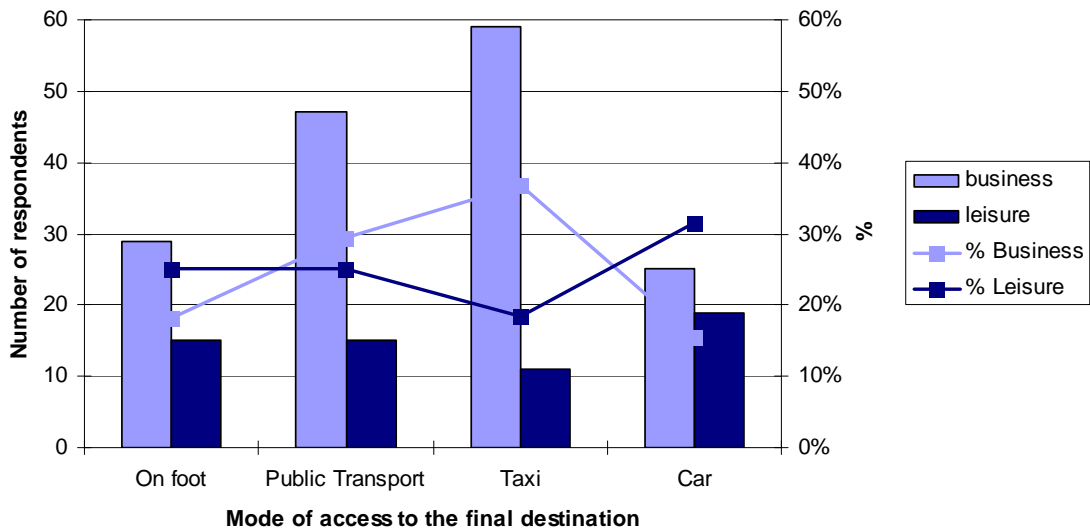
3.5 Figure 3.2, Figure 3.3, Figure 3.4 and Figure 3.5 show the modes of access and egress for air and rail with respect to their journey purpose. The average access time for people who walked to the station was 13 minutes, which is reasonable. Most of the respondents who travelled by rail used Public Transport (local or regional rail) to access the station.

FIGURE 3.2 MODE OF ACCESS - RAIL



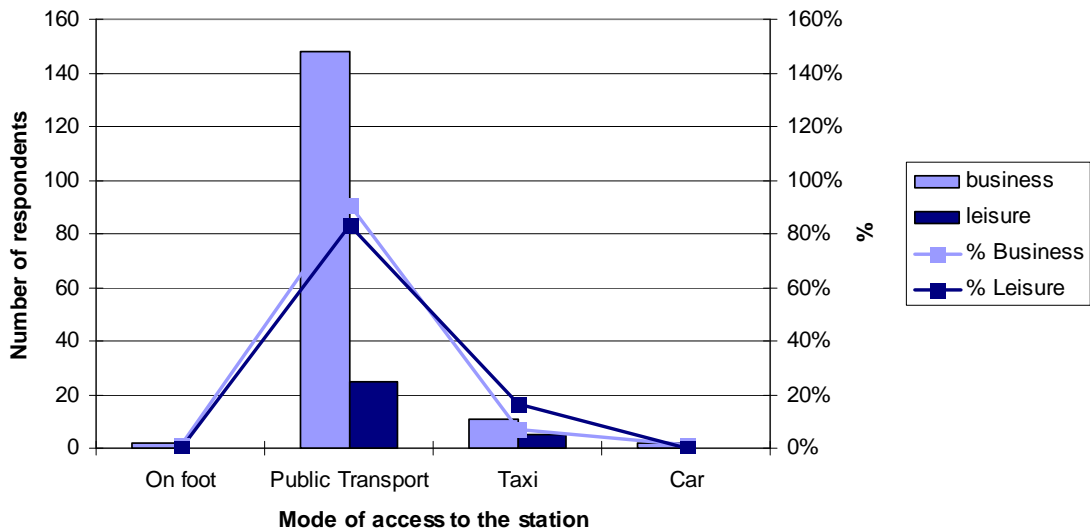
3.6 Most of the respondents who travelled by rail used taxi or public transport to access their final destination.

FIGURE 3.3 MODE OF EGRESS - RAIL



3.7 Most of the people accessed the airport via public transport. Two respondents said they walked and indicated either a 5 or 10 minute walk to the airport.

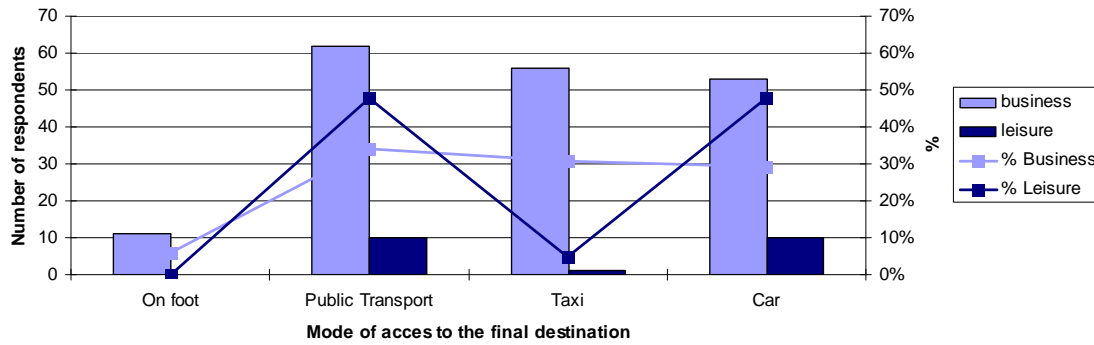
FIGURE 3.4 MODE OF ACCESS - AIR



3.8 The modes used to reach the final destination varied in a balanced way between Public Transport, Taxi and Car. 11 respondents said they walked and indicated either a 5 or 10 minute walk from the airport.

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FIGURE 3.5 MODE OF EGRESS - AIR

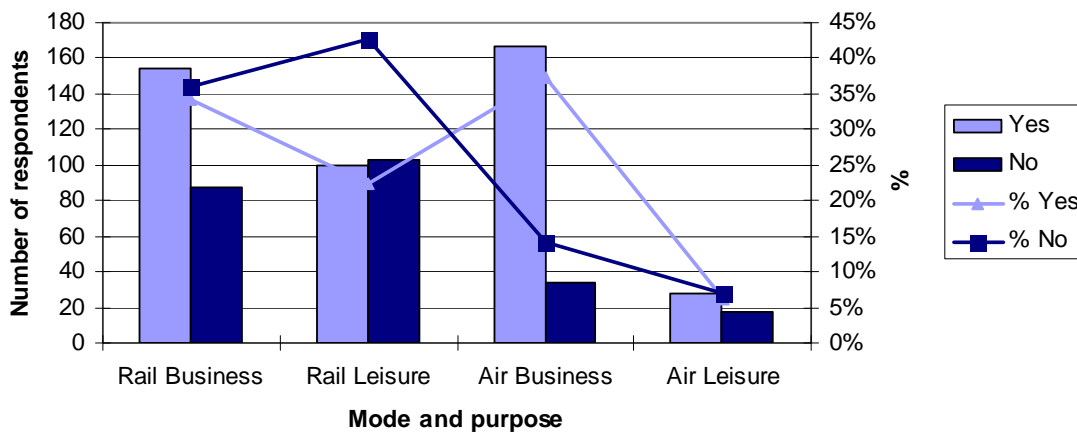


*Journey description*

3.9 Most of the air and rail respondents were travelling on their own (2/3 of the rail respondents, 87% of the air users). Car respondents were more frequently travelling with other people: a third of them were travelling alone, another third were travelling with one person only and the remaining ones were travelling with at least two other people.

3.10 Figure 3.6 shows car availability for respondents. This information is distributed between Rail and Air with respect to the journey purposes. 15 air users and 90 rail users did not own a car at all and are included.

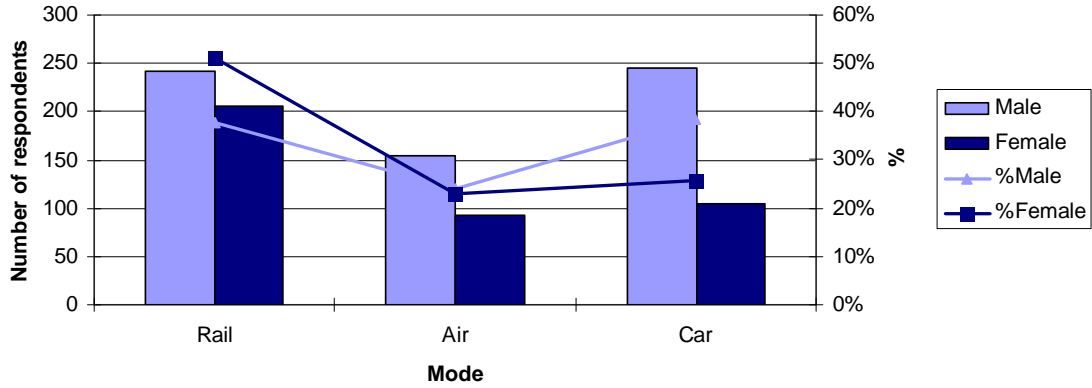
FIGURE 3.6 CAR AVAILABILITY BY PURPOSE AND MODE



Socio-Economic Profile

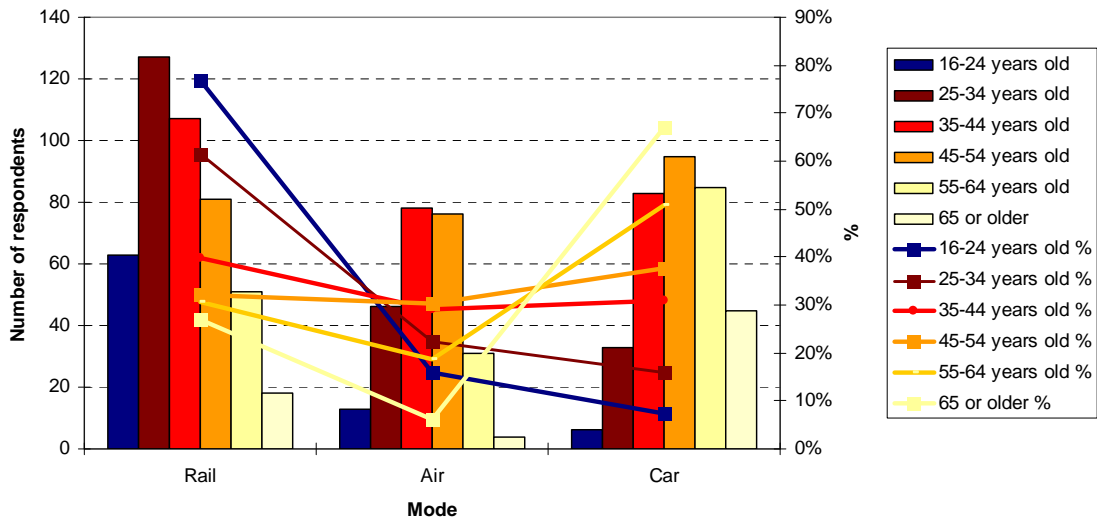
3.11 Figure 3.7 shows the gender profile of the users with respect to the modes travelled.

FIGURE 3.7 GENDER PROFILE



3.12 Figure 3.8 shows the age profile of the respondents distributed with respect to the modes used. For rail, the highest number of respondents belonged to the age group of 25 to 34 years old whereas for air and car, the most respondents came from the age group of 35 to 44 years and 45-54 years, respectively.

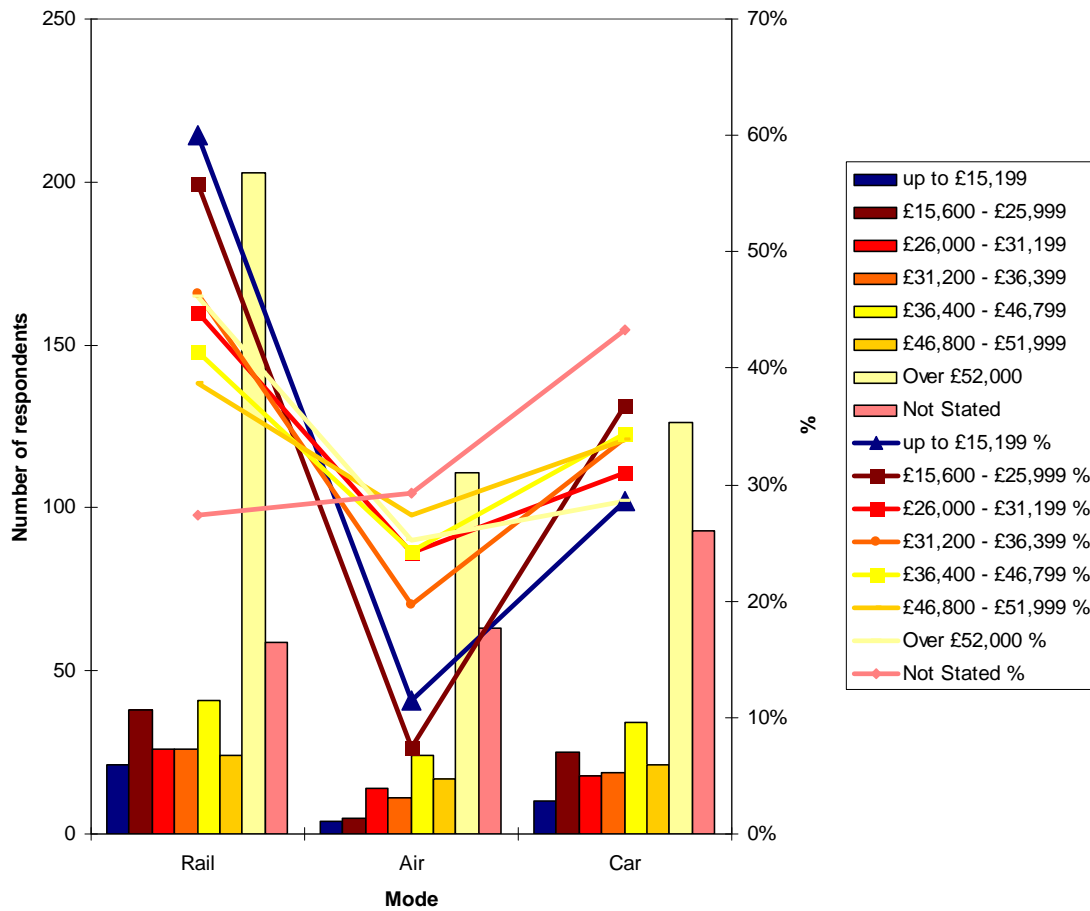
FIGURE 3.8 AGE PROFILE



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3.13 Figure 3.9 shows the income profile of the respondents with respect to the modes used. The car user category was the one with the largest proportion of people who did not state their income.

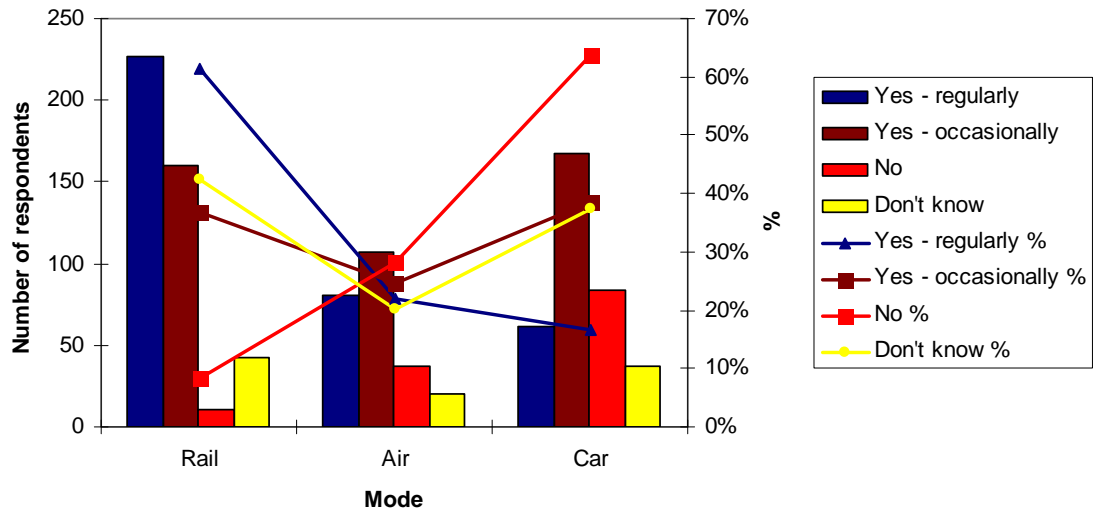
FIGURE 3.9 INCOME PROFILE



### Attitude Towards the New Service

3.14 Figure 3.10 shows if people were willing to use the new proposed service. This question can be used to flag out people who are definitely against the service and can be used in the Stated Preference analysis. As it can be seen, rail users are most enthusiastic about it.

FIGURE 3.10 ATTITUDE TOWARDS THE SERVICE





## 4 Analysis of the mode choice SP exercise



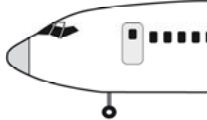
4.1 Each respondent saw two Stated Preference exercises: the first one was concerned with mode choice and offered a choice between:

- | Classic Rail - High Speed Rail - Air for rail and air users
- | Classic Rail - High Speed Rail - Car for car users

4.2 It was considered that showing all four modes in each survey would lead to an overly complex survey that would be onerous to complete.




4.3 Figure 4.1 and Figure 4.2 present one example of SP choices presented to the respondent. Full questionnaires are available in Appendices C to F.

FIGURE 4.1 EXAMPLE OF MODE CHOICE SP CARD (AIR AND RAIL USERS)

	Existing Rail Service	High Speed Rail	Air
<b>Service Frequency</b>	 every 20 mins	 every 20 mins	 every 90 mins
<b>Journey Time</b>	3 h 30 mins	1 h 40 mins	2 h 15 mins
<b>One-way Cost</b>	£80	£95	£90
<b>Which of these options do you prefer?</b>			
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SP1-2

FIGURE 4.2 EXAMPLE OF MODE CHOICE SP CARD (CAR USERS)

SP2-2	Existing Rail Service	High Speed Rail	Car
<b>Service Frequency</b>	 every 20 mins	 every 60 mins	 -
<b>Journey Time</b>	3 h 55 min	2 h 30 min	4 h 30 min
<b>One-way Cost</b>	£65	£80	£40
<b>Which of these options do you prefer?</b>			
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4.4 The second exercise dealt with access mode to the rail station, assuming that the respondent would use the new rail service and valuation of access time.

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4.5 This chapter presents the results of the mode choice exercise, and their application in the demand forecasting framework. In the following chapter, the key findings from the access SP exercise are presented.

*Choice proportions*

4.6 The choice proportions are useful to understand if the respondents understood the Stated Preference exercises and reacted to the proposed trade-offs in a sensible way, i.e. the higher cost a service is, the fewer people chose it.

4.7 The following tables show the percentage of people choosing each option when a change in journey time and cost occurs and thus the sensitivities to these changes. People were sensitive to changes in in-vehicle time or one-way cost but not to changes in headway which is hence not mentioned here. The level of headway presented to the respondent was between 20 and 60 minutes and was thus covering a wide range. Only rail and high-speed rail headway levels were varying. Air headway level was assumed to be constant to 1h30 minutes.

4.8 Each table presents the percentage of respondents choosing one of the three options when either classic rail in-vehicle time varies or when high speed rail in-vehicle time varies. Table 4.1 and Table 4.2 show the choice proportions when either Classic Rail in-vehicle time varies or High Speed Rail in-vehicle time varies.

**TABLE 4.1 RAIL AND AIR RESPONDENTS CHOICE PROPORTIONS: VARYING CLASSIC RAIL IN-VEHICLE TIME**

IVT (mins)	Rail users			Air users		
	% choosing Classic Rail	% choosing High Speed Rail	% choosing Air	% choosing Classic Rail	% choosing High Speed Rail	% choosing Air
150	50%	46%	4%	12%	51%	37%
210	25%	66%	9%	5%	54%	41%

4.9 As the journey time of classic rail increase from 150 to 210 minutes, the percentage of people choosing classic rail is halved and is distributed across high speed rail and air. For a 20 minute change in the journey time of high speed rail, the same phenomenon occurs but not as severe as classic rail.

**New Lines Programme: Stated Preference Survey**

4.10 As the journey time of classic rail increase from 150 to 210 minutes, the percentage of people choosing classic rail is halved and is distributed across high speed rail and air. For a 20 minute change in the journey time of high speed rail, the same phenomenon occurs but not as severe as classic rail.

**TABLE 4.2 RAIL AND AIR RESPONDENTS CHOICE PROPORTIONS: VARYING HIGH SPEED RAIL IN-VEHICLE TIME**

IVT (mins)	Rail users			Air users		
	% choosing Classic Rail	% choosing High Speed Rail	% choosing Air	% choosing Classic Rail	% choosing High Speed Rail	% choosing Air
100	30%	65%	5%	6%	59%	35%
120	44%	48%	8%	10%	46%	44%

4.11 Again it is seen from Table 4.3 and Table 4.4 that as the cost increases for classic rail or high speed rail, respondents chose to move to different modes. If the cost difference is low the trading is also lower, whereas if the cost difference is high e.g., from £ 95 to £130 for high speed rail, a higher level of trading occurs between high speed rail and other modes.

New Lines Programme: Stated Preference Survey

TABLE 4.3 RAIL AND AIR RESPONDENTS CHOICE PROPORTIONS: VARYING CLASSIC RAIL COST

Cost (£)	Rail users			Air users		
	% choosing Classic Rail	% choosing High Speed Rail	% choosing Air	% choosing Classic Rail	% choosing High Speed Rail	% choosing Air
60	50%	46%	5%	14%	50%	36%
70	39%	54%	7%	9%	51%	40%
80	30%	63%	7%	5%	54%	41%

TABLE 4.4 RAIL AND AIR CHOICE PROPORTIONS: VARYING HIGH SPEED RAIL COST

Cost (£)	Rail users			Air users		
	% choosing Classic Rail	% choosing High Speed Rail	% choosing Air	% choosing Classic Rail	% choosing High Speed Rail	% choosing Air
90	26%	64%	10%	6%	52%	42%
95	30%	66%	3%	7%	57%	57%
130	64%	28%	8%	14%	43%	43%

4.12 For air users, when the cost for classic rail increases to £70, 9% of the people said they would use classic rail (see Table 4.3) whereas 51% said they would use high speed rail. However, when the price rises to £80, only 4% choose to use classic rail whereas the percentage of respondents choosing high speed rail goes up to 54%. People who chose air are more or less insensitive to price or IVT changes in classic rail.

4.13 Table 4.5, Table 4.6, Table 4.7 and Table 4.8 show the choice proportions for car users. They illustrate the fact that for car users, when the cost increases from £50 to £60 for people who chose classic rail, the percentage of people who said they would choose classic rail falls from 20% to 12%, while the percentage of people who chose high speed rail rose from 26% to 32%.

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TABLE 4.5 CAR RESPONDENTS CHOICE PROPORTIONS: VARYING CLASSIC RAIL IVT

IVT (minutes)	% choosing Classic Rail	% choosing High Speed Rail	% choosing Car
175	11%	30%	59%
180	21%	25%	53%
210	12%	34%	54%
235	9%	37%	54%

TABLE 4.6 CAR RESPONDENTS CHOICE PROPORTIONS: VARYING HIGH SPEED RAIL IVT

IVT (minutes)	% choosing Classic Rail	% choosing High Speed Rail	% choosing Car
120	11%	30%	59%
150	14%	32%	54%

TABLE 4.7 CAR RESPONDENTS CHOICE PROPORTIONS: VARYING CLASSIC RAIL COST

Cost (£)	% choosing Classic Rail	% choosing High Speed Rail	% choosing Car
50	20%	26%	53%
60	12%	32%	57%
65	11%	35%	55%

TABLE 4.8 CAR RESPONDENTS CHOICE PROPORTIONS: VARYING HIGH SPEED RAIL COST

Cost (£)	% choosing Classic Rail	% choosing High Speed Rail	% choosing Car
70	10%	43%	47%
80	17%	26%	57%
90	16%	16%	69%

*Trading analysis*

4.14

A respondent is said to have traded if he chose at least once two different modes and that he did not always choose his current or preferred mode. The following table shows the trading proportions with respect to journey purpose.

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- 4.15 For example, almost 84% of leisure travellers on rail always traded. Trading level for car users is lower than for the other modes: this was expected since people travelling by car are usually doing so either for practical purposes or because they like it and are more reticent to switch to other modes.
- 4.16 It is important to note that the people who did not trade either always chose their current mode or another one. For instance, amongst the air users who did not trade, half of them always chose high speed rail and half of them always chose air. This is a sign that the Stated Preference exercise is not too biased towards one mode.

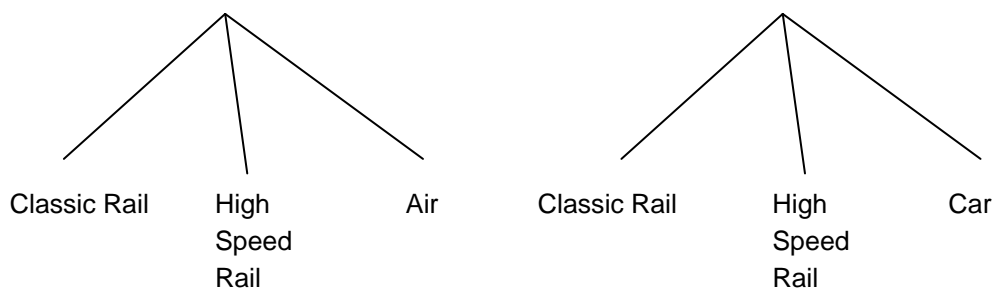
TABLE 4.9 TRADING ANALYSIS MODE CHOICE SP

Mode	Business	Leisure
Rail	86%	84%
Air	65%	72%
Car	58%	50%

*Model calibration*

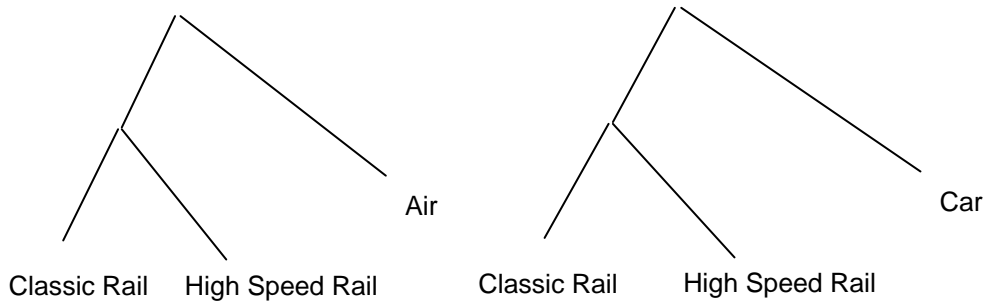
- 4.17 Several models were tested which included both Multinomial and Nested logit models.
- 4.18 The multinomial structure illustrated in Figure 4.3 assumes that the three modes are independent. Two different models were calibrated, one including air and rail respondents offered a choice between classic rail, high-speed rail and air, the other offered a choice between two rail options and car

FIGURE 4.3 MULTINOMIAL MODELS



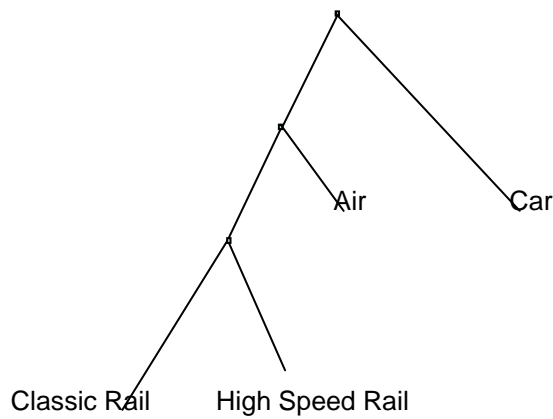
- 4.19 The nested logit models fell into three main categories. First, a single level nested logit model (see Figure 4.4) where classic and high-speed rails were distinguished between and grouped under one category namely, rail. This model assumes that the two rail options are not independent and share common characteristics. A similar but separate model was calibrated for car users, distinguishing car from the "rail" nest. Our preferred models come from this structure. The nest parameter for car was significantly different than 1. For the air-rail choice, the parameter was quite close to 1, which indicates that the air option is quite similar to the rail ones for this mode choice exercise.

FIGURE 4.4 SINGLE-LEVEL NESTED MODEL



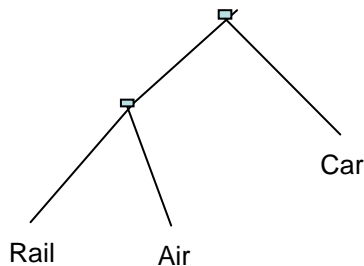
4.20 Second, a double-level nested logit model (shown in Figure 4.5) whereby car and public transport were differentiated with air and rail coming under the public transport branch; additionally, rail was further divided into a nest with high-speed and classic rail acting as two different nodes.

FIGURE 4.5 DOUBLE-LEVEL NESTED MODEL



4.21 Third, a model whereby distinction between classic and high-speed rail was not made and both were grouped under Rail (shown in Figure 4.6).

FIGURE 4.6 CLASSIC AND HIGH-SPEED GROUPED UNDER RAIL: NESTED MODEL



4.22 A generic example of the utility function for classic rail is as follows:

$$\text{Classic Rail} = \text{BETA\_COST} * \text{cost\_classic\_rail} + \text{BETA\_HWAY} * \text{headway\_classic\_rail} + \text{BETA\_JT} * \text{time\_classic\_rail} + \text{mode\_constant}$$

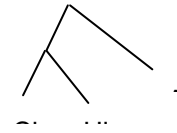
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- 4.23 The above example shows that the utility function consists of the cost, the in-vehicle-time (IVT) and the headway. Various models were tested either by adding an alternative specific constant and having the same BETA\_COST, BETA\_HWAY and BETA\_JT for all modes or by having the relative weight on in-vehicle time vary per mode and not having a mode constant. This latter is equivalent to assuming that the mode constant is not a one-off value but that the impact of the mode is continuous as the journey time varies.

#### *Model results*

- 4.24 A large number of models were tested: Table 4.10 and Table 4.11 give the results from the two preferred models i.e. models 10 and 12 for the air-rail and car samples respectively. These are the final results that were used for further analysis. Both are nested structures. It should be noted here that if the nest parameter is close to 1 then the nest is not very strong. The figures in italics indicate insignificant values.
- 4.25 The value of travel time savings for classic rail users travelling on business purpose that is very close to the PSM value. It should be noted that the value of travel time savings on high speed rail is lower than the one for classic rail, which was expected. It is lower than the PSM value to which a large mode constant was associated. In the absence of any mode constant, the value of time for High Speed Rail is smaller.

TABLE 4.10 PREFERRED MODEL - MODEL 10 - AIR-RAIL SAMPLE  
NESTED STRUCTURE



Parameter	Value	T-stat	Relative value	PSM Values (inflated to 2008)
Cost	-0.037	-8.71		
Classic Rail IVT (Business)	-0.025	-8.47	£ 39.6/h	£ 40/h
Classic Rail IVT (Leisure)	-0.016	-7.46	£ 25.2/h	£ 11/h
High Speed Rail IVT (Business)	-0.019	-7.09	£ 30.2/h	£ 51/h
High Speed Rail IVT (Leisure)	-0.0145	-5.68	£ 23.3/h	£ 14/h
Air IVT (Business)	-0.0225	-10.83	£ 36.1/h	£ 51/h
Air IVT (Leisure)	-0.022	-10.68	£ 35.3/h	£ 14/h
Headway (Business)	-0.012	-6.4	£ 19.3/h	£ 22/h for Classic Rail and HSR £ 12/h for Air
Headway (Leisure)	-0.003	-1.61	£ 5.3/h	£ 8/h for CR £ 2/h for HSR and Air
Nest parameter	1.19	8.36		

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TABLE 4.11 PREFERRED MODEL - MODEL 12 - CAR SAMPLE  
NESTED STRUCTURE

Parameter	Value	T-stat	Relative value	PSM Values (inflated to 2008)
Cost	-0.0242	-9.7		
Classic Rail IVT (Business)	-0.0095	-5.43	£ 24/h	£ 40/h
Classic Rail IVT (Leisure)	-0.007	-4.37	£ 20	£ 11/h
High Speed Rail IVT (Business)	-0.008	-3.59	£ 19/h	£ 51/h
High Speed Rail IVT (Leisure)	-0.006	-2.89	£ 15/h	£ 14/h
Car IVT (Business)	-0.009	-6.54	£ 23/h	£ 40/h
Car IVT (Leisure)	-0.004	-3.15	£ 11/h	£ 14/h
Headway (Business)	-0.005	-3.82	£ 12/h	£ 22/h for Classic Rail and HSR £ 12/h for Air
Headway (Leisure)	-0.002	-1.76	£ 6/h	£ 8/h for Classic Rail £ 2/h for HSR and Air
Nest parameter	3.39	7.5		

- 4.26 For the air and rail sample, (see Table 4.10) the relative values for IVT for business travellers on Classic Rail calibrated on the collected sample are of the same order or magnitude as the PSM parameters for business people (£30/h to £40/h compared to the PSM values (£40/h to £50/h). However the leisure parameters are significantly higher (£20/h - £35/h) than the PSM values (£11/h to £14/h).
- 4.27 It is known that a Stated Preference design is tailored to capture some value of time better than others, i.e. the ones in the core part of the range of values of time underlying each SP card. In this particular case, our SP design could have captured values as low as the PSM leisure value of time. The fact that the leisure values of time are higher than expected is thus not a side effect of our design.

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- 4.28 These issues were investigated by calibrating different models that are presented in the appendices of this document, but this did not improve on the model calibration.
- 4.29 For the car sample, the value of time for High Speed Rail leisure travellers, is very similar to the inflated PSM values. The valuation of travel time savings by rail for car users is lower than the one for rail users (Business travellers: £24/h instead of £39/h, leisure travellers: £20/h instead of £25).
- 4.30 From these preferred models it was noted that the value of time for leisure was higher than expected, which led us to test several more models. These are set out in Appendix A.

### *Use of Stated Preference analysis in demand modelling*



- 4.31 As discussed in Chapter 2, the results of the preferred model (cf. Table 4.10) were used to derive values of time for high-speed rail segmented by purpose, relative to classic rail in-vehicle time. Revealed Preference calibration was not updated from the PSM research and thus the nest parameters and classic rail, air and car values of time were kept unchanged from the PSM research. However, the relative values employed were:
- | a business high speed rail value of time being 25% lower than classic rail value of time;
  - | a leisure high speed rail value of time being 8% lower than classic rail; and
  - | commuter values were unchanged from PSM.
- 4.32 More detail on the reasons underlying this selection of parameters is provided in the demand and revenue model report.

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## 5 Analysis of the Access and Egress SP exercise

5.1 The same SP exercise was presented to all respondents. Respondents were asked to compare ways of accessing the rail station, if they were to use the new rail service. Figure 5.1 presents an example of the SP card.

FIGURE 5.1 EXAMPLE OF ACCESS SP CHOICE

	Option A	Option B
Mode of Transport	 Rail	 Rail
Journey time	30 min	40 min
Cost	£8	£4
Which of these options would you prefer?		
	<input type="checkbox"/>	<input type="checkbox"/>

### Analysis of the Choice Proportions

5.2 The access-egress SP was different in design from the mode-choice SP. The left hand card, or Option A, always represented a shorter journey but more expensive. The right hand card, or Option B, always represented a longer journey but cheaper than Option A. As the cost difference increases, more respondents tend to choose the cheaper option. It is seen from Table 5.1 that when there was a difference of £2 for option A, 79% people chose the more expensive option. When the difference was increased to £8, only 44% chose the more expensive option.

TABLE 5.1 CHOICE PROPORTIONS: DIFFERENCE IN COST - ALL USERS

Difference between Left card and Right card (£)	Option A: quicker, more expensive	Option B: longer, cheaper
2	79%	21%
4	54%	46%
8	44%	56%

5.3 Table 5.2 presents the results for the whole sample. When segmented by existing mode, it is to be noted that rail users were the most sensitive to changes in access time.

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TABLE 5.2 CHOICE PROPORTIONS: DIFFERENCE IN ACCESS TIME - ALL USERS

Difference between Left card and Right card (min of access)	Option A: quicker, more expensive	Option B: longer, cheaper
10	49%	51%
15	56%	44%
25	72%	28%

*Trading analysis*

5.4 Table 5.3 shows the trading proportions for different modes. These are very high and indicate that most of the respondents chose different modes of access according to their characteristics.

TABLE 5.3 TRADING ANALYSIS - ACCESS AND EGRESS SP

Mode	% of traders per current mode
Rail	93%
Air	90%
Car	92%

*Model calibration*

5.5 Table 5.4 to Table 5.9 show the results of the logit models for different modes with respect to journey purpose. The constant indicates that, all things being equal, access by rail is preferred to access by bus by an equivalent of 10 minutes of access time. Taxi is valued slightly better than rail by business people travelling by train on their long-distance journey.

TABLE 5.4 RAIL USERS - BUSINESS TRAVELLERS

Parameter	Value	Z Value	Relative value
Cost	-0.32	-16.37	
IVT	-0.09	-18.24	£ 18/h
Rail vs. bus ASC	0.95	9.72	10 minutes
Taxi vs. bus ASC	1.66	7.08	12 minutes

5.6 People travelling for leisure purpose value access by rail slightly better than access by taxi. It can be seen that the monetary value of access time for leisure travellers is lower than business travellers by almost £5.

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TABLE 5.5 RAIL USERS - LEISURE TRAVELLERS

Parameter	Value	Z Value	Relative value
Cost	-0.38	-15.0	
IVT	-0.077	-11.92	£ 12/h
Rail vs. bus ASC	0.97	8.83	12.5 minutes
Taxi vs. bus ASC	0.79	4.6	10 minutes

5.7 Air travellers have a much higher valuation of access time but do not value much the difference of mode of access, the important factor being journey time.

TABLE 5.6 AIR USERS - BUSINESS TRAVELLERS

Parameter	Value	Z Value	Relative value
Cost	-0.15	-8.5	
IVT	-0.08	-14.3	£ 35/h
Rail vs. bus ASC	0.6	5.3	6.5 minutes
Taxi vs. bus ASC	0.7	4.05	8 minutes

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TABLE 5.7 AIR USERS - LEISURE TRAVELLERS

Parameter	Value	Z Value	Relative value
Cost	-0.02	-5.3	
IVT	-0.06	-5.9	£ 18.3/h
Rail vs. bus ASC	0.03	1.5	6 minutes
Taxi vs. bus ASC	0.5	1.3	8 minutes

5.8 Car travellers, especially the ones travelling for leisure purposes, value very differently on access by bus or rail than access by taxi to the rail station.

TABLE 5.8 CAR USERS - BUSINESS TRAVELLERS

Parameter	Value	Z Value	Relative value
Cost	-0.15	-5.1	
IVT	-0.07	-7.5	£ 29/h
Rail vs. bus ASC	0.23	1.03	3 minutes
Taxi vs. bus ASC	0.9	3.0	12 minutes

TABLE 5.9 CAR USERS - LEISURE TRAVELLERS

Parameter	Value	Z Value	Relative value
Cost	-0.2	-7.7	
IVT	-0.04	-5.7	£ 12/h
Rail vs. bus ASC	0.3	1.3	7 minutes
Taxi vs. bus ASC	1.1	2.8	24 minutes

APPENDIX  
A  
MAIN MODEL CALIBRATION

## A1. MODE CHOICE SP RESULTS

As discussed in Chapter 4, different models were calibrated in order to see how the relative weight to journey time and frequency would vary. This Appendix presents models whose structures vary substantially from the preferred model. Appendix B presents the results of some additional models whose structures are closer to the preferred model.

The findings from these models are in-line with results obtained with the preferred model. When it has not been the case, it was mainly because the model failed to calibrate in a satisfactory manner.

Models tested included

- | Estimating the relative weight to generalised journey time, rather than in-vehicle time only;
- | Segmenting the results by route (Glasgow/Manchester);
- | Having a discrete representation of headway;
- | Combining both rail options into a single one;
- | Calibrating the models on the whole sample (air-rail-car users);
- | Estimating the relative weight to a non-linear impact of change in in-vehicle time;
- | Estimating the variation amongst respondents.

## A2. GENERALISED JOURNEY TIME

This section, discusses the results of the models where instead of the In-Vehicle-Time (IVT), Generalized Journey Time (GJT) was measured. In other words, the access and egress costs and times were added to the utilities.

The models in tables A1.1 and A1.2, made the best use of the available information. The respondent's characteristics for access and egress to its current mode were added into the estimation. Since the access and egress characteristics for the other mode (e.g. access time to the airport for rail user) was not available, the average value for people who chose this mode (e.g. average access time to the airport on all air users) was used. It is recognised that this may be biased; people travelling by air may do so because their origin or destination is closer to the airport than to the rail station. However more detailed information is not available at this stage. The addition of access and egress time introduces a different way of estimating the journey times and costs. Results are in-line with other models for business travellers but are considered too high for leisure travellers.

APPENDIX: TABLE A2.1 MODEL1: GJT - BUSINESS TRAVELLERS  
MULTINOMIAL STRUCTURE



Parameter	Value	T-stat	Relative value
Cost	-0.015	-9.02	
Classic Rail GJT	-0.010	-15.27	£ 43/h
High Speed Rail GJT	-0.005	-5.89	£ 21/h
Air GJT	-0.007	-7.61	£ 27/h
Headway	-0.009	-5.64	£ 39/h

APPENDIX: TABLE A2.2 MODEL 1: GJT - LEISURE TRAVELLERS  
MULTINOMIAL STRUCTURE



Parameter	Value	T-stat	Relative value
Cost	-0.03	-13.71	
Classic Rail GJT	-0.005	-9.62	£ 10/h
High Speed Rail GJT	-0.0015	-2.64	£ 3/h
Air GJT	-0.005	-5.7	£ 10/h
Headway	-0.002	-0.94	£ 4/h

In the models in tables A1.3 and A1.4, we decided to represent access times and costs in a similar way for the respondent's current mode and the alternative one by using the average value for people who chose this mode (e.g. average access time to the airport on all air users). Results are very close to the models based on in-vehicle time only.

APPENDIX: TABLE A2.3 MODEL 2: GJT - BUSINESS TRAVELLERS  
MULTINOMIAL STRUCTURE



Parameter	Value	T-stat	Relative value
Cost	-0.04	-17.42	
Classic Rail GJT	-0.028	-18.55	£ 38/h
High Speed Rail GJT	-0.022	-11.85	£ 32/h
Air GJT	-0.018	-11.01	£ 26/h
Headway	-0.013	-7.32	£ 18/h

For leisure travellers, the relative weight on headway is not statistically significant at a 5% level and almost significant at 10% level.

APPENDIX: TABLE A2.4 MODEL 2: GJT - LEISURE TRAVELLERS  
MULTINOMIAL STRUCTURE



Parameter	Value	T-stat	Relative value
Cost	-0.05	-15.17	
Classic Rail GJT	-0.179	-11.4	£ 23/h
High Speed Rail GJT	-0.016	-7.71	£ 21/h
Air GJT	-0.015	-8.09	£ 20/h
Headway	-0.004	-1.63	£ 5/h

### A3. SEGMENTATION PER ROUTE

Table A1.5 shows the impact of journey route since the value of time may vary according to the duration of the travel. There were two routes on which respondents were interviewed: one was the shorter one to Manchester and surrounding areas and the other was the longer one to Glasgow. Rail and car users on both routes were interviewed. Only air users travelling on the Manchester route were interviewed.

Tables A1.5 and A1.6 show the same model disaggregated into the two routes. The results are in-line with expectations: shorter journeys tend to have a larger value of time than longer journeys.

APPENDIX: TABLE A3.1 MODEL 9C: MANCHESTER ROUTE  
MULTINOMIAL STRUCTURE



Parameter	Value	T-stat	Relative value
Cost	-0.044	-22.9	
Classic Rail IVT (Business)	-0.03	-20.52	£ 41/h
Classic Rail IVT (Leisure)	-0.02	-12.9	£ 27/h
High Speed Rail IVT (Business)	-0.03023	-10.64	£ 31/h
High Speed Rail IVT (Leisure)	-0.0187	-7.61	£ 26/h
Air IVT (Business)	-0.025	-13.3	£ 34/h
Air IVT (Leisure)	-0.024	-11.29	£ 33/h
Headway (Business)	-0.014	-7.54	£ 19/h
Headway (Leisure)	-0.004	-1.65	£ 5/h

Table A1.6 presents the results for the Glasgow route. It should be noted that rail passengers travelling on leisure on this route had a very low valuation of travel time savings. This is again in-line with expectations since, given the journey time difference between air and rail mode on this route, you would not expect people who value travel time savings highly to travel by train.

APPENDIX: TABLE A3.2 MODEL 9C: GLASGOW ROUTE  
MULTINOMIAL STRUCTURE



Parameter	Value	T-stat	Relative value
Cost	-0.044	-22.9	
Classic Rail IVT (Business)	0.012	6.44	£ 25/h
Classic Rail IVT (Leisure)	0.0122	6.05	£ 10/h
High Speed Rail IVT (Business)	0.014	5.05	£ 12/h
High Speed Rail IVT (Leisure)	0.017	5.02	£ 3/h
Air IVT (Business)	No air travellers to Glasgow		

Parameter	Value	T-stat	Relative value
Air IVT (Leisure)			No air travellers to Glasgow
Headway (Business)	-0.014	-7.54	£ 19/h
Headway (Leisure)	-0.004	-1.65	£ 5/h

#### A4. ALTERNATIVE REPRESENTATION OF HEADWAY

The preferred model estimates the relative weight per minute of headway. This was not found to be statistically significant for leisure trips. We subsequently tried to calibrate a discrete level of headway, i.e. the relative weight of a 30-minute headway compared to the relative weight of 60-minute headway.

Three “discrete” levels of headway were presented in the SP exercise (20 minute, 30 minute and 60 minute headway) for the two rail options. Air headway was presented as constant (90 minutes). The base level in the results presented below is 20 minutes and we present the valuation

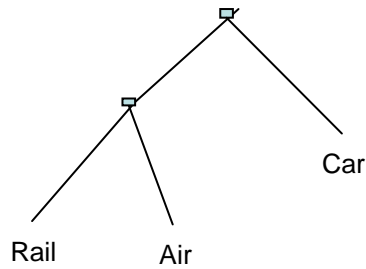
It could be noted that headway of 30 minutes compared to 20 minutes for leisure travellers was not significant. The Table A1.7 describes the results from the model.

APPENDIX: TABLE A4.1 MODEL 9B: REPRESENTATION OF HEADWAY  
MULTINOMIAL STRUCTURE

Parameter	Value	T-stat	Relative value
Cost	-0.05	-22.8	
Classic Rail IVT (Business)	-0.03	-20.03	£ 40/h
Classic Rail IVT (Leisure)	-0.02	-12.1	£ 25/h
High Speed Rail IVT (Business)	-0.022	-10.1	£ 30/h
High Speed Rail IVT (Leisure)	-0.016	-6.87	£ 23/h
Air IVT (Business)	-0.03	-17.5	£ 43/h
Air IVT (Leisure)	-0.03	-12.4	£ 34/h
Headway Rail - 30 minutes (Business)	-0.14	-2.20	£ 20/h
Headway Rail - 60 minutes (Business)	-0.54	-7.43	£ 19/h
Headway Rail - 60 minutes (Leisure)	-0.134	-1.6	£ 5/h

## A5. NEST WITH ONE RAIL OPTION

The model presented in this section was the nested structure with classic and high-speed rail combined into a single category 'rail'. This model is the one in which the 2 rail options are considered as one option. In order to calibrate this model, we had to duplicate the two rail choices per respondent (as one hsr-air choice and one classic rail - air choice). This is not a conventional approach and the results produced were not considered robust.



A multinomial model with the same variables was also tested: Tables A1.8 and A1.9 respectively present the results of the nested and of the multinomial models.


In Model 13a, it can be seen that the coefficient of cost does not have the right sign on it i.e., it is positive when it should be negative. This is highly unrealistic.

APPENDIX: TABLE A5.1 MODEL 13A: CLASSIC AND HIGH SPEED RAIL COMBINED  
NESTED STRUCTURE

Parameter	Value	T-stat	Relative value
Cost	0.02	21.23	
Classic Rail IVT (Business)	-0.004	-6.57	£ 12/h
Classic Rail IVT (Leisure)	0.0016	2.97	£ 5/h
Air IVT (Business)	-0.024	-13.55	£ 76.5
Air IVT (Leisure)	-0.02	-11.5	£ 63/h
Car IVT (Business)	-0.018	-21.3	£ 60/h
Car IVT (Leisure)	-0.018	-21.3	£ 60/h
Headway (Business)	0.0053	3.91	£ 17.2/h
Headway (Leisure)	0.00125	0.92	£4/h
Nest Parameter	1.95	14.5	

In Model 13b above, it can be seen that journey times have a very high relative weight.

APPENDIX: TABLE A5.2 MODEL 13B: CLASSIC AND HIGH SPEED RAIL COMBINED MULTINOMIAL STRUCTURE



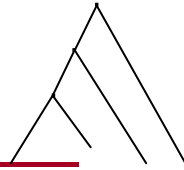
Parameter	Value	T-stat	Relative value
Cost	-0.03	-18.6	
Classic Rail IVT (Business)	-0.03	-29.1	£ 59/h
Classic Rail IVT (Leisure)	-0.02	-15.4	£ 31/h
Air IVT (Business)	-0.03	-25.3	£ 62/h
Air IVT (Leisure)	-0.02	-15.2	£ 43/h
Car IVT (Business)	-0.02	-26.2	£ 45/h
Car IVT (Leisure)	-0.01	-11.1	£ 19/h
Headway (Business)	-0.01	-4.8	£ 18/h
Headway (Leisure)	-0.004	-1.96	£ 8/h

#### A6. MODEL FOR ALL RESPONDENTS (AIR-RAIL-CAR)

We calibrated two models on the whole data set (one for leisure travellers and the other for business travellers). The relative weight on journey time is assumed to be the same for all modes but alternative specific constants were estimated.

Tables A1.10 and A1.11 will look at the double-nested structures for both business and leisure travellers.

APPENDIX: TABLE A6.1 MODEL 14: COEFFICIENTS OF IVT COMBINED FOR ALL MODES, BUSINESS TRAVELLERS NESTED STRUCTURE



Parameter	Value	T-stat	Relative value
Cost	-0.02	-6.33	
IVT	-0.01	-5.9	£ 37/h
Headway	-0.006	-5.1	£ 19/h
Air ASC	0.174	1.55	-15 minutes
Car ASC	0.5	3.64	-46 minutes
High Speed Rail ASC	0.4	5.09	-30 minutes

Parameter	Value	T-stat	Relative value
Nest Parameter - Rail	2.3	6.01	
Nest Parameter - "PT"	1.94	4.9	

APPENDIX: TABLE A6.2 MODEL 14: COEFFICENTS OF IVT COMBINED FOR ALL MODES LEISURE TRAVELLERS NESTED STRUCTURE

Parameter	Value	T-stat	Relative value
Cost	-0.03	-9.04	
IVT	-0.01	-9.04	£ 21/h
Headway	-0.002	-2.1	£ 5/h
Air ASC	0.6	-2.3	67 minutes
Car ASC	1	5.21E+08	-107 minutes
High Speed Rail ASC	0.2	3.17	-22 minutes
Nest Parameter - Rail	2.0	9.0	
Nest Parameter - "PT"	1.4	4.4	

#### A7. NON-LINEAR VALUATION OF TRAVEL TIME SAVINGS

We calibrated a non-linear model in which time was the only variable that was non-linear (log-formulation). All parameters are strongly significant at a 5% level. Even the weight on headway for leisure people is significant.

APPENDIX: TABLE A7.1 MODEL 14: TIME IS NON-LINEAR MULTINOMIAL STRUCTURE

Parameter	Value	T-stat
Cost	-0.05	-23.71
Classic Rail IVT (Business)	-4.2	-17.27
Classic Rail IVT (Leisure)	-2.9	-11.01
High Speed Rail IVT (Business)	-4.3	-18.03

Parameter	Value	T-stat
High Speed Rail IVT (Leisure)	-2.8	-11.0
Air IVT (Business)	-4.4	-18.1
Air IVT (Leisure)	-2.8	-10.7
Headway (Business)	-0.5	-7.4
Headway (Leisure)	-0.18	-2.0

Tables A1.13 and A1.14 show the monetary impact of 30 minute reduction in journey times and how this impact varies according to the different modes and different travellers. It can be seen that the value of time is significantly lower for leisure travellers with comparison to the business travellers for the same modes. It can also be seen that as the existing IVT increases from 2 to 4 hours, the value of time decreases. This is consistent for all travellers on all modes.

APPENDIX: TABLE A7.2 MONETARY IMPACT (£) OF A REDUCTION OF 30 MINUTES IN JOURNEY TIME BUSINESS TRAVELLERS

IVT	Classic Rail	High Speed Rail	Air
<b>2hours 15 minutes</b>	<b>£23</b>	<b>£23</b>	<b>£24</b>
<b>3 hours</b>	<b>£17</b>	<b>£17</b>	
<b>4 hours 30 minutes</b>	<b>£12</b>	<b>£12</b>	

APPENDIX: TABLE A7.3 MONETARY IMPACT (£) OF A REDUCTION OF 30 MINUTES IN JOURNEY TIME LEISURE TRAVELLERS


IVT	Classic Rail	High Speed Rail	Air
<b>2hours 15 minutes</b>	<b>£16</b>	<b>£15.5</b>	<b>£15</b>
<b>3 hours</b>	<b>£12</b>	<b>£11</b>	
<b>4 hours 30 minutes</b>	<b>£8</b>	<b>£8</b>	

## A8. TASTE VARIATION

Taste variation aims at understanding how differently respondents value travel time savings. Taste variation models assume an underlying distribution of variation and estimate average and variance of the sample for this distribution. We calibrated two models: one for which the variation was assumed to be on the cost weight and the other for which we assumed that the variation was on the time weight. In both cases we assumed a normal distribution.

When we try the variation on journey time, we see that the only significant variation is on classic rail in-vehicle time. The variation per respondent on high speed rail and air journey times does not come out as statistically significant.


APPENDIX: TABLE A8.1 TASTE VARIATION ON JOURNEY TIME PARAMETERS



Parameter	Value	T-stat	Relative value
Cost	-0.06	-10.9	
Classic Rail IVT	Average: -0.04 Std. Dev.: 0.01	Average: -9.7 Std. Dev.: 5.8	£ 37/h
High Speed Rail IVT	Average: -0.03 Std. Dev.: 0.002	Average: -8.3 Std. Dev. 0.8	£ 30/h
Air IVT	Average: -0.03 Std. Dev.: 0.004	Average: -9.6 Std. Dev. 1.2	£ 34/h
Headway	-0.01	--6.3	£ 13/h

The variation per respondent on cost comes out as statistically significant.

APPENDIX: TABLE A8.2 TASTE VARIATION ON COST PARAMETER



Parameter	Value	T-stat	Relative value
Cost	Average: -0.04 Std. Dev. 0.02	Average: -18.4 Std. Dev.: 3.9	
Classic Rail IVT	-0.02	-18.1	£ 34/h
High Speed Rail IVT	-0.02	-10.7	£ 27/h
Air IVT	-0.02	-14.5	£ 34/h
Headway	-0.009	-5.5	£ 12/h

Some tables in Appendix B describe in detail the results of the a few more model runs, varying the use of alternative specific constant and the use of different weights on journey time per respondent. The results are in-line with the models presented so far.

APPENDIX  
B  
ADDITIONAL MODEL RESULTS

## B1. MODE CHOICE SP RESULTS

The models presented below vary very slightly from the preferred models. The differences are

- | the structure of the logit model (multinomial or nested)
- | the presence or absence of alternative specific constant (denoted ASC)
- | a value of travel time constant for all modes or varying per mode.

The results are very close to the one of the preferred models.

APPENDIX: TABLE B1.1 MODEL 1: AIR-RAIL SAMPLE, BUSINESS TRAVELLERS  
MULTINOMIAL STRUCTURE, NO ASC, MODAL VOT



Parameter	Value	T-stat	Relative value
Cost	-0.0422	-17.2	
Classic Rail IVT	-0.028	-19.6	£ 41/h
High Speed Rail IVT	-0.022	-10.2	£ 31/h
Air IVT	-0.024	-13.4	£ 35/h
Headway	-0.013	-7.3	£ 19/h

APPENDIX: TABLE B1.2 MODEL 2: AIR-RAIL SAMPLE, LEISURE TRAVELLERS  
MULTINOMIAL STRUCTURE, NO ASC, MODAL VALUE OF TIME



Parameter	Value	T-stat	Relative value
Cost	-0.046	-15.1	
Classic Rail IVT	-0.019	-12.1	£ 24/h
High Speed Rail IVT	-0.017	-6.9	£ 22 /h
Air IVT	-0.024	-11.1	£ 31 /h
Headway	-0.004	-1.6	£ 5/h



APPENDIX: TABLE B1.3 MODEL 3: AIR-RAIL SAMPLE, BUSINESS TRAVELLERS  
MULTINOMIAL STRUCTURE, 2 ASC'S, FIXED VALUE OF TIME

Parameter	Value	T-stat	Relative value
Cost	-0.045	-17.8	
In vehicle time	-0.026	-16.73	£ 35/h
High Speed Rail ASC	1.01	7.99	39 minutes
Air ASC	0.734	4.96	28 minutes
Headway	-0.0135	-7.38	£ 18/h



APPENDIX: TABLE B1.4 MODEL 4: AIR-RAIL SAMPLE, LEISURE TRAVELLERS  
MULTINOMIAL STRUCTURE, 2 ASC'S, FIXED VALUE OF TIME

Parameter	Value	T-stat	Relative value
Cost	-0.047	-15.49	
In vehicle time	-0.017	-10.67	£ 22/h
High Speed Rail ASC	0.354	2.54	20 minutes
Air ASC	-0.603	-3.52	37 minutes
Headway	-0.004	-1.63	£ 5/h

APPENDIX: TABLE B1.5 MODEL 5: AIR-RAIL SAMPLE, BUSINESS  
NESTED STRUCTURE, NO ASC, MODAL VALE OF TIME



Parameter	Value	T-stat	Relative value
Cost	-0.038	-17.3	
Classic Rail IVT	-0.026	-7.27	£ 41/h
High Speed Rail IVT	-0.02	-6.48	£ 31/h
Air IVT	-0.02	-9.84	£ 36/h
Headway	-0.01	-5.96	£ 19/h
Nest parameter Rail	1.12	6.88	

APPENDIX: TABLE B1.6 MODEL 6: AIR-RAIL SAMPLE, LEISURE TRAVELLERS NESTED  
STRUCTURE, NO ASC, MODAL VALUE OF TIME



Parameter	Value	T-stat	Relative value
Cost	-0.033	-3.62	
Classic Rail IVT	-0.015	-3.59	£ 27/h
High Speed Rail IVT	-0.014	-3.23	£ 25/h
Air IVT	-0.02	-6.48	£ 37/h
Headway	-0.004	-1.45	£ 7/h
Nest parameter	1.36	3.5	

APPENDIX: TABLE B1.7 MODEL 6B: AIR-RAIL SAMPLE, LEISURE TRAVELLERS  
 NESTED STRUCTURE, NO ASC, MODAL VALUE OF TIME



Parameter	Value	T-stat	Relative value
Cost	-0.042	-3.49	
Classic Rail IVT	-0.015	-3.28	£ 21/h
High Speed Rail IVT	-0.013	-2.78	£ 19/h
Air IVT	-0.024	-6.47	£ 34/h
Headway	-0.001	-0.35	£ 1/h
Nest parameter	1.23	3.33	

APPENDIX: TABLE B1.8 MODEL 7: AIR-RAIL SAMPLE, BUSIINES TRAVELLERS  
 NESTED STRUCTURE, 2 ASC'S, FIXED VALUE OF TIME



Parameter	Value	T-stat	Relative value
Cost	-0.04	-7.31	
In vehicle time	-0.023	-7.36	£ 35/h
High Speed Rail ASC	0.877	5.11	38 minutes
Air ASC	0.493	1.8	21 minutes
Headway	-0.012	-7.31	£ 19/h
Nest parameter	1.15	7.05	

APPENDIX: TABLE B1.9 MODEL 8: AIR-RAIL SAMPLE, LEISURE TRAVELLERS  
NESTED STRUCTURE, 2 ASC'S, FIXED VALUE OF TIME



Parameter	Value	T-stat	Relative value
Cost	-0.0375	-5	
In vehicle time	-0.014	-4.73	£ 22/h
High Speed Rail ASC	0.268	2.17	19 minutes
Air ASC	-0.857	-3.8	62 minutes
Headway	-0.003	-1.48	£5/h
Nest parameter	1.31	4.78	

APPENDIX: TABLE B1.10


MODEL 9: AIR-RAIL SAMPLE, BUSINESS AND LEISURE TRAVELLERS MULTINOMIAL STRUCTURE, NO ASC, MODAL VALUE OF TIME



Parameter	Value	T-stat	Relative value
Cost	-0.044	-22.9	
Classic Rail IVT (Business)	-0.029	-20.1	£ 39.6/h
Classic Rail IVT (Leisure)	-0.018	-12.2	£ 25.2/h
High Speed Rail IVT (Business)	-0.022	-10.1	£ 29.9/h
High Speed Rail IVT (Leisure)	-0.017	-7.0	£ 23.1 /h
Air IVT (Business)	-0.024	-13.1	£ 33.7/h
Air IVT (Leisure)	-0.023	-11.0	£ 32.2/h
Headway (Business)	-0.012	-6.4	£ 19.3/h
Headway (Leisure)	-0.004	-1.7	£ 5.3/h

APPENDIX: TABLE B1.11


MODEL 10: AIR-RAIL SAMPLE, BUSINESS AND LEISURE  
TRAVELLERS NESTED STRUCTURE, NO ASC, MODAL VALUE  
OF TIME



Parameter	Value	T-stat	Relative value
Cost	-0.037	-8.71	
Classic Rail IVT (Business)	-0.025	-8.47	£ 39.6/h
Classic Rail IVT (Leisure)	-0.016	-7.46	£ 25.2/h
High Speed Rail IVT (Business)	-0.019	-7.09	£ 30.2/h
High Speed Rail IVT (Leisure)	-0.0145	-5.68	£ 23.3/h
Air IVT (Business)	-0.0225	-10.83	£ 36.1/h
Air IVT (Leisure)	-0.022	-10.68	£ 35.3/h
Headway (Business)	-0.012	-6.4	£ 19.3/h
Headway (Leisure)	-0.003	-7.67	£ 5.3/h
Nest parameter	1.19	8.36	

APPENDIX: TABLE B1.12

MODEL 11: CAR SAMPLE, BUSINESS AND LEISURE  
TRAVELLERS MULTINOMIAL STRUCTURE, NO ASC, MODAL  
VALUE OF TIME



Parameter	Value	T-stat	Relative value
Cost	-0.0315	-12.97	
Classic Rail IVT (Business)	-0.025	-5.88	£ 47.6/h
Classic Rail IVT (Leisure)	-0.021	-1.73	£ 39/h
High Speed Rail IVT (Business)	-0.023	-3.85	£ 43/h
High Speed Rail IVT (Leisure)	-0.0214	-3.41	£ 40.8/h
Car IVT (Business)	-0.019	-5.63	£ 36/h
Car IVT (Leisure)	-0.0131	-3.68	£ 25/h
Headway (Business)	-0.010	-3.14	£ 19.4/h
Headway (Leisure)	-0.006	-7.73	£ 10.9/h

APPENDIX: TABLE B1.13

MODEL 12: CAR SAMPLE, BUSINESS AND LEISURE  
TRAVELLERS NESTED STRUCTURE, NO ASC, MODAL VALUE  
OF TIME



Parameter	Value	T-stat	Relative value
Cost	-0.0242	-9.7	
Classic Rail IVT (Business)	-0.0095	-5.43	£ 23.6/h
Classic Rail IVT (Leisure)	-0.007	-4.37	£ 19.7
High Speed Rail IVT (Business)	-0.008	-3.59	£ 18.8/h
High Speed Rail IVT (Leisure)	-0.006	-2.89	£ 15.3/h
Car IVT (Business)	-0.009	-6.54	£ 22.9/h
Car IVT (Leisure)	-0.004	-3.15	£ 10.6/h
Headway (Business)	-0.005	-3.82	£ 12.4/h
Headway (Leisure)	-0.002	-1.76	£ 5.9/h
Nest parameter	3.39	7.5	