

Bus to rail substitution

1. This appendix discusses the possible profit incentives available to FirstGroup as the owner of bus operations in both Glasgow and Edinburgh and the operator of the ScotRail franchise. In principle, bus frequencies could be reduced or bus fares increased, with the lost revenue from passengers switching away from bus being more than offset by the additional rail fares from those passengers who switch to rail, lower bus operating costs and in the case of increased fares the increase in revenue from passengers remaining with the bus. This appendix attempts to simulate the possible profit outcomes arising from FirstGroup reducing bus frequencies and increasing bus fares, in 30 routes in Glasgow and Edinburgh. These routes are those where the overlap flows exceed 10 per cent of route revenue and where there is no effective bus competition¹ in the overlap flows. Of these, seven are in Edinburgh and the remainder are in Glasgow. These correspond to the routes listed in Annex 1 of Appendix G. The simulations make assumptions on switching behaviour and the variability of costs.
2. The rail to bus substitution strategy is unlikely as all rail fares in the SPTE area are set by the SPTE, and rail service levels are predetermined in the franchise agreement across the whole franchise area. Accordingly this appendix does not simulate the effects of increasing rail fares or rail headway.

How bus/rail substitution may be profitable

3. The potential to increase profits arises in part from rail fares being generally higher than bus fares over comparable flows, most notably at peak times. On the basis of information supplied by FirstGroup, average revenues per passenger during the current financial year were higher for rail services relative to corresponding bus services for the majority of overlapping flows in Glasgow and Edinburgh during the current financial year ([x%] per cent and [x%] per cent respectively).
4. The profitability of transferring passengers from bus to rail arises also from the fact that bus operations have a high proportion of costs that are variable or semi-variable. Rail operations, on the other hand, have largely fixed costs. The rail franchise agreement 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 if lower bus services lead to fewer bus passengers but extra train passengers generally add little to train costs.
5. FirstGroup told us that increases in bus frequencies (to accommodate extra passenger volume) would have a direct and linear impact on costs. If three buses an hour were run instead of two, total costs on a route would increase by just under 50 per cent (reflecting a small impact from fixed route overheads). Conversely any fall in frequencies should result in a linear reduction in operating costs.
6. Along with the differences between rail and bus fares and the variability of costs, the existence of revenue risk may be an important factor in determining the viability of

¹Competition was considered effective if competitors offered a comparable frequency of service.

bus/rail substitution. If the revenue risk from the new rail franchise is to reside with FirstGroup in whole or in part, then the company would have an incentive to increase rail passenger numbers.

7. FirstGroup stated that revenue risk on rail would most likely be shared between the franchise, the SRA and the SPTe through a cap-and-collar mechanism. This sharing arrangement could reduce the incentive for FirstGroup to encourage passengers to switch to rail beyond the cap as some incremental revenue would be shared with the SRA. FirstGroup argued that it would not have an incentive to shift passengers from bus to rail under this mechanism. It had set target passenger revenue of about £[x] million for the first year of the franchise term. If actual revenue exceeds this figure by [x] to [x] per cent, the SRA will receive from FirstGroup [x] of the amount by which actual revenue exceeds [x] per cent of this target revenue. But FirstGroup is entitled to retain all extra revenue if revenue exceeds the target by up to [x] per cent. Therefore FirstGroup would be entitled to exceed this target by up to about £[x] million (£[x]), and keep [x] per cent of the excess. This would easily cover the incremental rail revenues shown in Table 5, which totalled only £[x] for all the routes shown. Accordingly it seems unlikely that the cap-and-collar mechanism will have an impact on profit incentives for First Group to make changes on a small number of overlap flows.
8. Another factor affecting the incentive to shift passengers from one mode to another is the level of bus driver shortages, which has been estimated at about 32,000 across the UK.² This has forced many bus operators to cut back services, and is likely to have an impact on any future bus service levels provided by FirstGroup.

Assumptions

9. Our calculations assume that all rail costs are fixed³ and that the majority of bus costs vary directly with mileage or hours in service. FirstGroup provided figures, which indicated that the combined variable costs (driver, fuel and tyres) and semi-variable costs⁴ (engineering and PCV⁵) for operating a bus were about £[x] an hour. When calculating the amount of cost savings in the case studies, driver costs are calculated on the basis of driver salaries saved (£[x] a year per driver). Fuel and tyres, engineering and PCV costs are calculated on the basis of miles saved (£[x], £[x] and £[x] per mile respectively). These calculations are consistent with figures supplied by FirstGroup in its 2003 management accounts. No fixed overhead savings have been assumed.
10. Elasticity⁶ estimates depend on various factors such as fare levels, the size and direction of fare changes, income levels, car availability etc. It was not possible to obtain elasticities for each modelled route, which would have taken into account route-specific factors such as route distance, social-demographic profiles and the existence of other modes of transport. FirstGroup provided an overall own-fare elasticity figure of -0.3. FirstGroup stated that there was no reliable general elasticity that could be applied to frequency effects on demand as these tended to be route/flow specific. The work carried out by OXERA on studies on transport elasticities in the UK suggests that price elasticity (short run) on urban bus services range from -0.3 to -0.5, and that headway⁷ elasticity ranges from -0.25 to -0.40.⁸ FirstGroup added that a robust

²Nottingham City Transport 2004.

³Confirmed by FirstGroup.

⁴Most of these costs are variable depending on the number, frequency and duration of buses run.

⁵Passenger Carrying Vehicle depreciation, insurance and operating leases.

⁶The reduction in bus passengers in response to increased fares or reduced frequency.

⁷Waiting time.

⁸See the OXERA report on our web site.

conclusion could not be drawn from any calculations using short-run elasticities, as they suggested that FirstGroup could improve its profitability regardless of the merger, and argued that if long-run price elasticity was applied the results would be very different. Accordingly, we have attempted to simulate the effects on profitability from using a range of price and headway elasticities, including a long-run price elasticity estimate from the OXERA study, and to separate those profits that can be achieved by FirstGroup without the merger and those that arise from the bus to rail substitution.

11. We assumed that the loss of bus patronage on the overlapping part of the route is split evenly between those who switch to rail and those who avoid both FirstGroup and ScotRail. It is possible that greater than 50 per cent of the passengers will divert elsewhere, given that the NOP survey showed that only 32 per cent of passengers⁹ would switch to rail if they stopped using bus. However, another 15 per cent stated that they would use another bus company. If FirstGroup were to reduce frequency or alter fares during out-of-hours times, when there is usually a lack of bus competition, it is possible that more than 32 per cent of passengers would switch to rail.
12. The difference between the average revenue per passenger for rail and bus has been applied. These averages have been obtained from the overlapping part of the route, and the difference between rail and bus may reflect the differences in composition of ticket types used.
13. It is assumed that fare increases are applied to the overlapping part of the route only. At an elasticity of less than -1.0 , increasing bus fares could be applied to the whole route, increasing profits even further. However, given the current OFT undertakings (fare cap) (see Appendix J), it would be more beneficial to restrict the fare increases to selective areas where the benefit would be greatest, ie overlapping areas of specific routes. Applying fare increases to the overlapping part of routes only would lessen the need to reduce fares in other parts of the bus network in order to keep within the overall weighted fare increases allowed under the fare basket.
14. The calculations do not take into account the lost bus revenue arising from FirstGroup having to reduce bus fares elsewhere to comply with the OFT undertakings. Were FirstGroup required to apply a proportionate fare reduction to the same number of passengers that pay the fare increase they would lose revenues on the other routes. However reducing fares elsewhere would attract extra passengers (and thus extra revenue), offsetting some of the loss from lower fares. Accordingly at higher elasticities the reduction in fares would have a minimal impact on profitability.

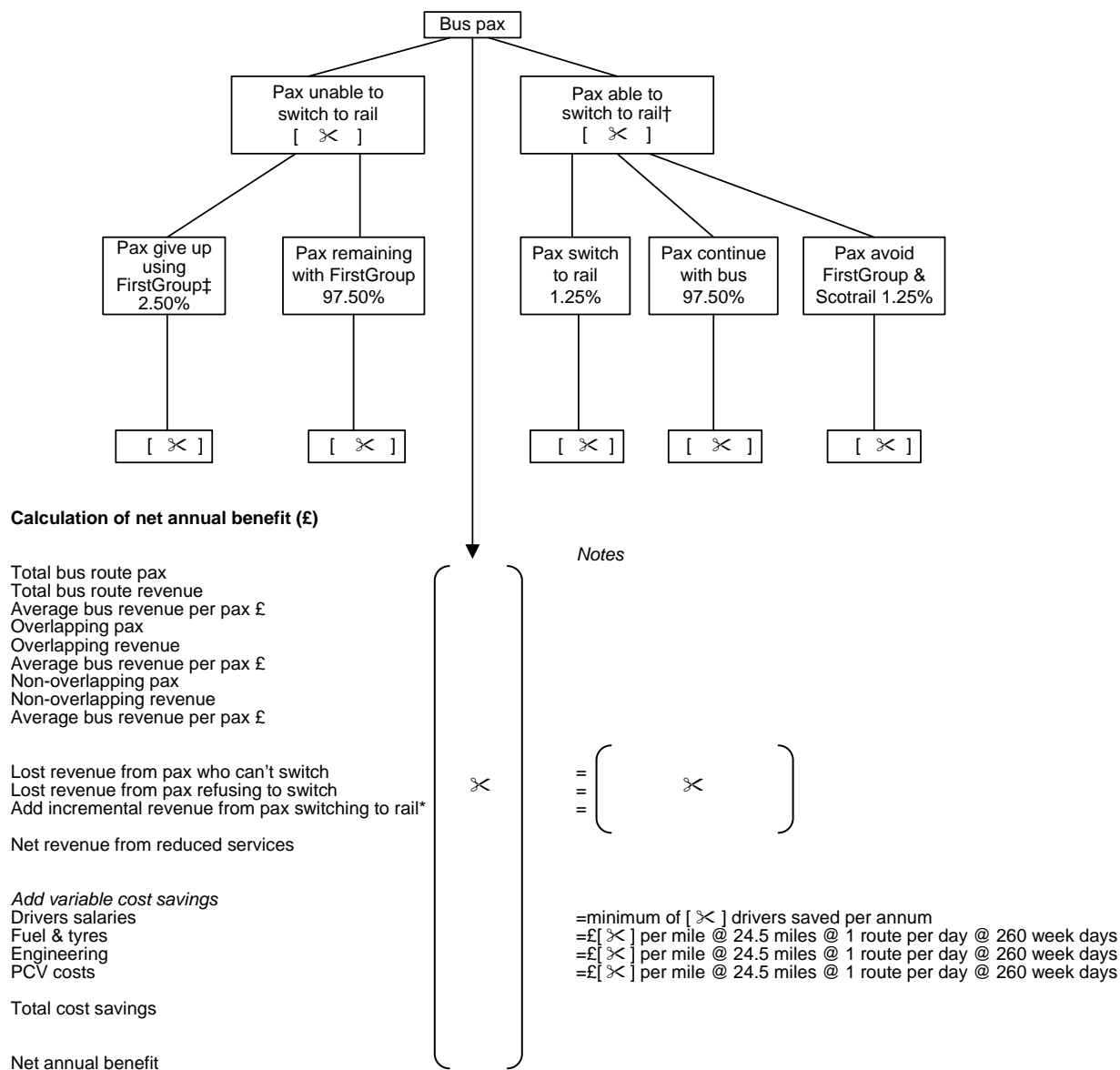
North Berwick to Edinburgh case study

15. Figure 1 shows the projected profit outcome from increasing bus headway. FirstGroup operates an express service between North Berwick and Edinburgh—X5—with a journey time of about 75 minutes. Frequencies are every 60 minutes throughout the day up till late afternoon. ScotRail operates a 40-minute service at intervals of every 30 minutes peak and 60 minutes off-peak. The average revenue per passenger is £[x] for bus and £[x] for rail. The amount of overlapping passengers is high relative to total bus route passengers—[x] per cent.

⁹At off-peak times.

FIGURE 1

North Berwick to Edinburgh—frequency reduction



Source: CC calculations from FirstGroup data.

*Average rail revenue per passenger on all overlapping sections=[]

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

‡This represents % of non-overlap passengers who decide to discontinue with FirstGroup because of reduced services.

16. If the demand response to an increase in headway is an elasticity of -0.25 across the route, including overlapping and non-overlapping passengers, and if FirstGroup were to increase headway by 10 per cent, then the expected loss of bus patronage would be 2.5 per cent across the route, which would equate to loss of bus revenue of £[]. The incremental revenue arising from passengers switching to rail would only amount to £[].

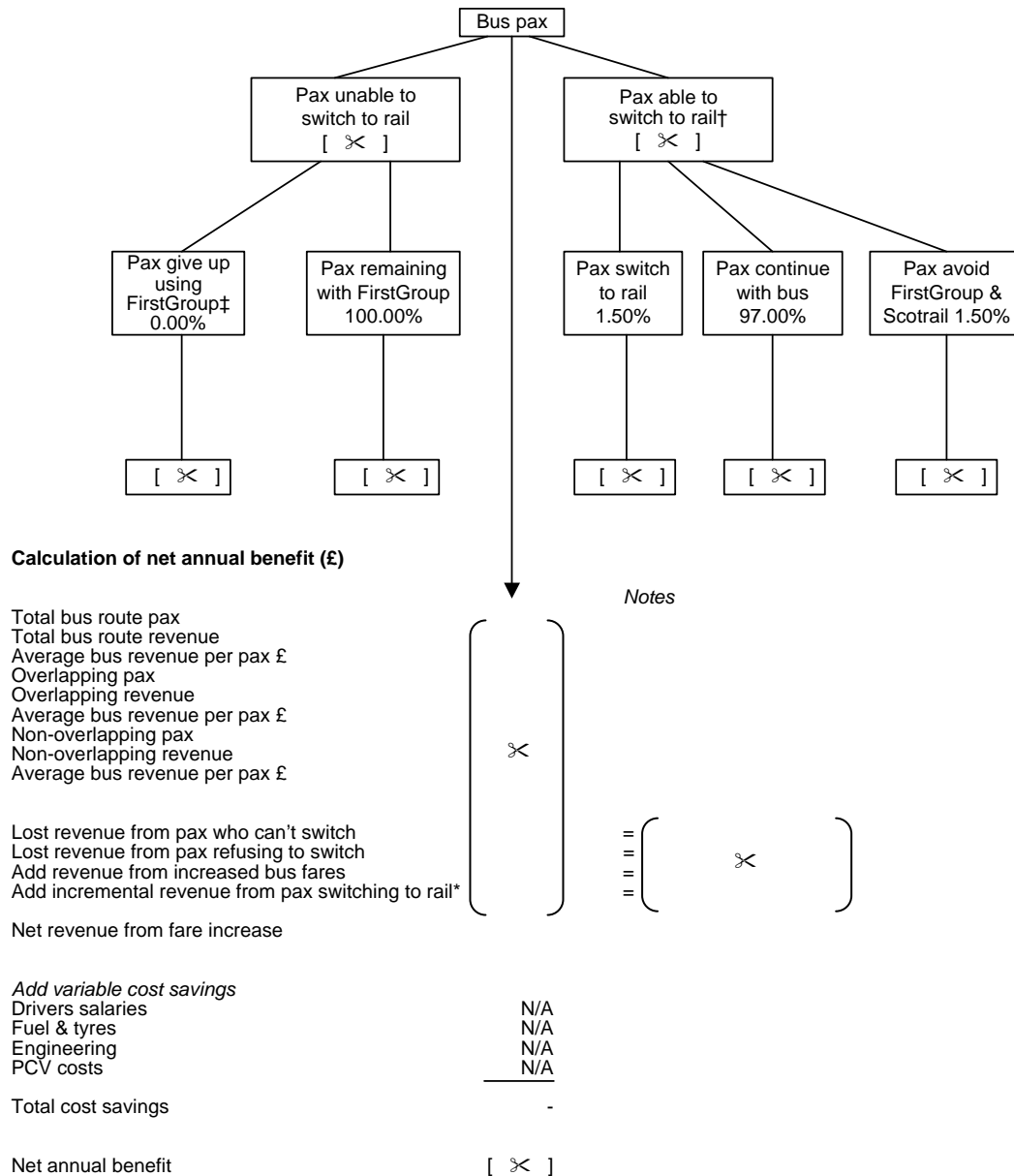
17. Cost savings would include about £[] of driving costs saved a year. There is also about £[] of fuel and tyres, engineering and PCV savings arising from less mileage. Total savings amount to £[], which, combined with the net revenue losses above, results in a net increase in profit of £[] annually. 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 only a small portion. Accordingly FirstGroup could arguably achieve a profitable outcome currently, by simply reducing frequencies on routes, without the need for passengers to switch.

18. Figure 2 shows the projected profit outcome from increasing bus fares on the same route. Using the same assumptions as above and a price elasticity of -0.3 , there would be an increase in profits of £[~~8~~] when bus fares are raised by 10 per cent most of which comes from increased revenue from remaining bus passengers.

FIGURE 2

North Berwick to Edinburgh—fare increase



Sensitivity analysis

19. This case study above assumed a headway elasticity of -0.25 and a price elasticity of -0.3. If the higher estimates of elasticities are used, the extra profits arising from a 10 per cent increase in headway is only £[£] (headway elasticity of -0.4), and from a 10 per cent increase in bus fares the extra profit is £[£] (price elasticity of -0.5). Applying a long-run price elasticity of -1.0 lowers the extra profit to £[£]. Accordingly higher elasticities have the effect of lowering the profits arising from increasing fares or reducing frequencies.

20. The case study also shows that most of the increase in profits arises from the variable costs savings and from the increased bus revenues from the passengers that do not switch. The incremental rail revenue from the switching passengers accounts for only a minority of the profit increase. Accordingly much of these profits can be achieved by FirstGroup without ScotRail, by simply reducing frequencies or increasing fares on these routes.
21. Tables 1 to 5 provide a sensitivity analysis for all of the routes showing the simulated change in profits under a price elasticity of -0.3 , -0.5 and -1.0 , and under a headway elasticity of -0.25 and -0.40 . The tables also provide a split between extra revenues arising from passengers that switch, and profits from non-switching passengers and variable cost savings, which theoretically could be achieved by FirstGroup without owning ScotRail.
22. Table 1 shows the simulated profit outcomes on all routes arising from a 10 per cent increase in headway, assuming a headway elasticity of -0.25 . Less than half of the routes show an increase of profits. The split between profits from switching passengers and from other sources on these routes vary considerably by route. On these routes, about half of these increased profits arise from the extra rail revenue from switching passengers. The balance is made up of variable cost savings (offset by the loss of bus revenue from switching passengers).

TABLE 1 Extra profits arising from increasing headway by 10 per cent—assuming headway elasticity of -0.25

Region	Bus service number	Flow/route ratio of passengers %	Revenue from switching passengers £	Balance £	Total extra profits £
Edinburgh	X5				
Glasgow	X1				
Edinburgh	58				
Glasgow	262				
Edinburgh	38/38A				
Glasgow	109/119				
Glasgow	216				
Glasgow	64				
Glasgow	202/205/215				
Edinburgh	54/54A				
Edinburgh	X29				
Glasgow	M29				
Glasgow	203				
Glasgow	54				
Glasgow	45				
Glasgow	57				
Glasgow	20/X12				
Glasgow	38				
Glasgow	62				
Glasgow	267				
Glasgow	263				
Glasgow	44				
Edinburgh	124				
Glasgow	40				
Glasgow	19/43				
Glasgow	255				
Glasgow	61				
Edinburgh	43/43B				
Glasgow	66				
Glasgow	55				
Total					

Source: CC calculations from FirstGroup data.

23. Table 2 uses a headway elasticity of -0.4 . Less than one-quarter of the routes show increased profits, and on most of these, the incremental rail revenue from switching passengers accounts for a minor portion of the overall profit increase. On the other routes the loss of income from passengers avoiding both FirstGroup and ScotRail more than offsets the combination of extra rail revenue and variable cost savings. This table suggests that there are only a few routes where FirstGroup could theoretically increase profits from reductions in frequency, assuming the higher end of the range of headway elasticities.

TABLE 2 Extra profits arising from increasing headway by 10 per cent—assuming headway elasticity of -0.4

Region	Bus service number	Flow/route ratio of passengers %	Revenue from switching passengers £	Balance £	Total extra profits £
Edinburgh	X5				
Glasgow	X1				
Edinburgh	58				
Glasgow	262				
Edinburgh	38/38A				
Glasgow	109/119				
Glasgow	216				
Glasgow	64				
Glasgow	202/205/215				
Edinburgh	54/54A				
Edinburgh	X29				
Glasgow	M29				
Glasgow	203				
Glasgow	54				
Glasgow	45				
Glasgow	57				
Glasgow	20/X12				
Glasgow	38				
Glasgow	62				
Glasgow	267				
Glasgow	263				
Glasgow	44				
Edinburgh	124				
Glasgow	40				
Glasgow	19/43				
Glasgow	255				
Glasgow	61				
Edinburgh	43/43B				
Glasgow	66				
Glasgow	55				
Total					

Source: CC calculations from FirstGroup data.

24. Table 3 shows the outcomes arising from a 10 per cent increase in bus fares, assuming a price elasticity of -0.3 . In contrast with Tables 1 and 2, all routes are showing increases in profits, totalling £[X]. However, only [X] of these profits arise from passengers switching to rail. The balance is made up of the extra bus revenue from passengers that continue using bus (no cost savings are assumed in this scenario).

TABLE 3 Extra profits arising from increasing fares by 10 per cent—assuming price elasticity of -0.3

Region	Bus service number	Flow/route ratio of passengers %	Revenue from switching passengers £	Balance £	Total extra profits £
Edinburgh	X5	()	£	£	£
Glasgow	X1				
Edinburgh	58				
Glasgow	262				
Edinburgh	38/38A				
Glasgow	109/119				
Glasgow	216				
Glasgow	64				
Glasgow	202/205/215				
Edinburgh	54/54A				
Edinburgh	X29				
Glasgow	M29				
Glasgow	203				
Glasgow	54				
Glasgow	45				
Glasgow	57				
Glasgow	20/X12				
Glasgow	38				
Glasgow	62				
Glasgow	267				
Glasgow	263				
Glasgow	44				
Edinburgh	124				
Glasgow	40				
Glasgow	19/43				
Glasgow	255				
Glasgow	61				
Edinburgh	43/43B				
Glasgow	66				
Glasgow	55				
Total					

Source: CC calculations from FirstGroup data.

25. Table 4 uses a price elasticity of -0.5. Compared with Table 3, total incremental profit is slightly lower at £[£]. However, the portion of these profits accounted for by the extra rail revenue increases to [%] per cent, as more passengers switch to rail under the higher elasticity.

TABLE 4 Extra profits arising from increasing fares by 10 per cent—assuming price elasticity of -0.5

Region	Bus service number	Flow/route ratio of passengers %	Revenue from switching passengers £	Balance £	Total extra profits £
Edinburgh	X5				
Glasgow	X1				
Edinburgh	58				
Glasgow	262				
Edinburgh	38/38A				
Glasgow	109/119				
Glasgow	216				
Glasgow	64				
Glasgow	202/205/215				
Edinburgh	54/54A				
Edinburgh	X29				
Glasgow	M29				
Glasgow	203				
Glasgow	54				
Glasgow	45				
Glasgow	57				
Glasgow	20/X12				
Glasgow	38				
Glasgow	62				
Glasgow	267				
Glasgow	263				
Glasgow	44				
Edinburgh	124				
Glasgow	40				
Glasgow	19/43				
Glasgow	255				
Glasgow	61				
Edinburgh	43/43B				
Glasgow	66				
Glasgow	55				
Total					

Source: CC calculations from FirstGroup data.

26. Table 5 uses a long-run price elasticity of -1.0. Total incremental profit would be lowered to £[£]. At this level of elasticity, all the profits come from passengers switching to rail and there is a net loss of revenue from other passengers who divert elsewhere. These tables show that at higher elasticities, there is less of an incentive for FirstGroup to increase fares generally prior to the merger as the revenue loss from deserting passengers erodes any incremental bus revenue from the higher fares. However, with the ownership of the rail franchise, a higher number of diverting passengers means a greater number of passengers that could switch to rail. For example, on the 202/5/15 route, there could be up to [£] passengers that could switch to rail, generating about £[£] of rail revenue, more than offsetting by a long way the revenue loss from deserting bus passengers. For all the routes the calculations show that at an elasticity of -1.0, FirstGroup would have an incentive to increase fares after the merger, where it did not have before the merger. The ownership of the rail business to attract some of these diverting passengers could make a fare increase profitable, even at an elasticity of -1.0.

TABLE 5 Extra profits arising from increasing fares by 10 per cent—assuming price elasticity of -1.0

Region	Bus service number	Flow/route ratio of passengers %	Revenue from switching passengers £	Balance £	Total extra profits £
Edinburgh	X5				
Glasgow	X1				
Edinburgh	58				
Glasgow	262				
Edinburgh	38/38A				
Glasgow	109/119				
Glasgow	216				
Glasgow	64				
Glasgow	202/205/215				
Edinburgh	54/54A				
Edinburgh	X29				
Glasgow	M29				
Glasgow	203				
Glasgow	54				
Glasgow	45				
Glasgow	57				
Glasgow	20/X12				
Glasgow	38				
Glasgow	62				
Glasgow	267				
Glasgow	263				
Glasgow	44				
Edinburgh	124				
Glasgow	40				
Glasgow	19/43				
Glasgow	255				
Glasgow	61				
Edinburgh	43/43B				
Glasgow	66				
Glasgow	55				
Total					

Source: CC calculations from FirstGroup data.

Other considerations

27. FirstGroup argued that at peak times rail was near to or already at capacity in terms of rolling stock and infrastructure, and that rail could not therefore take any more passengers. The SRA stated that current overcrowding on certain routes might create problems in trying to persuade bus passengers to make more use of trains. [✂] The Scottish Ministers announced major funding for 29 new Class 170 trains (seven for SPTE services and 22 for other services) which will enhance capacity to meet much of this anticipated demand.
28. Consideration was given to the incentive to reduce frequency during out-of-hours (before 7 am and after 7 pm Monday to Saturday and Sunday) periods. Bus services are typically run at frequent intervals throughout the day, with the majority of passengers using the service in hours (from 7 am to 7 pm). The usage peaks during commuter times, and drops away significantly during out-of-hours periods. Because the costs of running a bus are the same throughout the day, these out-of-hours services are likely to be less profitable than in hours services. FirstGroup provided figures for several of its bus routes, which suggested that its out-of-hours services, whilst profitable, were currently less profitable than its in hours services. Hence, the rewards for reducing frequency during out-of-hours times are likely to be greater, given

that the cost savings are the same throughout the day but the loss of patronage would be less at out-of-hours periods. If frequency were to be reduced, it would be more profitable to do so during these periods. Also, as suggested in the NOP survey, a higher portion of passengers are likely to switch to rail at off-peak times, given the lack of bus competition.

29. FirstGroup previously reduced or withdrew from some routes in the South-West and in Manchester due to poor commercial performance, and it is possible that FirstGroup is currently reviewing the frequency levels on some of its less profitable routes, particularly in Edinburgh. FirstGroup stated in its three-year business plan¹⁰ that its services were subject to frequent change due to competition from Lothian on key corridors. Owning the rail franchise could provide an even greater incentive to reduce these less profitable routes, mostly during out-of-hours periods. Further, the FirstGroup business plan had stated that FirstGroup would continue to develop local market bus commuter services aimed at attracting passengers from trains and cars. If these commuter services were to produce low returns, then FirstGroup would have an incentive to reduce these services, particularly if it owned the rail franchise. Moreover, there may be cases in which configuration of routes, for example to operate as feeder services into train stations, could produce more significant operating cost savings, and be profitable for FirstGroup after the merger.
30. FirstGroup stated that its bus services, even at lower evening frequencies, were making positive contributions to the group-wide costs and provided some calculations to support this, and thus it would not make commercial sense to reduce these. [X]

Conclusion

31. It appears that FirstGroup carries out regular assessments of its bus service levels, which occasionally result in service reductions on a number of routes. The issue is whether the acquisition of the Scottish rail franchise would add to the incentive to reduce these services, particularly marginally profitable ones. The increase in this incentive may not be material as any rail revenue it could earn from switching passengers would be minor compared with the variable cost savings it could achieve currently. Any incentive to reduce services would likely be directed at out-of-hours times.
32. Increasing bus fares appears to be a more viable option for increasing profits, particularly at lower elasticities. FirstGroup argued that elasticities of -0.3 and -0.5 underestimate the true long-term price effects. However, it appears that profitable outcomes could be achieved even at an elasticity of -1.0 as extra rail revenue could be earned from switching passengers. Accordingly the ownership of the rail franchise could add materially to the incentive to increase fares. However, the fare cap applicable under the OFT undertakings where this applies could limit some of FirstGroup's ability to selectively increase fares. FirstGroup acknowledged that the undertakings had limited their scope to increase or decrease certain fares. [X]

¹⁰First Scotland East three-year Business Plan 2003/04 to 2005/06.