Own price elasticity of demand for rail and coach

1. As noted in paragraph 4.5, there is an extensive and complex array of evidence available on the elasticity of demand for different modes of transport.

2. We commissioned a study by Mark Wardman of the Institute of Transport Studies in Leeds to obtain reliable and robust own- and cross-price elasticities for changes in price and non-price variables for coach versus rail travel in the Greater Anglia area; and for rail travel on the Southend to London rail links. The study involved first a review of relevant literature, and secondly the conduct of survey work and modelling of the results of that work. The main results of that work have been placed on the CC's web site.

3. For most categories of rail traffic, estimated elasticities on the basis of existing studies, particularly in the short run, are likely to be smaller than –1: ie an increase in price would lead to a less than proportionate decrease in number of passengers, hence revenue and profits would increase. Rail demand as a whole could therefore be regarded as a separate market. However, for leisure travel on certain routes, elasticities are likely to be larger than –1—ie a price increase would lead to a more than proportionate reduction in number of passengers, reducing revenues. Since train operating costs are largely fixed for any given level of service, with little scope under the terms of the franchise agreement to reduce the number of services operated, profits would also be reduced. In part, that higher elasticity of leisure travel is likely to reflect passengers travelling less often, or travelling to other destinations, rather than necessarily their use of other mode of transport: hence we do not believe it calls into question whether rail demand can be regarded as a separate market, but is a factor we take into account in considering the effect of the merger.

4. An own-price elasticity of demand of below 1 was also suggested by ITS analysis of the results of our surveys. The full documents are available on the CC's web site; a non-technical summary of the analysis of the survey of Southend rail users is annexed to this appendix.

5. There are few studies of coach own-price elasticity of demand. What there is, however, suggests, as at the time of the previous NEG:MML report, that elasticity of demand for coach travel is likely to be somewhat larger than –1. However, in general coach costs, at least on the busiest routes and in the longer term, are likely to be variable, as frequency can be reduced or services withdrawn altogether. A price rise would be profitable if costs were reduced in line with demand.

6. A number of parties argued that it was not relevant to consider public transport separately from private transport, ie use of cars, and that competition between private transport and public transport was a far more significant issue than competition between operators of public transport. As we noted above, the own-price elasticities of most categories of rail demand, at least in the short term, are significantly smaller than –1, and the own-price elasticity of coach demand is not likely to be sufficient to prevent price rises being profitable. Hence, the extent of competition from car (together with the extent to which, if prices increased or services decreased, passengers would stop travelling altogether) is insufficient to constrain fare increases or any reductions in service levels. Second, and confirming this limited degree of substitutability, previous trends in fares of public transport have differed significantly from those in the costs of using car. Over the past 20 years, for example, bus fares

have increased in real terms by some 40 per cent, whereas the inflation-adjusted cost of using private car has been broadly unchanged, which could also suggest that the cost of using private car has imposed little competitive constraint on changes in bus fares. In this period, we have seen a shift in demand from public to private transport, but (as shown in the low own-price elasticities of bus and rail) this may well reflect factors other than relative prices, in particular the extent to which rising real incomes increase car ownership and usage.[1] Despite the shift from public to private transport, the operation of bus services has generally remained profitable. Third, a large number of users of public transport do not have access to a car or there are problems in parking at their destinations or there may be other constraints on using cars for particular journeys, particularly into urban areas.

7. In particular, use of car for travelling into central London is likely to be discouraged by congestion, and/or by the congestion charge. NEG, for example, quoted us figures that only 9 per cent of journeys into central London are made by car. 68 per cent of respondents to our Southend rail users survey had access to a car as a driver: but only 14 per cent said that they could easily switch to other transport compared with 60 per cent who would find it difficult. Speed, availability and cost of parking, the congestion charge and dislike of driving into central London were main factors for use of train by those who would have car available: relative cost was a more minor factor. On the other hand, about one-quarter of rail passengers travel by car to stations, suggesting that use of car and rail are often complementary rather than competitive. Car may be more competitive, however, for journeys outside London, or leisure journeys, as to an extent reflected in the higher price elasticities of leisure travel we noted above, and a factor we have taken into account in assessing the effects of the merger below.

8. There is less evidence available on the interrelationship between demand for coach and car travel. Only about 30 per cent of coach passengers responding to our survey had access to a car as a driver, compared with about 60 per cent of rail travellers on those routes. 28 per cent of coach passengers (compared with 24 per cent of rail passengers on those routes) said that it would be easy to switch to forms of transport other than coach or train and 43 per cent said that it would be difficult (compared to 53 per cent of rail passengers). Most of the journeys we are considering are into London, where use of car is likely to be an unattractive alternative for coach as well as for rail passengers. But this may not apply to other routes. In particular, car accounts for the majority of travel between East Anglia and the London airports, and

[1]Among other evidence suggesting that choice between private and public transport is likely to depend on factors other than relative prices or costs is a research study, *Transport Choices of Car Users in Urban and Rural Areas*, undertaken in 2000 for the Department of Environment and Transport. Among the conclusions of that study were that 'Cost, defined in pure monetary terms, did not emerge as a strong factor in the respondents' choice of how to travel', convenience and flexibility of using cars clearly outweighing the impact of cost. The study also noted 'It was only when respondents were forced to consider an extreme projection (doubling or more in fuel prices) that they would consider adapting to a new set of circumstances. With regards to public transport, cost was a secondary issue, with the negative factors associated with public transport emerging as the primary concern'. We also noted the statement in NEG's Central Trains Business Plan 'For journeys people have to make (for example commuting and business journeys) the car is by far our biggest competitor. However we can do little to fight against the majority view that cars are quicker, more convenient, cheaper and a better travel experience and we would be wasting our money by trying. Therefore, our targets continue to be those groups for whom car is not a good option (eg commuting into major urban areas) or those for whom the choice is close enough for us to actively compete against'.

coach has a much more significant share of public transport journeys, presumably because of the disadvantages of having to change between rail services in London.[2]

[2]A 2002 CAA survey showed the last mode of transport used by passengers in travelling from East Anglia to Gatwick and Heathrow airports was as follows:

	% of passengers from East Anglia travelling to	
Last mode of travel:	Gatwick	Heathrow
Buses/coaches	11	19
Car/hire car	70	47
Taxi/minicab	10	19
Train/tube	8	14

Although these figures suggest coaches (which are likely to include private hire as well as scheduled services) may have a greater share of journeys to the airports than train and tube, it is possible that some taxi use was by passengers travelling to London by rail, than by taxi to the airports, particularly Heathrow.

Non-technical summary of the 'Report of Southend-London Route Choice Study'

1. The paper by the Institute for Transport Studies *Report of Southend-London Route Choice Study* presents the results from an econometric analysis of the behaviour of rail passengers travelling between Southend and London.

2. The data used was based on a survey of passengers travelling on the c2c and Great Eastern trains which offer services between Southend and London. The final sample used in the analysis consisted of 238 revealed preference (RP) observations and 3,537 stated preference (SP) observations.

3. To facilitate the analysis, three econometric models were used: a binary logit model, a multinomial logit model and a mixed logit model. The basic equation estimated using these models is of the form:

$$\boldsymbol{V}_{ni} = \sum_{k} \boldsymbol{\beta}_k \boldsymbol{X}_{nik} ,$$

where $\boldsymbol{V}$ is the dependent variable, which describes the mode choice *i* of individual *n* and $\boldsymbol{X}$ is a vector of the *k* main explanatory variables of interest. These are: in-vehicle time, headway, rail costs, other costs, and out-of-vehicle costs. The βs are the parameters to be estimated.

4. Several specifications based on this equation (referred to generally as models) were considered as well as several econometric issues relating to these specifications. The estimates in Model 1 are based on a binary logit model. The estimates in Model 2 to 6 are derived from a multinomial logit model and Model 7 is estimated using a mixed logit model. Therefore, in Model 1, $\boldsymbol{V}$=[c2c, Great Eastern] and in Models 2 to 7, $\boldsymbol{V}$=[c2c, Great Eastern, neither].

5. Model 1 is estimated using only the RP data while the estimates in Model 2 are based only on the SP data. Model 3 and Model 4 use a dataset made up of the merged RP and SP data. Model 4, which is an extension of Model 3, looks at how the factors of interest vary with journey purpose. Model 5 and Model 6 build on Model 3 and Model 4 respectively by controlling for the relative market shares of c2c, Great Eastern and Neither.[3] Model 7 takes into account the 'panel' nature of the data[4] and the existence of heterogeneity in tastes across the population. However, it does not control for the relative market shares. Nonetheless, it is the preferred specification of the author and the one of interest to the CC insofar as the reported elasticities are based on this model.

6. Though Model 7 is the model of interest, it is important to note that Model 1 to 6 provide useful insights into passengers' behaviour. It is found that passengers' travel decisions are significantly influenced by in-vehicle time, headway, rail costs, other costs, and out-of-vehicle costs. The results also revealed that the impact of these factors vary by journey purpose. In addition, the estimates from Model 5 formed the

[3]This did not lead to significantly different results when compared to Model 3 and Model 4.
[4]The (SP) data is said to have a 'panel' structure insofar as there are repeated observations for each individual.

basis for the calculation of the generalized cost of journey based on the RP and SP data[5] (see the paper on our web site for further details).

Elasticities

7. Three scenarios were considered in the analysis. These are:

- fare increases for c2c of 5 per cent and 10 per cent;
- fare increases for Great Eastern of 5 per cent and 10 per cent; and
- fare increases for both c2c and Great Eastern of 5 per cent and 10 per cent.

8. By definition, the elasticities are related to the market shares. Therefore, since the estimates in Model 7 do not take into consideration the market shares, the results were recalibrated to the market shares of [✂] per cent for c2c and [✂] per cent Great Eastern and 2 per cent for neither.

9. For each scenario, the arc elasticity of demand[6] was calculated. These are presented in the tables below:

TABLE 1 **Elasticities for a 5 per cent increase in fares**

	c2c	*Great Eastern*	*Neither*
c2c	–0.714	0.411	0.225
Great Eastern	0.884	–0.561	0.324

Source: ITS study from CC survey.

TABLE 2 **Elasticities for a 10 per cent increase in fares**

	c2c	*Great Eastern*	*Neither*
c2c	–0.733	0.411	0.228
Great Eastern	0.886	–0.583	0.331

Source: ITS study from CC survey.

TABLE 3 **Elasticities for a 5 per cent increase in both fares**

	c2c	*Great Eastern*	*Neither*
c2c and Great Eastern	0.187	–0.131	0.554

Source: ITS study from CC survey.

[5]One reason why Model 7 was not used to derive estimates of the generalized cost of journey is that certain software constraints meant that the author could not adequately combine the analysis of repeated choice (which is controlled for in Model 7) with re-weighting (by market shares).

[6]The arc elasticity of demand refers to the elasticity that is calculated over a certain segment (arc) of the demand curve. Therefore, to calculate the proportionate change in the quantity demanded with respect to a proportionate change in prices, the average of the initial and final quantities and prices must be used.

TABLE 4 **Elasticities for a 10 per cent increase in both fares**

	c2c	*Great Eastern*	*Neither*
c2c and Great Eastern	0.190	–0.135	0.569

Source: ITS study from CC survey.

10. From these elasticities, it is seen that compared with Great Eastern, the demand for c2c is more responsive to changes in fares.

The coach:rail survey

11. A similar analysis was carried out by ITS of the coach rail:survey, using Stated Preference data. The elasticities, based on estimates from a multinomial logit model, were as follows:

TABLE 5 **Own and cross arc elasticities of demand**

	+5% rail fare	*+5% coach fare*	*+10% rail fare*	*+10% coach fare*
Norwich				
Coach	3.10	–1.89	3.10	–1.94
Rail	–0.65	0.30	–0.71	0.30
Ipswich				
Coach	2.77	–1.47	2.78	–1.51
Rail	–0.43	0.18	–0.47	0.18
Colchester				
Coach	2.15	–1.09	2.16	–1.13
Rail	–0.33	0.13	–0.35	0.13
All				
Coach	2.84	–1.63	2.85	–1.68
Rail	–0.51	0.23	–0.56	0.23

Source: ITS analysis of CC survey.

12. Coach travel is clearly more sensitive to fare change than rail travel with coach elasticities being around three times as large as rail elasticities. This is likely to be a result of the coach market containing a large proportion of cost-sensitive low-income household respondents. The own-price elasticities are highest for Norwich, followed by Ipswich and Colchester, and are marginally greater for larger fare changes. The cross-price elasticities are highest for Norwich followed by Ipswich and Colchester, and are relatively stable across different fare changes. Where both rail and coach fares are increased simultaneously, the market shows a relatively low elasticity of –0.05 indicating a high degree of captivity to travel—'neither' was chosen only 79 times from 4,624 choices in the SP data.