COMPETITION COMMISSION

Review of methodologies in transport inquiries

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Introduction

1. The Competition Commission (CC) has conducted six merger inquiries in the transport sector under the Enterprise Act 2002, of which four were cleared, one was cleared with undertakings and one was cancelled before the CC completed its inquiry. Certain aspects of the analysis of these inquiries have become well established,[2] so in this note we will examine a number of themes (and general lessons learned) from transport inquiries conducted under the Enterprise Act 2002, setting out the approaches and reasoning followed in each and discussing issues that have arisen.

2. This note is structured around the following aspects that we have identified as most useful to look at:

   (a) market definition;

   (b) competitive assessment;

      (i) overlaps; and

      (ii) filters;

   (c) elasticities, diversion ratios and surveys;

   (d) counterfactual; and

   (e) theory of harm/profitability modelling (including the effect of regulation and entry/ expansion).

Market definition

3. In transport inquiries, the CC has tended to focus on the competitive effects of the merger rather than the market definition. In practice, this means that when analysing competitive effects, the CC usually considers point-to-point journeys (flows) as the relevant geographic markets and conducts a competitive analysis of the same and different transport modes on a flow-by-flow basis (and where relevant, an analysis of network markets) in order to determine whether a merger might provide an incentive to increase fares or reduce services.

4. In this section we explain the CC's approach to defining the markets in which it has had to assess the competitive effects. The approach to market definition, which is based on the CC's standard approach to substitutability, usually adopted by the CC in transport inquiries, is:

   (a) Point-to-point journeys (ie flows) are considered as the relevant geographic markets.

   (b) Wider network markets, to the extent that they exist and are relevant, are considered when assessing competitive effects.

   (c) The CC does not explicitly define the relevant product market in each flow or in the wider market. Rather, alternative transport modes are considered on a flow-by-flow basis as necessary because demand elasticities can vary by geographic

[2]See Annex 1 for a complete list and description of these inquiries.

area and type of passenger, such that coach and rail (and indeed other forms of transport) may compete in the same market on specific flows.

(d) Leisure travel is distinguished from commuting and business travel, but these do not form separate markets.

We consider these in turn below.

Geographic market definition: point-to-point journeys

5. The CC's approach has been to look at individual flows and routes, as well as networks of flows and routes where it thinks there is a merger effect. A 'flow' is defined as a particular journey between start and end points. A flow may constitute an entire train or bus route, or it may be only a part of a longer route. The CC defines the relevant start and end points of flows in the competitive assessment. For example, consider the following diagram showing a journey between points A and D (beginning and end of a route), travelling via points B and C:

Journey A to D would be the *route* that this diagram represents. However, journeys A to B, A to C, C to D and all other combinations would be *flows* on the route A to D. A to D is both a *route* and a *flow* according to these definitions.

6. The CC has looked at flows because passenger demand is for travel between two points (from origin to destination). In these cases, the CC has reached the view that although substitutability may point towards a network market, it is still important to analyse some routes or parts of them, particularly overlapping parts of routes, because transport companies can charge different fares on their routes (these differences being unrelated to cost).[3]

7. Flows cannot always be fully distinguished from those routes of which they are a part, given that decisions on frequencies and fares are to some extent taken on the basis of routes as a whole. Furthermore, flows can be part of more than one route, particularly on 'main corridors' (main roads on to which a number of routes converge from a number of termini). Hence, where relevant, the CC has also considered the effects of the merger in the context of routes **as well as** flows.

Geographic markets: wider network markets

8. The CC has taken the point-to-point flow approach to market definition because passenger demand is for travel between two points (from origin to destination). However, demand- and supply-side reasons may point to a geographic market wider than individual flows or routes. On the demand side, some passengers purchase network tickets (rather than route/flow-specific fares). For these passengers, the relevant market may be the network (rather than the flow). There are also supply-side reasons that the appropriate geographic market may be wider than individual flows or routes. For example, as the CC noted in FirstGroup/ScotRail, bus operators organize themselves around bus depots and fleets and the wider networks they operate. Within these networks, existing operators can easily switch buses between routes.

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[3]See *Arriva plc of Sovereign Bus & Coach Company Ltd: a report on the acquisition by Arriva plc of Sovereign Bus & Coach Company Ltd*, January 2005, paragraph 4.13.

9. Therefore, in a number of cases, the CC has considered wider public transport network markets (a collection of interconnected services) in addition to individual flows, taking account of the factors such as:

(a) the geographical area over which bus services from particular depots operate;

(b) the potential for offering network tickets or multi-modal tickets; and

(c) the extent to which local authorities tender for bus services.

Product market definition

10. In general, because of the possible variability in substitution between modes by geographic area, the CC has not explicitly defined the relevant product market in transport inquiries. Rather, its approach has been to consider the degree and ease of demand- and supply-side substitution between modes on a flow-by-flow basis in assessing the competitive effects of the merger, which in some cases is broadly the same as defining markets.

11. Although elasticity estimates suggest that separate markets may exist for different modes of travel, the CC has taken this approach because passengers on some specific flows (whose elasticities may differ from the more general elasticity estimates) may be able to switch between alternative modes of public transport in response to a small but significant increase in price, such that these alternative modes compete for business on these flows. We discuss this further in paragraph 14 with specific reference to cars.

12. A passenger's choice of mode of travel and ability to substitute between different modes is likely to depend on a number of factors (known as the 'generalized cost'[4]) including:

(a) cost of the journey;

(b) journey time;

(c) time spent travelling to the passenger's ultimate destination;

(d) frequency and directness of the services available and the ease of interchange; and

(e) other factors such as personal preferences, whether the passenger is travelling alone or in a group, the amount of luggage and the reliability of different modes.

13. The CC has considered all these factors in its competitive assessments. Annex 2 sets out a table of the relevant aspects of market definition in the last six CC transport inquiries. Table 1 sets out the public transport market definition in past inquiries.

[4]Generalized cost of a journey is the fare plus the perceived value to passengers of all time spent on the total journey which passengers are generally thought to want to minimize when making their decisions about which modes to use for their journeys. The factors that might affect this choice include the convenience of access to that service (for example, buses serving high streets and residential areas, from which passengers have to change to another bus or train to travel to their final destination); waiting times, which depend on the frequency; journey times; and fares.

TABLE 1 **Public transport market definition on past inquiries**

Inquiry	*Transport*	*Public transport*
First Group/GWF (2006)	Bus and rail	In general there are separate markets by transport mode. Considered in competitive effects on a flow-by-flow basis.
NEG/Thameslink (2005)	Rail and coach	In general there are separate markets by transport mode. Considered in competitive effects on a flow-by-flow basis.
First Group/ICEC (2005)	Rail	On some long distance flows air travel and coach travel may be an alternative. On shorter flows, bus would be a viable alternative to rail.
Arriva/Sovereign (2005)	Bus	No other public transport alternatives.
NEG/Greater Anglia (2004)	Rail and coach	Limited rail and coach substitutability on routes being considered.
First Group/ScotRail (2004)	Bus and rail	Bus and rail may be substitutable on some routes.

14. In a number of recent inquiries various different parties have suggested that the product market may be wider than public transport services and that the car is an important competitor to public transport services. However, in these cases the CC reached the view that there was limited substitution between public and private transport in response to price changes: that is, if the cost of using public transport increased by, for example, 5 per cent, relative to the cost of using private transport, fewer than 5 per cent of the public transport users would use cars instead. This was supported by evidence of long-run trends in public transport fares compared with the costs of using a car. As indicated in the reports,[5] in the UK as a whole, the direct cost of travelling by bus increased by 44 per cent from 1980 to 2003/04, and that of rail by 38 per cent, while the cost of using cars reduced by 6 per cent;[6] yet despite these increases, in the period between 1987/88 and 2003/04, bus usage, which may have been influenced by factors other than bus fares, fell by only 14 per cent in Great Britain[7] in terms of passenger journeys.[8] Furthermore, the decreasing cost of using cars did not appear to have constrained rises in fares on public transport.

15. However, as with different modes of public transport, the extent of substitution between public and private transport varies. Passengers on some specific flows may be more willing or able to switch to private transport in response to fare increases, and this may vary according to the level of car ownership and availability of parking. Therefore, the CC has taken account of the impact of the ease of substitution both by mode and between public and private transport in its analysis of the competitive effects of the merger on a flow-by-flow basis.

Journey purpose

16. The extent of substitution can also be considered by journey purpose. In general, leisure passengers are generally more sensitive than other types of passenger to changes in price, and will be more likely to substitute between services (either by time of day or by service provider) and between different modes of transport in response to a price rise. Commuters and business passengers generally need to travel at specific times of the day and are particularly sensitive to journey times; they are consequently less sensitive to price rises in the short run, although they might be

[5]*First Group Plc/ScotRail* (2004), Appendix D, paragraph 5; *National Express Group Plc/Greater Anglia Franchise* (2004), Appendix E, paragraph 6; *Arriva plc/Sovereign Bus & Coach Company Ltd* (2005), *National Express Group/Thameslink/Great Northern Rail Franchise* (2005). However, some of the percentages quoted in these reports differ from those cited here.
[6]TAS, *Bus Industry Monitor 2005*, Volume 1, Table 17, p33.
[7]Fare and volume changes have varied within Great Britain, eg the fall in the number of bus journeys outside London is far greater than in London, where ridership has been stable or even increasing.
[8]TAS, *Bus Industry Monitor 2005* Volume 1, Table 12, page 11.

expected to be increasingly responsive in the longer term (eg by changing where they work and/or live, or by buying a car).

17. In practice, the leisure/business/commuting segmentation is not always clear-cut. For measurement purposes, the standard approach has been to determine journey purpose using the type of ticket purchased as a proxy.[9] However, some passengers could be expected to shift between ticket types in response to a price rise, in circumstances where the purpose of their journey had not changed. For this reason, the CC has looked at the effects on particular passenger types in its competitive assessment.

Competitive assessment

Overlaps

18. Transport services that overlap on the same flows may compete, so the CC needs to identify and analyse overlaps in order to determine the competitive effects of the merger. Flows on different transport services overlap if they share the same start and end points. For example, if a train runs along the flow A to C in the diagram above, and a bus also runs from a point close to the train station at A to a point close to the train station at C, then the train and bus flows would be said to overlap with one another.

19. This definition of an overlap flow is sensitive to the definition of the term 'close'. The appropriate definition depends on the service being considered and the geographic setting (for example, rural vs urban areas) and is sensitive to the data available to the parties. The 'catchment areas' are normally assessed in the competitive effects section, based on survey and other evidence of the local areas.

20. In *FirstGroup/ScotRail*, catchment areas were defined according to the geographic setting:

    (a) In rural areas they included overlaps where both bus and train served a settlement regardless of the station/stop locations.

    (b) In more urban areas, they included overlaps where the catchment area of a rail station overlapped with the catchment area around the nearest bus stop, using 800 metres for a rail station and 400 metres for a bus stop (ie the station and the bus stop could be up to 1,200 metres apart).[10] This figure was based on survey evidence of the local areas.

    (c) In addition to these overlaps, the CC also considered the effects of the merger on routes serving sizeable discrete communities which are at some distance from a city centre and which have one or two rail stations. This was because the CC considered that in certain cases it would be possible to reconfigure bus routes to operate as feeder services to and from railway stations, and withdrawing or partially withdrawing direct services.[11]

21. In *Arriva/Sovereign* (a merger between two bus operators), the CC considered it useful to look at catchment areas based on the assumption that passengers may

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[9]One approach is to survey passengers and ask them the purpose of their journey.
[10]See *A report on the proposed acquisition by FirstGroup plc of the Scottish Passenger Rail franchise currently operated by ScotRail Railways Limited*, June 2004, paragraph 5.4.
[11]See *A report on the proposed acquisition by FirstGroup plc of the Scottish Passenger Rail franchise currently operated by ScotRail Railways Limited*, paragraphs 5.16 to 5.21.

have a choice between bus stops that are within reasonable walking distance and defined catchment areas as 'bus stops within half a mile radiuses'.[12]

22. In *NEG/Greater Anglia*, the CC considered overlaps between direct and indirect coach and rail services between the same points.

23. In *GWR*, the CC used catchment areas with a 400-metre radius for urban areas and 1,200 metres for rural areas.

24. Whilst its approach to date has been to take as the starting point the overlap flows identified by the parties in their submissions to the OFT, the CC, due to the greater time period for phase two inquiries, has tended to find more overlaps, substantially so in some cases. This approach can also lead to inconsistent definitions of catchment areas by different parties in the same inquiry, or by different parties in different inquiries. An alternative approach taken in GWR was to ask the parties to determine for themselves the most reasonable catchment area for the region under consideration, but to ask them to provide data on the distance from other stops and the start and end of each overlap flow. This allowed the CC to adjust the definition of the relevant catchment area if necessary.

Filters

25. In most transport inquiries there will be a very large number of overlap flows. In order to focus the analysis on those areas that are most likely to give rise to competition concerns, the CC has applied relevant filters to the overlaps. This approach allowed the CC to prioritize its analysis. It was stated in the *Greater Western Passenger Rail Franchise* report (2006)[13] that if no SLC were identified in relation to the overlaps that are the subject of more detailed analysis, it would be unlikely that an SLC would be found in relation to those overlaps that are filtered out at this initial stage. Filters have been applied in cases where the merger creates a large number of overlap flows,[14] but not in other cases.

26. The CC generally considers the following types of filters:

(a) The relative importance of overlapping flows: It has been argued that it is only worthwhile for the parties to adjust fares and/or reconfigure routes post-merger if the overlap flows on the route account for a significant proportion of total route revenue. Therefore, routes where overlap flows account for a small proportion of revenue could be filtered out of the analysis. The CC has in many cases chosen to exclude from initial analysis those routes for which overlaps account for less than 10 per cent of passengers and revenue.

(b) Countervailing competition: Flows that are the subject of countervailing competition from third parties could be filtered out of the analysis. The appropriate definition of an effective competitor differs between inquiries because it depends on the geographic characteristics of the flows or routes. The CC has applied the following definitions of an effective competitor:

(i) In *FirstGroup/ScotRail*, competition was considered effective if competitors offered a comparable frequency of service. If FirstGroup (the incumbent oper-

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[12]See *A report on the acquisition by Arriva plc of Sovereign Bus & Coach Company Ltd*, Appendix F, paragraph 6.
[13]Appendix E, paragraph 11.
[14]The CC did not apply any filters in the assessment of the *NEG/Thameslink* merger and chose instead to examine the effect of the merger on each individual overlap flow. This will not always be possible in every inquiry.

ator) offered a 'frequent' service, ie at least one bus every 10 minutes, to be effective the CC required that competitor services had a frequency of less than 10 minutes greater than the FirstGroup service, for example if FirstGroup ran a service every 5 minutes, competitor frequencies had to be greater than every 15 minutes. This was because passengers facing a frequent bus service would be unlikely to refer to a timetable but instead would probably just wait at the bus stop for the next service, in which case the extra time they would be willing to wait for a competitor bus service would probably be limited. Where FirstGroup services were less frequent, then passengers would most probably plan their journey with reference to a timetable, as they do for trains. Therefore a longer gap between services would be more tolerable. The CC considered that competitor frequencies had to be at least half as frequent as FirstGroup services to be effective. These frequencies were calculated across all bus routes covering a particular flow: no account was taken of the quality or reputation of the competitor.[15]

(ii) The CC applied the same definition in *Arriva/Sovereign* as that used in *FirstGroup/ScotRail*.

(iii) In *ICEC*, the CC defined an effective competitor as one that provided at least half the number of services, or one that accounted for at least half the flow revenue or passengers.

(iv) In *GWR*, the CC defined an effective competitor as one that provided a service with at least half the frequency of FirstGroup (the incumbent operator) unlike *FirstGroup/ScotRail*, there being no relevant services with a frequency of more than 10 minutes.

(c) De minimis: Flows of relatively little importance, in terms of either revenue, number of passengers or frequency of service, can also potentially be excluded from the initial stages of analysis. Some inquiry groups have used the value of revenue on overlaps initially to prioritize flows and routes for further analysis. This is because they thought that there would have been insufficient incentive to attract passengers from bus to rail on flows carrying very few passengers and that if no SLC were to be found on flows with revenue above the minimum threshold, they would not have expected to find an SLC on flows below the threshold. In *NEG/Greater Anglia* and *GWR*, the CC adopted a threshold of £10,000 revenue a year and concentrated initial analysis on routes with at least one overlap flow of above £10,000 and confined initial analysis on remaining routes to those with above £10,000 annual revenue.

27. In *ICEC*, the CC used a different filter and considered the proportion of revenue on overlap flows from certain ticket types to be indicative of the degree of price competition pre-merger. Specifically, the CC found that where a significant proportion (over 90 per cent) of tickets were interavailable (that is, they could be used for travel on the services of any rail operator on the flow and the fare is set by the lead operator), it was likely that there was little price competition between operators on this flow.

28. Table 2 shows a summary of the filters that have been used in past transport inquiries and the type of overlap to which they have been applied.

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[15]See *A report on the proposed acquisition by FirstGroup plc of the Scottish Passenger Rail franchise currently operated by ScotRail Railways Limited*, Appendix G, paragraph 21.

TABLE 2 **Summary of filters in past inquiries**

Filter	*Inquiry*	*Applicable to what type of overlap?*
10% overlap share of route revenue (similar to *de minimis*)	FirstGroup ScotRail	Bus/rail
	GWR	Bus/rail
	NEG/Greater Anglia	Coach/rail
	Arriva/Sovereign	Bus
Existence of an effective competitor (variously defined)	FirstGroup ScotRail	Bus/rail
	GWR	Bus/rail
	ICEC	Rail/rail
	Arriva/Sovereign	Bus
De minimis	NEG/Greater Anglia	Coach/rail
	GWR	Bus/rail
No significant price competition pre-merger	ICEC	Rail

29. The CC has considered and rejected other filters:

(a) In *FirstGroup/ScotRail*, the CC considered and rejected a *de minimis* threshold of £20,000 that was put forward by the parties. The CC considered that this would not be appropriate for local bus services because, even though only a small number of passengers may be affected on such flows, nevertheless, individual passengers regularly use the service and the adverse effect for an individual passenger could be significant.

(b) In *FirstGroup/ScotRail*, the CC considered and rejected a filter proposed by the party that would exclude from further analysis those flows where bus journey time was more than double the journey time by train. The CC considered that there were other factors in the 'generalized cost' besides journey time that were also relevant to passengers' choice between bus and rail services.[16]

(c) In *ICEC*, the CC considered and rejected a *de minimis* filter because it was not clear that an incentive to exploit the position post-merger would not exist even if the value of revenue on the flow was only small. Moreover, an accumulation of small flows could create incentives for the merged entity to exploit its position. This factor was of particular importance in that inquiry because the ICEC franchise essentially consists of one route.

(d) In *GWR*, FirstGroup favoured a threshold of £30,000 revenue a year, but the CC adopted the £10,000 threshold.

Issues

30. Filtering overlaps can be a very useful way to prioritize analysis and can be particularly important where there are a large number of overlap flows. However, the process is data intensive and there can be difficulties in obtaining the necessary information at a sufficiently early stage of the inquiry. There may also be some difficulty measuring passengers and revenue on flows that do not coincide with full routes, particularly for bus and coach. There are also some concerns regarding the design of inquiry-specific filters. In an effort to overcome this for rail inquiries, the CC and the OFT are working with the relevant government departments to develop standard pro formas that will be used to collect the necessary data from the franchise bidders, the DfT and ORR. These pro formas will be of help to the OFT, the CC and other transport companies in non-rail transport mergers,

[16]For example, fares and frequency.

31. In some cases the CC has analysed incentives and constraints with reference to routes rather than flows. In particular, in *FirstGroup/ScotRail*, *NEG/Greater Anglia*, *Arriva/Sovereign* and *GWR* the CC considered that it would not be meaningful to look at specific overlap flows in isolation because the scope for any changes by an operator post-merger (fares, frequencies etc) and the constraints on them can best be analysed by reference to the route.

Elasticities, diversion ratios and surveys

32. As the first stage of the competitive assessment of transport inquiries, the CC has usually modelled the profit incentives to adjust fares or frequencies on overlap flows (theory of harm modelling).[17] As an illustration, consider the example of a merger that creates overlaps between bus services and a rail franchise: if we know the own-price elasticity of bus demand, and, among passengers who would stop using the bus in response to a price increase, the proportion who would switch to rail (the diversion ratio), then we can calculate the effect of an increase in the bus fare on demand for rail.

Elasticities and diversion ratios

33. The own-price elasticity of demand for goods or a service is the percentage change in quantity demanded that occurs in response to a percentage change in the price. For example, if a price increase of 5 per cent causes demand to fall by 10 per cent, the own-price elasticity of demand is –2.[18]

34. The cross-price elasticity of demand is the percentage change in quantity demanded of good or service A that occurs in response to a percentage change in the price of good or service B. Estimates of cross-price elasticities for transport services tend to be less transferable than own-price elasticity estimates because they vary between routes depending on the relative scale of services.

35. Generalized journey time elasticities measure the change in demand for a service in response to a change in the journey time and generalized cost elasticities measure the change in demand for a service in response to a change in the perceived value to passengers of cost and time spent on a journey. Generalized cost elasticities tend to be less robust than fare elasticities (which are themselves not very robust) because journey time changes less often than fare and is the subject of fewer studies.

36. It is important to distinguish between a firm-specific price elasticity (the percentage change in demand for a given firm or operator in response to a change in that firm or operator's price) and a market elasticity (the percentage change in demand for a good or service in response to a change in the price of that good or service by all suppliers). These two can vary widely and the firm-specific elasticity is likely to be greater than the market elasticity. If the CC uses the firm-specific elasticity when the market-specific elasticity is the appropriate measure, it would over-estimate the likely response to a change in fare.[19]

37. A good measure of the degree of rivalry between two firms is the *diversion ratio* between them. A diversion ratio from firm A to firm B represents the proportion of

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[17] See paragraphs 55 to 63 for a full discussion.
[18] The own-price elasticity of demand measures the total change in quantity demanded for a given change in price, including a reduction in demand as passengers switch to alternative modes of transport or cease to travel altogether, so it takes account of competition from other modes of transport.
[19] Under certain assumptions, firm-specific elasticities can be estimated by using diversion ratios in a simple formula. See *NEG/Thameslink* for a full discussion.

customers who would choose firm B (as opposed to firms C, D and so on) as their second choice. As an example, if 100 passengers stop using a particular bus service in response to a fare increase or service reduction, and 30 of these switch to a particular rail service, the diversion ratio from the bus service to the rail service is 30 per cent.

38. Estimates of elasticities and diversion ratios have been drawn from a variety of sources. The CC has engaged consultants to provide relevant data on elasticity estimates. In rail inquiries, the CC has sometimes been able to use elasticity estimates from the *Passenger Demand Forecasting Handbook* (PDFH) (compiled by the Association of Train Operating Companies), or estimates from the merging parties themselves (used, for example, in internal yield management models or in franchise bid proposals). The CC has usually tried to estimate elasticities and diversion ratios that apply to particular flows and/or routes from a range of sources, including data from the parties and responses to a passenger survey. We consider the CC's use of surveys in transport inquiries in the next section.

Issues

39. There is some concern that despite the apparent wealth of available estimates, it has been extremely difficult for the CC to obtain reliable and relevant elasticity estimates. These concerns are important for the CC because for the theory of harm modelling to be meaningful it needs to estimate reliable firm-specific own price elasticities that apply to particular flows.

40. Academic research in this field has tended to focus on estimating market elasticities for rail travel, and to a lesser extent bus, but there are few estimates of elasticities for coach travel. The research has also produced more estimates of own-price elasticities than of cross-price elasticities.

41. A range of studies have been carried out into fare elasticities on UK transport, including the Department for Transport/TRL report *The demand for public transport: a practical guide*.[20] Wardman and Shires (2003) reviewed 902 public transport fare elasticities obtained from 104 UK studies conducted between 1951 and 2002. The PDFH, Wardman and Shires, Transport Planning Society and others have attempted to combine the results of these studies, as have literature surveys carried out by Mark Wardman at the Institute of Transport Studies (ITS) and Oxera Consulting Ltd (Oxera) for previous CC inquiries. However, the relevant published material typically has a number of drawbacks in the context of CC inquiries including the lack of a consistent methodology, the lack of route-specific elasticity estimates and a focus on rail, rather than bus and coach, elasticities.

42. A particular problem with regard to inconsistent methodology is the distinction between short-run and long-run effects. The PDFH, which provides estimates of rail elasticities, notes: 'There is considerable uncertainty as to how long the long run is and what the incremental effect on the fare elasticities would be' and that 'there are some doubts as to whether what are reported as long run elasticities in the literature is in fact long run'. For the CC's modelling to be meaningful, it should use elasticities and diversion ratios the effects of which will occur over the same time period over which it analyses the impacts of the merger. Inconsistent distinctions between short-run and long-run effects may undermine the reliability of any analysis.

[20]TRL report, TRL 593, 2004.

43. One way to overcome some of the issues around elasticity estimates might perhaps be to work out the elasticity that would be necessary for an incentive to exist. The CC could then consider what evidence there is that the elasticity of demand is greater or less than that figure.

Surveys

44. The CC has undertaken passenger surveys in most recent transport inquiries. The aim of these surveys has been to gather quantitative and qualitative evidence on passengers' ease of substitution between services and modes of transport. In particular, in some inquiries the CC has tried to use surveys to estimate flow or route-specific elasticities and diversion ratios.

45. The CC's approach to this has changed over time. In *FirstGroup/ScotRail* the CC conducted a detailed survey in order to estimate elasticities using modelling techniques and obtained usable results for non-price elasticities, but not for price elasticities. This survey was conducted using computer-assisted telephone interviews using random-digit landline dialling in specific urban areas. One difficulty that arose was gathering consistent data on price per journey, a key input to the modelling and the bargaining scenario.

46. In *NEG/Greater Anglia* the CC took a similar approach but used self-completion questionnaires and tried to correct problems that had arisen in *FirstGroup/ScotRail* by asking respondents to choose from a number of given options (stated preference questions). This was successful to some extent. The survey in *ICEC* was scaled back and focused on qualitative questions to understand passengers' ease of substitution between the different rail operators on the same line. In *NEG/Thameslink* the CC expanded the scope of the survey a little to get an understanding of price sensitivity, but did not try to use models to estimate elasticities. The CC took the same approach on *GWR* but encountered some problems, and the resulting elasticity estimates were implausibly high.

47. In the *Stagecoach/Scottish Citylink* inquiry the CC used a form of question that attempts to pinpoint the reservation level at which a passenger would switch to another operator or travel mode, or cease to travel altogether. The questioning, conducted by telephone CATI interview following an initial screening, is structured to offer hypothetical ticket prices based on the price the passenger actually paid for their current trip. The prices offered are calculated alternatively between high and low percentage price increases, with the questioner starting by offering a large (50 per cent) and then a small (1 per cent) increase, and successively stepping down the large increases and stepping up the small increases until a price is offered at which the respondent indicates they would switch. This method has worked well on past inquiries, including *Stena AB/P&O*.

48. The CC has had more success in obtaining diversion ratios from surveys than obtaining elasticities, but there have been problems here too. For example, in *NEG/Thameslink* some respondents told the CC about switching services with the same operator (for example, to a later service) rather than to a different operator or mode of transport.

49. In order to deal with some of the concerns regarding estimates, the CC has developed the approach of looking first for existing estimates of elasticities and diversion ratios that are reliable and robust, and used by parties that apply to flows or routes the CC is dealing with. Where such estimates have not been available, the CC has asked whether there exists any data that it can use, or consider using surveys to estimate these.

Counterfactual

50. As in all merger inquiries, in order to establish whether the merger may be expected to result in an SLC, the CC needs to consider what may be expected to happen in the absence of the merger. In many cases, the counterfactual is the existing pre-merger conditions. In certain circumstances, however, the CC may need to take into account other factors such as expected changes in the structure of the market, or alternative developments that may be expected in the absence of the merger. This is in order to reflect as accurately as possible the CC's expectation of the process of rivalry which will occur in the absence of the merger. Transactions involving the award of a rail franchise are an example of where the pre-merger situation has not been found to be the correct counterfactual. The main reason for this is that the current franchise agreements will terminate and therefore it is not possible properly to reach an expectation that the current operator would continue to operate the franchise. The inability to use the pre-merger situation in rail mergers has also been generally accepted in CC inquiries.

51. In *GWR*, the CC concluded that the appropriate counterfactual would be the award of the franchise to a company that would either raise no competition concerns or one in respect of which any competition concerns would be remedied through behavioural remedies. The effect of both alternatives would be the same and in *GWR* the CC took as the counterfactual that the services would be operated by another TOC raising no competition problems.

Theory of harm modelling/profitability analysis

Theories of harm

52. In assessing the competitive effects of a merger, the CC has usually generated hypotheses concerning theories of competitive harm. The necessary conditions for these 'theories of harm' to arise can then be tested in order to develop the CC's understanding of the likely effects of a merger.

53. Theories of harm in these inquiries derive from the common ownership of transport services, either of the same, or different, modes of transport on overlapping flows or routes, which could give rise to unilateral effects—the incentive and ability to raise fares and/or reconfigure services post-merger (including reducing frequencies).

54. The main concerns have differed according to the modes of transport under consideration:

    (a) Bus/rail: In these cases, the CC has been more concerned with the effect on bus services. In general, it has not expected a significant effect on rail services because of the regulatory constraints on service and fares (though this can arise and is likely to differ by franchise) and because a high proportion of rail costs are fixed. However, bus services are not regulated (economically) and the main concern in past inquiries where bus and rail services overlap has been that services could be reduced, or fares increased, to shift passengers from bus to rail. This could be achieved by: reducing frequencies; selective fare increases on services; diverting bus routes away from stations; or, reconfiguring services to act as feeder routes to rail stations rather than direct services.

(b) Coach/rail: The main concern in these cases has been the effect on coach services. Coach services are not subject to economic regulation, so the merged party could, at least in principle, raise fares or reduce services on coaches, given that it would benefit from the additional revenue from those that switch to rail.[21]

(c) Rail/rail: In these cases, the CC has found that there is some scope for competition between TOCs, particularly for unregulated fares.

Incentive modelling

55. As discussed in paragraph 32, the CC has developed a model to assess incentives to adjust fares or reconfigure services (bus, coach and/or rail) on overlap flows. The model uses estimates of: *(a)* the demand responsiveness of passengers to changes in fares and frequencies (price and service elasticity); *(b)* the ratio of passengers that divert to another operator or mode (diversion ratio); and *(c)* the variability of costs, to simulate the possible profit outcomes from the relevant theory of harm strategies.

56. The model is described in detail in Annex 3. In sum, the model captures the merger-specific effects of the net annual benefit of a change in fares or services by estimating the net revenue gain/loss from passengers switching to the commonly-owned service, the increase in revenue from higher fares paid by passengers that do not switch away, the loss of revenue from passengers that stop using the existing more expensive service and any reduction in variable costs that may be realized from a reduction in service levels.[22] Usually, the CC's modelling also allows for only a percentage of incremental rail revenue to accrue to the TOC where the franchise agreement includes a revenue risk-sharing agreement with the DfT. It should be noted that in many cases the increase in revenue is actually an increase in profits as there is spare capacity and little or no increase in costs.

57. The description in Annex 3 of the incentive modelling presents examples that simulate the profit outcome from increasing bus fares and service reductions post-merger on a bus/rail overlap flow. The model can also be used to simulate the outcome of a reduction in service frequency.

58. Incentive modelling is an extremely useful tool for the assessment of the competitive effects of a merger. However, in practice there are a number of issues regarding the implementation of the model.

59. This modelling is highly sensitive to the inputs used, so it requires reliable estimates of, for example, relevant elasticities and diversion ratios. Concerns over the quality and reliability of estimates can have serious implications for the CC's ability to model potential theories of harm in a meaningful and robust way. To address these concerns, at least in part, in past inquiries the CC has attempted to sensitivity test the analysis under various different assumptions. This allows the CC to assess how realistic these assumptions are, and hence the likely profit incentives from the merger.

60. It has not been uncommon for the CC's models to show that a price rise (or service reduction) would be profitable even without the merger. This suggests that there could be constraints on pricing that are not incorporated into the CC's estimates (see paragraph 59 above) and into the CC's modelling; the CC investigates these

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[21]It should be noted that in NEG/Greater Anglia, the CC considered that whilst such an incentive might exist, it would jeopardize the network revenues generated by those passengers travelling to Victoria coach station to connect with other services.
[22]In the model, the CC only considers fare-paying passengers because concessionary passengers that don't pay a fare are unlikely to shift in response to a fare increase.

constraints during the course of the inquiry. It could be that to some extent, fares and fare structures are determined by legacy fares (ie pre-privatization). Or, it could be that companies set prices taking into account longer-term customer behaviour and that the CC should use long-run elasticities rather than short-run elasticities in its modelling, although the CC has usually used longer-term own-price elasticity estimates (see Paragraph 42 above). In the next subsection we consider the CC's approach to assessing the constraints on the ability of the merged entity to for example raise fares. .

61. There is also an issue regarding how the CC determines what an incentive is. In particular, if incentive modelling shows that a strategy is not profitable before the merger, but is profitable after the merger, then this could indicate a merger-specific incentive. However, if analysis shows that a strategy is profitable both before and after the merger, then it is not clear that this is a merger-specific incentive. However, where the difference in profitability pre- and post-merger has been significant, the incentive may be more likely to be considered merger-specific.

62. In some cases, the possible profit outcomes showed a range of incentives, some of which were larger than others. The CC has then had to decide whether the incentives were sufficiently large for the company to act upon. The CC attempted to quantify this in NEG/Thameslink and in GWR. In GWR, the CC considered that, expressed as a proportion of route revenue, the merger-specific incentives were limited. However, the way that the CC should approach this has yet to be considered in great detail.

63. There is also a question as to whether the CC should consider just the profit incentive on individual flows (which is likely to be relatively small) or if it should aggregate profit incentives on individual flows across the entire route (as per FirstGroup/ScotRail). Where network effects are important, it may also be necessary to aggregate profit incentives across routes or to consider the possible loss of network revenue. For example, in NEG/Greater Anglia, the CC incorporated into the modelling the loss of revenues from passengers connecting to another service in the network.

Constraints on ability to raise price including entry and regulation

64. The CC has needed to consider constraints on the ability of the parties post-merger to raise price. These constraints include:

(a) regulation of rail fares and service levels;

(b) the relationship between regulated and unregulated rail fares; and

(c) potential for entry/expansion.

(a) Regulation of rail fares and service levels

65. The scope to increase rail fares is limited by regulation.[23] In the cases to date, fare regulation has allowed a TOC to increase individual fares in a fare basket by a maximum of RPI+6 per cent, so in principle a TOC could target fare increases on flows or routes where competition would be reduced as a result of the merger. However, any increases in regulated fares would have had to be offset by holding back or reducing other fares so as to keep within the overall price cap of RPI+1 per

[23]The proportion of fares accounted for by regulated fares can vary, eg depending on the route.

cent. Furthermore, it was considered that any significant differentials in fare increases could distort the fare structure between nearby services and would also be likely to generate complaints.[24]

66. The scope to reduce services on rail franchises is also limited by regulation. In past inquiries, the CC has reached the view that there is negligible scope to reduce service levels on regulated franchises; franchise agreements often specify investments and service improvements and TOCs have to comply with a range of service quality standards.

(b) The relationship between regulated and unregulated fares

67. Although there may be more reason for concern about unregulated rail fares, there are several factors that may counteract the incentives to increase these fares. First, unregulated fares mainly cover journeys on non-peak times where there may be spare capacity. Given that almost all rail costs are fixed, there would be an incentive to increase demand at these times, and thus make off-peak fares as attractive as possible. In addition, non-peak passengers typically are more price-sensitive than peak passengers. The greater the price sensitivity of non-peak passengers, the less likely it will be that TOCs will find it profitable to significantly raise unregulated fares.

68. Unregulated fares are also, to varying extents, constrained by regulated fares that provide an alternative as there may be a need to keep a reasonable relationship between regulated and unregulated fares. For example, an unregulated supersaver fare cannot reasonably exceed the corresponding regulated saver fare which is subject to fewer restrictions. In NEG/Greater Anglia, the CC considered and stated some types of fare that might be subject to commercially motivated increases:

(a) significant increases in the standard class 'turn-up-and-go' single and open return fares or cheap day returns would probably result in most passengers using regulated saver tickets whenever possible;

(b) significant increases in first class fares would probably persuade many passengers to travel standard class or drive; and

(c) increases in low-price advanced-purchase return fares would defeat their purpose as yield management tools are designed to transfer peak loads to off-peak services and fill unused seats.

69. There may also be constraints between fares to different destinations such that an operator may not be able to raise the fare on a shorter flow to a level higher than fares on a longer flow of which it is a subset, because passengers would purchase the lower fare for the longer journey and get off at an earlier stop. [25]

(c) Potential for entry/expansion

70. The extent to which the parties could raise fares or reduce services on overlap flows or routes after the merger is subject to the prospects for entry and expansion of existing operators on those flows or routes. The merger itself may also increase

[24]Although fares on other transport modes are not regulated, it may be argued that operators of these modes take account of the threat of regulation when setting their fares.
[25]In addition, some transport operators may operate standard fares for certain routes or parts of routes, for instance through zonal fares or flat fares. In such cases, it may be costly for the operator to change the fare structure.

barriers to entry and expansion, for instance through the increase in the size of the network post-merger, and this would be taken into account in the analysis.

71. As indicated in the FirstGroup/ScotRail and NEG/Greater Anglia reports, it is generally agreed that the prospects for entry on train services are very limited given, for example, the lack of track capacity and is therefore not generally considered to be a constraint on behaviour post-merger. Hence, in cases to date, in assessing the likely effect of a merger the CC was interested in entry or expansion in response to a deterioration in the offering, rather than entry of this kind.

72. In appraising the effectiveness of entry and expansion from other bus operators to act as a constraint on FirstGroup, the CC considered first the previous extent of entry in the areas affected by the merger; second, the possible barriers to entry; and finally, the incentives and prospects for entry should FirstGroup, for example, increase fares and/or reduce frequencies as a result of the merger. The CC concluded in FirstGroup/ScotRail that the greatest barriers to entry or expansion for bus service operators are the threat of retaliation by the incumbent and the significant costs associated with entry on a network basis.[26] Networks are likely to be a particular concern where the incumbent is a multi-modal operator.

Comparative assessment where the CC finds an incentive and ability to raise fares/reconfigure routes

73. We noted in paragraph 12 that a passenger's choice of mode of travel and ability to substitute between different modes is likely to depend on a number of factors. As an additional stage in its competitive assessment, the CC has in some inquiries conducted a comparative analysis of various factors for those flows or routes where it has found a profitable incentive. This has normally included analysis of the journey purpose and ticket mix, as well as fares and other aspects of generalized costs such as frequency of services. Where possible, the CC has also drawn on qualitative evidence from passengers as to their likely response to changes in fares or services on the specific flow or route in question. This assessment allows the CC to test the robustness of its flow-by-flow, or route, modelling.

Conclusion

74. In conclusion, while there remain a number of issues that require further consideration, and while practice has varied according to the specific nature of the inquiry, the CC has *(a)* developed a fairly consistent approach and *(b)* improved its approach to transport inquiries. The CC has normally defined the relevant markets as point-to-point flows and possible wider network markets and have analysed the ease of demand-side substitution on a flow-by-flow basis in the competitive assessment. In most inquiries, the CC has identified and filtered overlaps to prioritize analysis and used estimates of elasticities and diversion ratios to model the profit incentives arising from the merger. The CC has assessed the likely constraints on the ability of the parties to pursue merger-specific profitable incentives, including the constraints from regulation and entry or expansion. Finally, in most inquiries, the CC has compared the fares and other aspects of generalized costs such as frequencies of the overlapping flows in order to determine the likely competitive effects of the merger.

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[26]Larger bus companies organize themselves around bus depots and fleets and the wider networks they operate. The existence of such a network can enable an operator to alter the allocation of resources among its individual routes, and also to offer network tickets. Operators with networks will find it easier engage in, withstand and respond to retaliation on individual routes than operators without networks (smaller operators).

CC transport inquiries under the Enterprise Act 2002

1. The CC has completed the following five inquiries in the transport sector under the Enterprise Act 2002:

   (a) FirstGroup/ScotRail: the successful bid for a rail franchise in Scotland by a bus operator. The CC found that this merger would be expected to result in an SLC on overlap flows on routes in and around Glasgow and Edinburgh. The CC also found that the merger may be expected to result in an SLC in wider public transport network markets in and around the Strathclyde Passenger Transport Executive area, Edinburgh and the Lowthians and elsewhere in Scotland. This merger was cleared with remedies in June 2004.

   (b) NEG/Greater Anglia: the successful bid for the Greater Anglia rail franchise by NEG, an operator of rail services and scheduled coach services. This merger was cleared without remedies in November 2004.

   (c) Arriva/Sovereign: the proposed acquisition by Arriva plc, a provider of local bus services, of the Hertfordshire bus operator, Sovereign Bus & Coach Company Ltd. This merger was cleared without remedies in January 2005.[27]

   (d) FirstGroup/ICEC: the bid for the InterCity East Coast rail franchise by FirstGroup, the owner of an open access rail operator in the same area. The franchise was awarded to another bidder and the reference was cancelled before the publication of our report. Please see the CC website for a commentary on this inquiry.

   (e) NEG/Thameslink and Great Northern Franchise: the proposed acquisition of the Thameslink and Great Northern rail franchise by NEG, the operator of a number of rail franchises and a network of coach services. This merger was cleared without remedies in December 2005.

   (f) Great Western Rail Franchise: the proposed acquisition of the Great Western Rail franchise by FirstGroup, where GWR services overlapped with FirstGroup's bus services on a number of point-to-point journeys. This merger was cleared without remedies in March 2006.

2. In March 2006, the OFT referred to the CC a completed joint venture between Stagecoach and Scottish Citylink, both operators of networks of coach services in Scotland.

[27] The Group was split in reaching a decision in this inquiry, with three of five members in favour of no SLC.

Market definitions on past inquiries

		Geographic		*Product*		
Inquiry	*Transport*	*Point-to-point*	*Network*	*Public transport*	*Private transport*	*Segmentation*
First Group/GWF (2006)	Bus and rail	Appropriate to consider journeys on point-to-point flows as relevant markets	Have regard to wider network markets.	In general, there are separate markets by transport mode. Considered in competitive effects on a flow-by-flow basis.	Limited substitution between public and private transport. Considered in competitive effects on a flow-by-flow basis.	Differences in journey purpose delineate segments of the relevant market rather than separate relevant markets.
NEG/Thameslink (2005)	Rail and coach	Appropriate to consider journeys on point-to-point flows as relevant markets	No need to consider wider public transport network markets because no effect from franchise award and little potential for combined rail and coach ticketing.	In general, there are separate markets by transport mode. Considered in competitive effects on a flow-by-flow basis.	Limited substitution between public and private transport. Considered in competitive effects on a flow-by-flow basis.	Appropriate to distinguish leisure travel from commuting and business travel, but these types of journey do not form separate markets.
First Group/ICEC (2005)	Rail	Appropriate to consider journeys on point-to-point flows as relevant markets	Considered wider network markets in Scotland.	On some long- distance flows, air travel and coach travel may be an alternative. On shorter flows, bus would be a viable alternative to rail.	Private car may be a more viable alternative to rail on some flows.	Considered different journey purposes.
Arriva/Sovereign (2005)	Bus	Consider supply of bus services on point-to-point journeys	Considered broader network markets in Hertfordshire	No other public transport alternatives	No substitution from private transport	Considered passengers and public sector bodies as different sets of customers.
NEG/Greater Anglia (2004)	Rail and coach	Point-to-point journeys regarded as relevant markets.	No need to consider markets on a network basis because the wider network was not affected by the merger.	Limited rail and coach substitutability on routes being considered.	Public transport journeys were different to journeys by private transport on the relevant routes.	Appropriate to distinguish leisure travel from commuting and business travel
First Group/ScotRail (2004)	Bus and rail	Point-to-point journeys regarded as relevant local market.	Relevant public transport network markets such as SPTE area, Edinburgh and the Lothians and, in some contexts, Scotland as a whole.	Bus and rail may be substitutable on some routes	Private cars do not provide a major competitive constraint on either bus or rail.	Segmented between in-hours and out-of-hours operations. Also considered passengers and public sector bodies as different sets of customers.

Modelling theory of harm

Introduction

1. This annex deals with the modelling of the theory of harm and the profit incentives that could be available to bidders of a rail franchise. It refers to bus:rail overlaps, however the methodology applies equally to other types of overlaps that arise in transport inquiries. The annex also covers a worked example of theory of harm modelling, which is usually carried out for key overlaps that come under consideration.

Factors affecting profit incentives

2. Theory of harm modelling attempts to simulate the possible profit outcomes arising from reducing bus frequencies and/or increasing bus fares. The simulations apply estimations on the demand responsiveness of passengers to changes in fares or frequencies (price or service elasticity), and the ratio of passengers that divert to rail (diversion ratio).

3. The potential to increase profits on overlapping bus/rail flows is greatest when overlapping flows make up a large portion of a bus route. A bus operating company is less likely to increase fares or reduce frequencies if overlapping passengers account for only a small portion of total route passengers. In this scenario, the loss of revenue from non-overlapping passengers shifting away from bus is likely to exceed the incremental revenue from overlapping passengers that shift to rail and from the incremental revenue from increased fares.[28] The existence of profit incentives is less likely when overlapping flows account for less than 10 per cent of a route (in terms of passenger numbers).

4. The incentive to shift passengers from bus to rail also arises in part from rail fares being generally higher than bus fares over comparable flows, most notably at peak times. Also, bus operations have a high proportion of costs that are variable or semi-variable. Rail operations, on the other hand, have largely fixed costs. A rail franchise agreement usually determines the mileage to be operated and imposes performance penalties for failing to run the required service. There are no such service level requirements for bus operations, and this, combined with the different characteristics of running a bus service, mean that variable costs such as drivers, fuel and tyres can be reduced by a discretionary lowering of service levels. Thus variable cost savings can be achieved from reducing bus services, but extra train passengers generally add little to train costs.

5. The existence of revenue risk may be an important factor in determining the viability of bus/rail substitution. Revenue risk would most likely be shared between the TOC and the DfT through a cap-and-collar mechanism. This sharing arrangement could reduce profit incentives as some incremental rail revenue would be shared with the DfT.

[28] This can, however, be overcome by the merged company if it is able to target its action, which is easier with a fare increase than with a service reduction which affects all passengers.

Profit incentives modelling

6. The modelling assumes that all rail costs are fixed and that the majority of bus costs are variable to the distance travelled. In the case of modelling service reductions, the model assumes an average variable cost per mile, and applies this against several scenarios of service reductions that result in reduced mileage.

7. The modelling requires estimates on how passengers will react to fare increases and service reductions. Elasticity[29] estimates depend on various factors such as fare levels, the size and direction of fare changes, income levels, car availability etc. It is difficult to obtain elasticities for each route, which would take into account route-specific factors such as route distance, social-demographic profiles and the existence of other modes of transport. Using smaller (ie less than 1.0) short-run elasticities can often produce modelling outcomes that suggest that profitability could be improved regardless of the merger. Accordingly, in attempting to simulate the profit outcomes over the long run, the modelling will include long-run price and service elasticity estimates, which are generally closer to 1.0.

8. The modelling also requires estimates of diversion ratios, ie the ratio of passengers who divert from bus who end up shifting to rail. Estimates of diversion ration can be gained from a variety of sources, but often the modelling will assume a range of values in order to test the sensitivity of results. Surveys can often provide a more robust estimate in the relevant market being investigated.

9. For each route being investigated, the difference between the average revenue per passenger for rail and bus is incorporated into the model applied, as much of the incremental revenue from shifting passengers arises from rail fares being more expensive than bus fares. Also, the relevant rail franchise's rail market share on each particular rail flow is taken into account (as in some cases there are more than one TOC on a flow), as well as the likely share of rail revenue the new franchise is likely to share with the DfT. The modelling assumes that the amount of incremental rail revenue received is limited to the current rail market share the new rail franchise has on each flow.

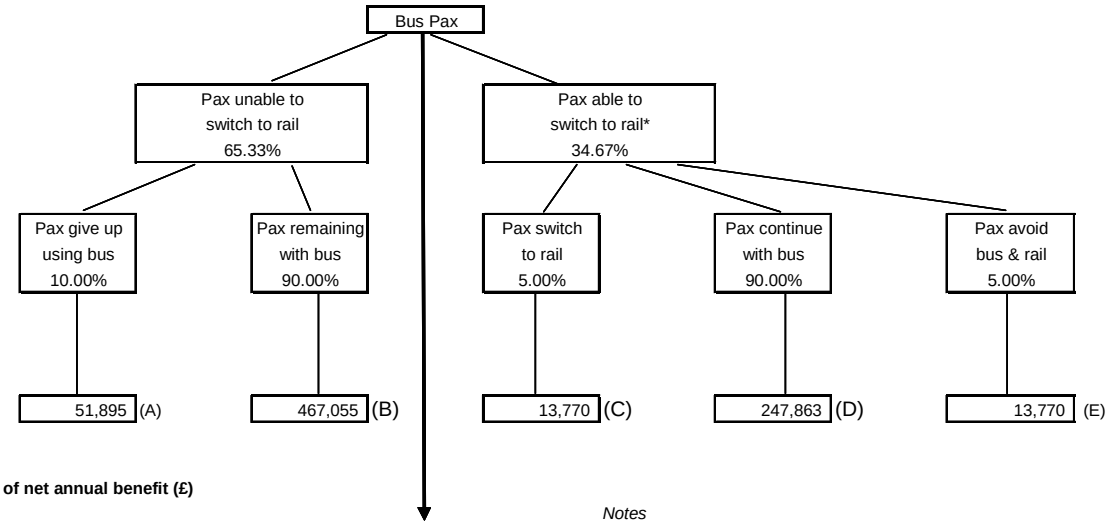
Example

10. Figure 1 shows the simulated profit outcome from increasing bus fares on a sample route, operated by a bus operator facing no competition from another bus operator (ie no diversion to other bus). The rail franchise, which the bus operator is bidding for, operates a service over the same route. The average revenue per passenger is £1.10 for bus and £2.36 for rail. The amount of overlapping passengers is high relative to total bus route passengers—34.67 per cent.

[29]The reduction in bus passengers in response to increased fares or reduced frequency.

FIGURE 1

Fare increase example



Calculation of net annual benefit (£)

		Notes
Total bus route pax	794,353	
Total bus route revenue	873,311	
Average bus revenue per pax £	1.10	
Average bus revenue per overlapping pax £	1.25	
Average bus revenue per non-overlapping pax £	1.02	
lost bus revenue from pax (A) who can't switch	-52,834	= 51895 @ £1.02
lost bus revenue from pax (E) refusing to switch	-17,249	= 13770 @ £1.25
lost bus revenue from pax (C) switching to rail	-17,249	= 13770 @ £1.25
Add revenue from increased bus fares - pax (B) & (D)	78,598	= 247863 @ £1.25 @ 0.1 + 467055 @ 1.02 @ 0.1
Add rail revenue from pax (C) switching to rail†	24,373	= 13770 @ £2.36 @ 75% rail share
Net annual benefit	15,640	

* This represents % of overal route passengers which are overlap passengers

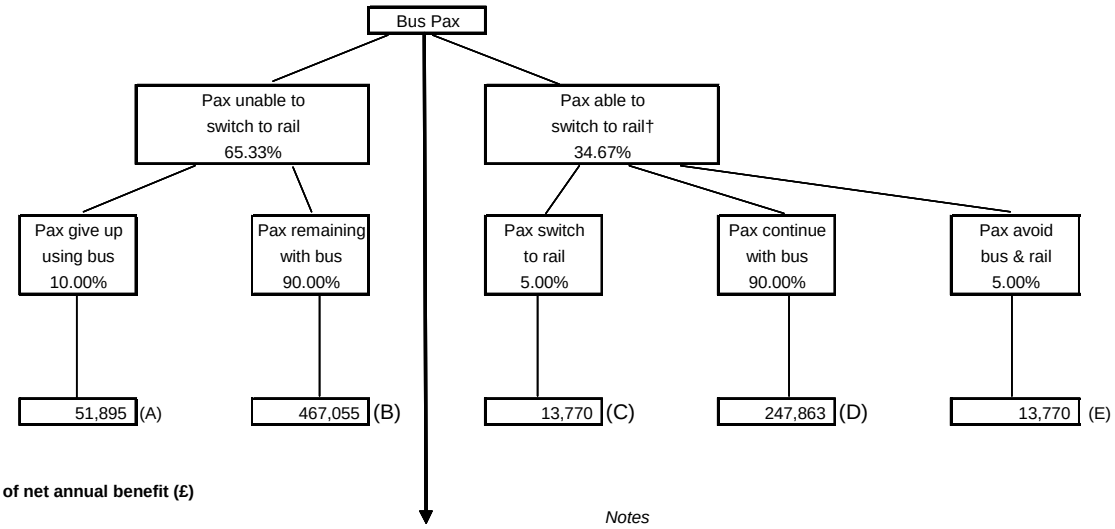
† Average rail revenue per passenger = 2.36

11. If the demand response to a fare increase is an elasticity of –1.0 across the route, including overlapping and non-overlapping passengers, and if the bus operator were to increase fares by 10 per cent, then the expected loss of bus patronage would be 10 per cent across the route, which would equate to loss of bus revenue of £8,734 (£78,598 – £52,834 – £17,249 – £17,249). Assuming a 50 per cent diversion ratio, the incremental revenue arising from passengers switching to rail would amount to £24,374, leaving a net increase in passenger revenue of £15,640.

12. Figure 2 shows the projected profit outcome from reducing bus services on the same route by 10 per cent, equivalent to about seven services per day. Using the same diversion ratio as above and a service elasticity of –1.0, there would be an increase in profits of £3,665. It should be noted that most of this increase in profit comes from the variable cost savings, and that the extra revenue gained from switching passengers accounts for a minority portion. However, without the incremental rail revenue, reducing services would lower bus operator's profits on this route. Variable cost savings have been calculated by multiplying the average bus cost per mile with the reduction in mileage under the 10 per cent service reduction scenario.

FIGURE 2

Frequency reduction example



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lost bus revenue from pax (E) refusing to switch	-17,249	= 13770 @ £1.25
lost bus revenue from pax (C) switching to rail	-17,249	= 13770 @ £1.25
Add variable cost savings	66,623	
Add revenue from pax switching to rail (C)	24,373	= 13770 @ £2.36 @ 75% rail share
Net annual benefit	3,665	

† This represents % of overall route passengers which are overlap passengers

* Average rail revenue per passenger = 2.36