CONCESSIONARY FARES ISSUES IN THE UK

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INTRODUCTION

1. The Transport Act 1985 deregulating bus operations outside London significantly changed the environment for concessionary travel by which adults (primarily the elderly) and children might travel at less than normal full fare. Local Authorities were given powers under the Act to establish concessionary fare schemes, the regulations governing them being set out in a Statutory Instrument (1986). While the extent and level of support of concessions offered to children, the elderly, disabled or other identified groups may be determined by the Local Authority, the Regulations state that the amount of compensation paid to a participating operator should leave the operator no better and no worse off than he would have been without the scheme. Importantly, in making this assessment of loss of revenue arising from an operator's provision of concessionary fares the number of extra journeys generated (and thus contributing directly to revenue unless the concession took the form of a free fare) must be taken into account.

2. This paper looks briefly at types of concessionary fares schemes operated in the UK and their coverage. It goes on to point out some of the financial implications of the Transport Act on concessionary fares, and summarises research conducted to ascertain the amount of 'generated' trips. A recent research study is then described which set out to determine the amount of generation in a British conurbation and differences between different survey methods are discussed.

FARE SCHEMES AND FINANCIAL IMPLICATIONS OF THE TRANSPORT ACT

3. Historically many different types of concessionary schemes have been adopted by differing Local Authorities in the UK. The schemes vary between the terms of criteria for eligibility, the type of payment (tokens, for example), the value of the concession and the times of day during which it is valid.

4. Picket and Barton (1986) showed that in 1984/5 31 percent of the elderly population could travel free within defined geographical limits, a flat fare was

available to 9 percent and reductions off the full fare of some sort were available to a further 38 percent. Only 6 percent of elderly people lived in areas which provided no concessionary fares scheme.

5. In a 1986 survey the most common concession offered to pensioners was a half fare, payable on production of a pass provided by the Local Authority either free or for a charge (often nominal) (O'Reilly 1988). The next most common concession was tokens, which typically are supplied to pensioners up to a certain value and which are then used to purchase 'full-fare' journeys. Half the schemes allowed people to travel throughout the county in which they were issues, while nineteen percent were only available in the Local Authority District (counties consist of several districts). The more generous concessions tended to be offered in the more urban areas.

6. Using data from the 1985/6 UK National Travel Survey, O'Reilly (1990) showed that over 90 percent of pensioners lived in areas in which concessionary fares were available. She determined that the majority of schemes (68 percent) were for those of a pensionable age (65 for men and 60 for women). The most common concession scheme again provided for travel at half-fare (28 percent), but that a significant proportion of schemes, 22 percent, provided for free fares. A charge for entry to the scheme was sometimes made - although this was often at nominal levels. A third of schemes had no restrictions on when the concession was available during the day and another third restricted its use typically to periods outside the morning peak. Fourteen percent of schemes had use restricted to off-peak periods.

7. Prior to the 1985 Transport Act, local authorities agreed details of concessionary fare schemes, including reimbursement for lost revenue, with selected operators - including, in many cases, their own bus undertakings. Following 1985, many public sector bus operations were privatised, and those that remained in local authority ownership had to be run on a properly commercial basis, competing with other operators for local authority subsidies. In particular, concessionary fare schemes ceased to be exclusive: all operators had a right to participate, and received fair compensation for lost revenues, and local authorities had power to compel any local bus service operator to participate in their schemes.

8. The 1985 Act also allowed local authorities to subsidise socially desirable but non-commercial bus services, provided contracts were let by competitive tender. This competition, in conjunction with a more efficient, restructured bus industry led to significant reductions in "revenue support". By 1989-90, reimbursement for concessionary travel schemes became the major source of public money received by the bus industry and one of the biggest constituents of an authority's transport budget. Preston and Mackie (1990) point out that public expenditure on concessionary fares is large and has been growing as a proportion of all public finance for bus transport. For all authorities in Great Britain, concessionary fares reimbursement had risen from just over one third of current grants to public transport in 1985/6 to nearly 60 percent in 1989/90, out of a total which had been reduced by over 40 percent in real terms between the two dates (Hill and Last,

1993).

9. It is therefore not surprising that Local Authorities, who are under constant pressure to constrain their expenditure, are looking increasingly closely at the ways in which their concessionary fares schemes operate. Clearly, if the numbers of people eligible for concessions increase, or they make more trips, or if the operators increase fares so that the value of the concession increases then the cost to the Local Authority increases. Importantly, these increases are generally outside the Authority's control, particularly if the concession is free travel for those eligible. Increasingly therefore free travel concessions are being abandoned and replaced with flat fares. Of eight authorities listed by Hill and Last (1993) as providing free travel in 1984/5, five had introduced a flat fare scheme by 1992. While there have been changes in the regimes operated, it appears that in recent years there has also been a decline in travel at concessionary fares - perhaps one or two percent per year (Hill and Last 1994).

GENERATION

10. Under the conditions noted in the previous section it is of considerable interest to both local authority and operator to establish the number of trips which are 'generated' by a concessionary fares scheme - that is the number of trips made which would not have been made were there no concessionary fare scheme. The costs of schemes change as demand changes. As noted earlier, the Regulations stipulate that an operator should be no better and no worse off from operating a concessionary fares scheme, *taking into account consequential cost increases and generated trips*. Take, for example, a case where the full fare for a trip is 50p and the concession is a free fare which results in a doubling of the number of trips made on the concession. In these circumstances the Local Authority will not reimburse the operator for all the trips made at the concession, but will only pay for half of them - no payment for those trips which are generated.

11. Reliable estimates of 'generation factors' are therefore essential for reimbursement negotiations between operators and authorities. In practice they have however been difficult to determine, although a number of cross-sectional studies have been made. O'Reilly (1990) analysed National Travel Survey data and showed that the lowest levels of generation were associated with schemes using tokens, as might be expected, and that the highest estimates of trip generation were associated with schemes which required a charge to 'join'. The figures are rather lower than those obtained from an earlier study by Hopkin (1986), where the generation factor arrived at from comparing free and full fare travel for elderly people was 86 percent. The orders of magnitude are in line with figures obtained by Goodwin *et al* (1988). A study of six towns by Goodwin et al suggested that average fares elasticities for different groups of the elderly ranges from 0 to -0.7, with a median value of -0.3 overall for the full fare areas. They suggest that these are long-term equilibrium figures and that the generation factor for the first year of a scheme would be substantially less. The full-term generation effect would be about 30 percent for free fares to the elderly.

12. The results of studies conducted by MVA (Hill and Last 1993), which involve assessing potential responses to hypothetical questions, suggest that between 55 percent and 65 percent of trips made free would continue to be made if passengers currently eligible for a pass had to pay full fare. They note in their 1994 paper that the relationship generally appeared to hold across different areas and between different types of trip. The distribution of trips by length and fare value at free travel and predicted at full or half fare was similar, whereas the introduction of a flat fare had a much greater effect on short low fare trips than on longer trips with higher fares.

13. The cross-sectional studies suffer from the fact that variations between different places in factors not directly related to fare concessions complicate analysis and the results can only indicate fairly wide ranges of generation factors. Estimation methods relying on asking people how their use of public transport would be affected by changes in the fares they are required to pay are critically dependent on people's immediate judgement of how they might adapt in the long term to changed circumstances, and the results have to be treated with considerable caution.

THE TYNE AND WEAR STUDY

BACKGROUND

14. A major change in the concessionary travel scheme in Tyne and Wear took effect in January 1992. Tyne and Wear is a large conurbation in the north-east of the country and has an extensive bus, Metro and rail network. The change provided a rare opportunity to attempt to determine generation factors by a different method - a 'before-and-after' study of actual travel patterns and public transport use. Before the change, people of pensionable age were permitted to travel free at off-peak times; afterwards concessionary travel was allowed at any time from 09.30, at a flat fare of 15 pence for single journeys and 20 pence for certain 'transfare' journeys requiring interchanges at certain places between buses and the Metro. The study was conducted by Balcombe and Astrop (1995).

15. Because of the short period of time between the announcement and implementation of the change in the concessionary scheme, it was not practicable to undertake a comprehensive 'before' study of travel patterns and use was therefore made of the results of a previous survey undertaken in 1990 for the PTE (Passenger Transport Executive, the subsidising organisation acting on behalf of the interested local authorities). This study (MVA 1991) used the 'reconstructive interview' method which is designed to elicit from people how their use of public transport on an actual journey might have been different under various fare regimes. The principal objective was to establish what journeys would have been made had full adult fares been charged, but people were also presented with a range of fare arrangements to help the establish their own priorities and hence make realistic responses to hypothetical questions. Thus, in

addition to deriving generation factors for free travel compared with full fare travel it was possible to make predictions of the amount of travel which might be generated by alternative concessionary schemes.

16. The 'after' survey was conducted in March/April 1993 and its design was constrained by that of its predecessor: in order to ensure compatibility, only necessary changes were made. The first objective, of assessing changes in travel patterns resulting from the introduction of concessionary fares, could have been achieved simply by using a travel diary survey. However, repetition of the reconstructive interview survey as well would, if the travel diary results confirmed the reliability of the method, provide improved estimates of generation factors, taking into account any possible change in people's attitudes from experience of concessionary fares. The travel diary was administered to a random sample of elderly concessionary pass holders drawn from a list held by the PTE. Around 600 useable completed diaries were obtained, around a half of the people completing these diaries agreed to take part in reconstructive interviews. These The results were weighted to take account of under-representation of infrequent travellers in the surveys.

BASIC RESULTS FROM THE TRAVEL DIARIES

17. The distribution of trip rates found in the two surveys are plotted on a cumulative basis in Figure 1; the shift towards less frequent trip making following the removal of the free concession is clear. The number of pass holders making no public transport trips in the survey week has risen from 15.6 percent to 19.0 percent. In 1993 51 percent made at least 5 trips per week whereas in 1990 slightly more, 55 percent, were making at least seven trips per week. The shift, measured in trips per week, was substantially greater for more frequent travellers, who would have been most affected financially by the introduction of fares, but smaller for less frequent travellers. There appears to be a stronger tendency in 1993 to follow outward with return trips.

18. Examination of the results categorised by journey purpose suggests that the imposition of (reduced) fares, instead of free travel, inhibits people's use of public transport for essential purposes less than those for optional trips. In general, there were few significant difference in trip lengths between the two years. Multi-stage journeys amounted to nearly 7 percent of all trips in 1990, increasing by nearly 2 percentage points by 1993.

FORECASTS BASED ON RECONSTRUCTIVE INTERVIEWS

19. Nearly half of the travel diarists in 1990 agreed to follow-up interviews. In these 'reconstructive interviews', people were asked to consider three hypothetical fare regimes (full fares, half fares and 10p flat fares), but the order in which they were presented was varied to minimise bias due to conditioning by the interview procedure. For each regime, people were shown what fares would have been for journeys they had actually made, and what their total public transport expenditure for the week would have been. They were then asked whether they would have

forgone some of the journeys actually made, and if so which.

20. Table 1 shows predicted average trip rates for each fare regime, derived from the results of these interviews. As expected, there is a negative correlation between trip rates and fare levels for each journey purpose.

21. The concessionary fares introduced in Tyne and Wear in January 1992 corresponded with none of the fare regimes tested in the 1990 survey. It is therefore impossible to make a direct comparison of actual changes in trip rates with those forecast on the basis of the survey results. Estimation has therefore been made of the mean fare for all journeys actually made by interviewees under the various fare regimes, and the mean fare under new concessionary conditions (a flat 15p for single-link journeys, 20p for transfare journeys).

Table 1: **PREDICTED TRIP RATES (1990)**

Journey purpose	Fare regime			
	Actual	Tested in survey		
	Free off-peak	Flat fare (10p)	Half fare	Full fare
Shopping	4.13	3.83	2.85	2.12
Visiting	1.34	1.26	0.89	0.75
Leisure	0.86	0.75	0.56	0.44
Personal	0.28	0.27	0.26	0.23
Work/ education	0.17	0.17	0.17	0.17
Other/not stated	0.81	0.77	0.66	0.58
TOTAL	7.58	7.05	5.37	4.29

22. For the purpose of interpolation between the predicted trip rates an equation of the following form has been fitted:

$$n(f) = n(0) \exp(-f/F)$$

where $n(f)$ is the number of trips per person at an average fare f, and F is a "fare constant". Such an equation, with $n(0) = 7.67$ is plotted together with observed trip rates for all journey purposes in Figure 2 (Note that $n(0)$ is slightly greater than the actual trip rate observed under the earlier concessionary scheme because the mean fare for all trips, including some made at times when concessions were

not available, was not zero but about 1p). The trip rate predicted from this equation for the average fare obtaining at the time of the 1993 survey is 6.42 trips per person per week, a reduction of 15.3 per cent from the original 1990 trip rate. The actual reduction observed was 25.1 per cent (to 5.68 trips per person per week).

23. It is worth considering whether factors other than the imposition of concessionary fares might have affected this comparison. The first such factor is inflation: fares paid by concessionaires in 1993 should perhaps be adjusted to 1990 prices when making forecasts. It is however a matter of judgement as to which inflation index better represents the relative movement of prices and incomes for pensioners (few of whom are likely to be paying off mortgages), and it is debatable whether people automatically adjust their spending patterns in accord with inflation in the short term. However, assuming, for the sake of illustration, inflation of 10 per cent over the 2½ years between the surveys, the predicted mean trip rate can be re-estimated: it is about 0.1 trips per person per week higher, which increases the discrepancy between observation and prediction.

24. Consideration should also be given to the effects of factors which are extremely difficult to quantify (especially on a local basis) but combine to produce secular decline in public transport use by elderly people as well as for the population as a whole (although not necessarily in exactly the same manner). The annual total of concessionary stages in Tyne and Wear reached a maximum of 83.2M in 1990, and fell to 81.0M in 1991 (a change of -2.6 per cent). The corresponding change for the first full year after the introduction of concessionary fares was from 64.3M in 1992 to 61.5M in 1993 (-4.4 per cent). While these statistics are not strictly comparable with the changes discussed above (they include disabled as well as elderly pass-holders and make no allowance for possible changes in total numbers), there is a clear suggestion of a declining trend in concessionary travel both in the period of free travel before the change and in the period of constant fares afterwards.

25. It is arguable therefore that the actual 1993 trip rate should be compared not directly with the 1990 trip rate, but with a rate extrapolated from 1990 to between 1992 and 1993 (since the second survey took place at a different time of year), which would be some six per cent smaller. This adjustment would account for nearly half the discrepancy between the predicted and actual trip rates noted above, and is incorporated into the estimation of generation factors presented later.

26. Attempts have also been made to investigate how people's sensitivity to fare increases might depend on journey purposes by estimating a fare constant (*F* in the equation described above) for each. High fare constants imply low fare sensitivities and vice versa. The resulting fare constants are shown, together with the implied reductions in trip rates at mean 1993 fares, in Table 2. The sample sizes for minority journey purposes are too small for accurate estimation of fare constants, so that the figures shown here serve only to illustrate a trend. People making work trips considered that they would be almost completely unaffected

Table 2: **FARE CONSTANTS FROM 1990 PREDICTIONS**

Journey purpose	Fare constant (p)	Predicted trip rate change (%) 1990-1993
shopping	82.5	-17.2
visiting	89.2	-16.0
personal	307	-4.9
leisure	77.5	-18.2
work/education	2380	-0.7
unknown	..	..
all purposes	94.2	-15.3

Table 3: **PREDICTED TRIP RATES (1993)**

Journey purpose	Fare regime						Fare constant (pence)
	Actual	Tested in survey					
		A	B	C	D	E	
	15/20p	3-step (low)	Flat (20/25p)	3-step (high)	Half fare	Full fare	
Shopping	3.24	3.05	2.87	2.41	2.00	1.18	42
Visiting	1.08	1.07	0.98	0.86	0.75	0.47	54.5
Personal	0.59	0.57	0.51	0.40	0.41	0.26	49
Leisure	0.49	0.47	0.43	0.34	0.30	0.16	38
Work/ education	0.16	0.16	0.16	0.14	0.15	0.12	168
Other/not stated	0.12	0.12	0.11	0.09	0.09	0.04	..
Total	5.68	5.44	5.05	4.23	3.69	2.24	46.1

by fare increases, and the fare constant derived from their responses, even though astonishingly high, merely reflects this opinion. In reality work trip rates appear to have suffered a greater proportionate reduction than rates for any other purpose, but in view of the tiny numbers of people making work trips in our samples, this comparison is not statistically significant. Personal business trips, too, have greater fare constants (being perceived as less price-sensitive) than shopping, visiting and leisure trips.

27. The results of the 1993 reconstructive interviews are summarised in Table 3, which is analogous to Table 1, relating to the 1990 survey (the 3-step fare scale related fares to three different distance bands). As expected, there is a progressive reduction in the number of public transport trips as fares increase. (The predictions for personal business and work/education trips for fare regime C are apparently anomalous in this respect. This is probably due to the subdivision of the sample between regimes A and C, which reduced the sample sizes and may have produced more random variation.)

28. Fare constants for individual trip purposes, and that for overall trip rates, are also shown in Table 3; they are all much smaller than the corresponding constants derived from the 1990 survey (Table 2), suggesting a much greater sensitivity to fare increases (ie a higher elasticity) than indicated in 1990.

29. Finally, the 1993 predictions of overall trip rates (from the reconstructive interviews) are plotted against mean fares in Figure 3, together with the exponential demand equation which best fits them. The corresponding results from the 1990 survey are also plotted for comparison, as well as the simple exponential curve (from Figure 2) which best describes them (the other curve in the figure is considered later). The exponential demand curves fit the predictions from the surveys tolerably well, but the 1993 equation overestimates the 1990 trip rate by 0.39 trips per week, a rather smaller discrepancy than that between the 1990 equation and the 1993 trip rate (0.74).

DIFFERENCES BETWEEN THE SURVEY RESULTS

30. If the results of the reconstructive interviews are accepted at face value, it would appear that people were roughly twice as sensitive to possible fare increases in 1993 as in 1990. The fare elasticities derived from the equations at 1993 concessionary fare levels are -0.18 in 1990 and -0.36 in 1993, both plausibly within the range established in previous studies, but very different from each other. According to the 1990 survey, increasing fares from 1993 levels to full adults fares would reduce the number of trips by 36 per cent, implying a generation factor of 56 per cent. The corresponding estimates for the 1993 survey are 67 and 202 per cent.

31. This raises the question of which of the two surveys provides the more reliable predictions, and, given the divergence between them, how best to estimate generation factors. If it is argued that the 1993 predictions are more reliable, on the grounds that they match the two observations better, then the 1990 predictions

must be discounted as unsound. But both sets of predictions were based on the same reconstructive interview method, and if it is considered that unacceptable results were produced in 1990, is there any reason for accepting the 1993 results? Factors contributing to the discrepancy are discussed in the following paragraphs. It is arguable that changes in people's general level of affluence, car ownership, age and general mobility might affect their dependence on public transport and therefore their perceptions of how they might be affected by fare changes. However, it is unlikely that there will have been any substantial changes over 2½ years in factors directly related to age: while individuals will be that much older, the sample, being randomly selected, should reflect the average age, which will have changed by much less than 2½ years, of pass-holders in general. It is however possible that car ownership may have increased, with new, recently retired, pass-holders belonging to a more affluent, car-owning generation than the older ones who are dying.

32. At the time of the second survey (March/April 1993) there was much public discussion of pensioners' living standards. Those with savings had been affected by falling interest rates, the imposition of Value Added Tax (VAT) on domestic energy use (from April 1994) had just been announced, and there was widespread speculation about the possibility of other tax increases and reductions in services provided by the Welfare State. This mood of pessimism may well have influenced people's judgement that they would be less able than in 1990 to afford higher fares, and some of the activities to which they travelled.

33. It is arguable that people were relatively relaxed about the questions they were asked in the first survey (1990) since at that time they were enjoying free public transport, and may not have been motivated properly to think through the options for responses to hypothetical fare increases. However, by 1993 they may have been more aware of alternative means of travel, possibilities of trip linking, or ways of modifying their activities to reduce the need for travel. They may also have regarded the hypothetical fare regimes as indicative of real further fare increases. This may have induced a greater degree of frugality and realism in considering responses to questions.

34. It is possible to construct a simple model based on this argument, which fits the predicted trip rates tolerably well. A certain proportion of trips are assumed to be essential, and to continue to be made even at full fares. The demand for the rest is assumed to vary in inverse proportion to fare levels, thus maintaining constant expenditure on them. The resulting demand function, which is constrained to fit the actual 1993 trip rate, is found to fit the predictions best when the proportion of essential trips is taken as 25 per cent. It is plotted alongside the other curves in Figure 3: it fits the reconstructive interview predictions slightly better than the exponential function. It should be noted however that this model cannot be extrapolated to zero fares: in practice when travel is free (or very cheap) other factors, like time constraints and the cost of activities for which journeys are made, limit the demand.

35. There is evidence that concessionary travel by elderly (and disabled) people

declined gradually, after an initial sharp fall early in 1992, well into 1993. While this may be partly due to an underlying secular decline in concessionary travel (following a peak around 1990), it also suggests that people have taken a considerable time to adapt to the new fare regime, and that the process may not yet be complete. With hindsight we can compare actual trip rates at the times of the two surveys, but we do not know what time horizon, if any, was in the minds of those responding to the first survey. In the circumstances of the interviews, respondents were likely to give off-the-cuff reactions which did not take into account possible changes in travel patterns which might become apparent after months of experience. It is therefore plausible that people underestimated the effects of fares on their use of public transport. While similar underestimation in 1993 cannot be ruled out, it is possible that respondents had by then realised that they could adapt travel patterns to save money, and so gave more realistic replies.

36. This may explain, at least in part, the apparent doubling of elasticity between the two surveys. An increase is consistent with the finding of Goodwin *et al* (1988) that elasticities are time-dependent, and that long-term reaction to change is greater than short term reaction. But that research suggested a time of between four and ten years for elasticities to double, implying a much slower rate of change than that observed in this study, which seems surprisingly rapid, especially as older people are supposed to adapt less quickly than others.

37. While long-term elasticity changes may have contributed to the observed decline in trip rates, it seems likely that the other factors discussed here may also be important. It is also possible that some long-term effects are still to occur, and that the demand for concessionary travel may continue to decline for some years.

ESTIMATION OF GENERATION FACTORS

38. A major main purpose of the Tyne and Wear study was to provide an improved method of estimation of the 'generation factors' for use in determination of amounts of reimbursement payable to operators participating in concessionary fare schemes. These generation factors depend on estimating what the demand by concessionaires would be if they were charged full fares for public transport. Had the forecasts produced by the two sets of reconstructive interviews proved consistent, the full-fare demand could have been determined with relative ease and a fair degree of confidence. While arguments may be advanced to account qualitatively for the divergence between these forecasts, they do not provide a quantitative means of determining how people might have reacted in practice to actual fare increases.

39. It is therefore instructive to explore alternative means of estimation, which depend on extrapolation of observed demand before and after the imposition of fares. This is a daunting task, as the pitfalls in extrapolation from observations at zero and 15p fares to mean fares of some 60p are obvious, and care must be taken in interpreting the results.

ADJUSTMENT FOR FALLING DEMAND

40. Since even without the imposition of concessionary fares, elderly people's use of public transport would probably have declined by some six percent between the two surveys the zero-fare trip made should be first adjusted by this amount. The adjusted value, together with the actual trip rate at the time of the 1993 survey, is shown in Figure 4 (where they are marked by crosses), together with the predicted trip rates from the reconstructive interviews.

41. A corresponding adjustment to the 1990 predictions is represented by the uppermost (dotted) curve in Figure 4. It is based on the extreme assumption that the lost six per cent of trips are completely separate from those which people claimed they would forgo under the various fare regimes. The curve is thus derived from the equation shown in Figure 2, less a uniform 0.45 trips per person per week (representing the six per cent decline in free travel). It is likely however that there would have been a fair degree of overlap between the trips (perhaps of marginal benefit) which people in 1990 said they might forgo if fares rose, and those which they would have given up by 1993. The dotted curve in Figure 4 therefore represents a lower limit to the values that the adjusted 1990 predictions could take. There are no means of computing the most likely values, but they probably lie close to the dotted curve at low fares, and closer to the actual predictions (triangles) at high fares.

AGGREGATE DEMAND FUNCTION

42. The lower curve (long dashes) in figure 4 represents a simple exponential demand function constrained to fit the adjusted zero-fare trip rate and the actual concessionary trip rate (ie the curve has to pass through the two crosses). This curve passes well below the 1990 predictions, but is closer to the 1993 predictions (although the discrepancy in the 25-35p fare range is considerable). But this coincidence does not constitute evidence of the validity of either the equation or the predictions: the reliability of the latter has yet to be proved, and while a simple two-parameter function is a convenient device for describing observations, it does not follow that it adequately represents the aggregate demand over a wide range of different journeys.

DISAGGREGATE DEMAND MODELS

43. Ideally the sample of trips should be disaggregated by journey purpose and distance, and the reaction to fare changes for each sub-group modelled. In practice the data-set is too small to yield statistically robust disaggregate models. However, in order to pursue this line of enquiry use can be made of a larger data set, that derived from the PTE's continuous monitoring survey (CMS). There are however some incompatibilities between the CMS and the surveys described here: the CMS is based on stages, as opposed to trips; the CMS includes travel by disabled, as well as elderly pass-holders; and the CMS has no information on

journey purposes. There is no way of allowing for these differences, but in practice they are unlikely to be large enough seriously to affect the conclusions of this exercise, although they may limit its precision.

44. The exponential model method of calculation relies on subdivision of the total trip rates into various distance bands. The total trip rate for free travel (adjusted by six per cent to reflect falling demand) is allocated in proportion to the numbers of stages in the various distance bands recorded during the CMS in the period just before the introduction of concessionary fares. Similarly, the trip rate for concessionary travel is allocated in proportion to the CMS data for the period just after the 1993 survey.

45. For each distance band, comparison of free and concessionary trip rates yields a fare constant. There is a plausible monotonic relationship between distance and fare constant. A mean fare may then be derived for each distance band, for each of the fare regimes used in the 1993 survey. Combining these mean fares with the fare constants, using the simple exponential demand function, provides estimates of trip rates for all distance bands which are then aggregated to yield estimates of total demand under each fare regime. The results obtained from this disaggregate model are shown in Figure 4 (as a curve composed of short dashes). Between the two crosses, this new curve coincides with the lower exponential function, which is to be expected since it is constrained to pass through the crosses. This coincidence continues up to mean fares of about 20p, but then the disaggregate demand function diverges from the exponential one, continuing in the same general direction but at a substantially higher level. The remarkable kink in the aggregate curve is apparently a product of the different fare structures associated with each regime. The mean fare for all distances increases in positive steps in progression from regime A to E, but individual bands have different patterns, and some even have negative steps.

FULL-FARE DEMAND ESTIMATE

46. There are thus a range of estimates of demand at the upper end of the fare range. At a fare of 62.5p (the appropriate mean estimated from the CMS data) reconstructive interview predictions suggest between 4.1 and 2.5 trips per person per week, and the extrapolations using disaggregate demand models between 3.4 and 3.7. Allowing for an uncertainty of ± 2.5p in the fare (which arises because of minor discrepancies between the various data sources) would modify these estimates by about ± 0.1 trips per person per week.

47. If the arguments advanced earlier, that the 1990 predictions may have over-estimated demand while those in 1993 may have underestimated it, are accepted, there is some support for the values based on extrapolation, which fall plausibly between them. Taking the view that reaction to the concessionary fare change may not have been complete by 1993, which would be consistent with the observed accelerated rate of decline in demand between 1992 and 1993 it is judged that the lower extrapolation (using the exponential model) should serve as our central estimate of 3.5 trips per person per week, with a margin of

uncertainty of ± 0.3.

GENERATION FACTORS AND REIMBURSEMENT

48. These estimates of full-fare demand may now be used to determine generation factors. Comparing the full-fare and free travel trip rates, adjusted for falling demand, yields the demand ratios.shown in Table 4.

Table 4: **DEMAND RATIOS AND GENERATION FACTORS**

					Difference in reimbursement	
Fare	**Trip rates (per person per week)**	**Demand ratios (R)**	**Generation factors (G)**	**R_0 - R**	**per trip (p)**	**per annum (£M)**
free	7.58 (unadjusted)					
full	4.1 (from 1990 RI)	0.54 (R_0)	0.85	-		
free	7.13 (adjusted)					
full	3.8 (upper estimate)	0.53	0.88	0.01	0.50	0.25
full	3.5 (central estimate)	0.49	1.04	0.05	3.13	1.56
full	3.2 (lower estimate)	0.45	1.23	0.09	5.76	2.88

49. The first part of Table 4 shows how a demand ratio (full fare:free travel) might have been determined using only the results of the 1990 reconstructive interviews (see Figure 2). It then shows demand ratios corresponding to the central, upper and lower estimated demand discussed in the previous section, and the free travel demand adjusted for decline between 1990 and 1993. Generation factors (G) are also shown; they are related to demand ratios by the equation:

$$G = \frac{1}{R} - 1$$

50. For every concessionary trip made, the reimbursement to the operator may be determined as:

$$R \cdot f_F - f_C$$

51. Assuming that the new estimates of demand shown in the lower part of the table are more reliable, the demand ratio R_0 over-estimates reimbursement by an amount $(R_0 - R).f_F$ per concessionary trip. These differences (with a full fare of 62.5p) are also shown in the table. Finally, assuming some one million concessionary trips per week, making a plausible allowance for multi-stage trips), and a fifty week year, differences in annual reimbursement are derived. These suggest that relying on the 1990 survey results would overestimate reimbursement by between £0.25M and £2.9M per annum.

CONCLUSIONS

52. The research described in detail in this paper has produced a higher estimate of the generation factor (comparing free and full fare travel) for elderly people than any other study. The value estimated for Tyne and Wear (104 $\pm$ 20 per cent) is substantially more than that previously estimated by Hopkin (1986), itself higher than other reported estimates. A possible explanation of this difference is that Tyne and Wear represents the extreme end of the type of places and conditions included in Hopkin's study. But if Tyne and Wear is so different from other places, then the result obtained here can have little direct relevance to estimation of generation factors elsewhere.

53. The conclusions reached here are based on a selection of methods which was constrained by the available evidence. Limiting analysis to measurements of actual changes in travel behaviour, resulting from the replacement of free travel by concessionary fares amounting to only about a quarter of full fares, demands extrapolation beyond normally acceptable limits. Reliance on people's own estimates (however carefully elicited) of their likely reactions to such a major change is also open to serious doubt, as the differences between two surveys using this method have shown. We have therefore sought to compensate for the deficiencies of the two methods by combining them. While this may have improved confidence in the final result, there is still a considerable degree of uncertainty.

54. Estimation of generation factors has always been a very difficult area of research, and it was not to be expected that one more study, in one place, would solve all the problems which have been encountered. If anything, this study will serve to emphasise the difficulties and dangers associated with currently available methods. In particular, the reliability of the method of 'reconstructive interview' is not proven. People's responses to hypothetical questions, although apparently logical and internally consistent, seem to depend on their current perceptions of public transport fares, which in turn depend on their recent experience, as well as other factors which may affect their lives.

55. Since generation factors are crucial in determining very large amounts of public money paid to bus operators for participation in concessionary fare schemes, it seems important to be able to determine them with a better degree of precision than is currently possible. It is therefore recommended that any opportunities for further research in this area, making use of newly available data, or collecting new information in appropriate circumstances, should be exploited.

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56. This study reported in this paper would have been impossible without the co-operation of the Tyne and Wear Passenger Transport Executive in allowing access to data collected for the 1990 study, and the active part played by their officers in producing other necessary information, determining notional fares for the reconstructive interviews. The authors are also indebted to the MVA Consultancy, who undertook the 1993 survey on TRL's behalf and provided us with detailed results of the 1990 survey

57. The authors are particularly grateful to Terry McCrady, Ian Pau and Bill Harbottle, of Tyne and Wear PTE, and Andrew Last of MVA for their many contributions to the study through criticism and discussion. The authors have sought to give due weight to their opinions, but they bear no responsibility for any opinions or conclusions presented in this paper.

58. The paper is in part based on work carried out for ECLTG Division, Department of Transport.

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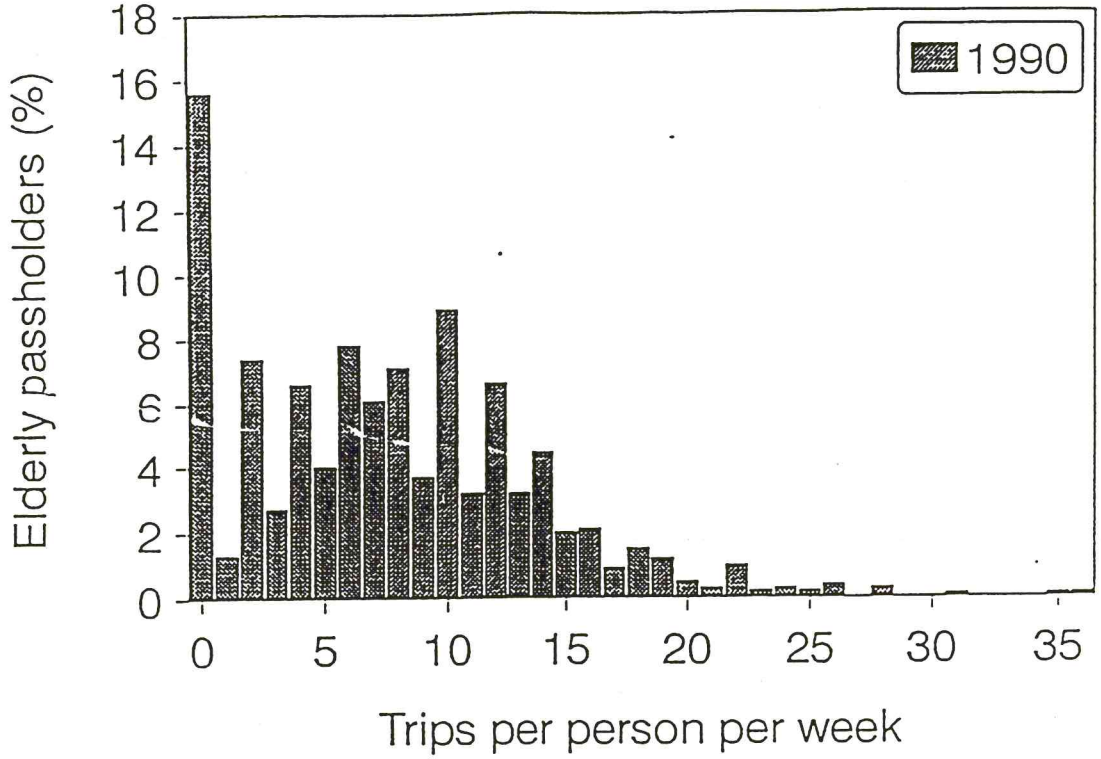

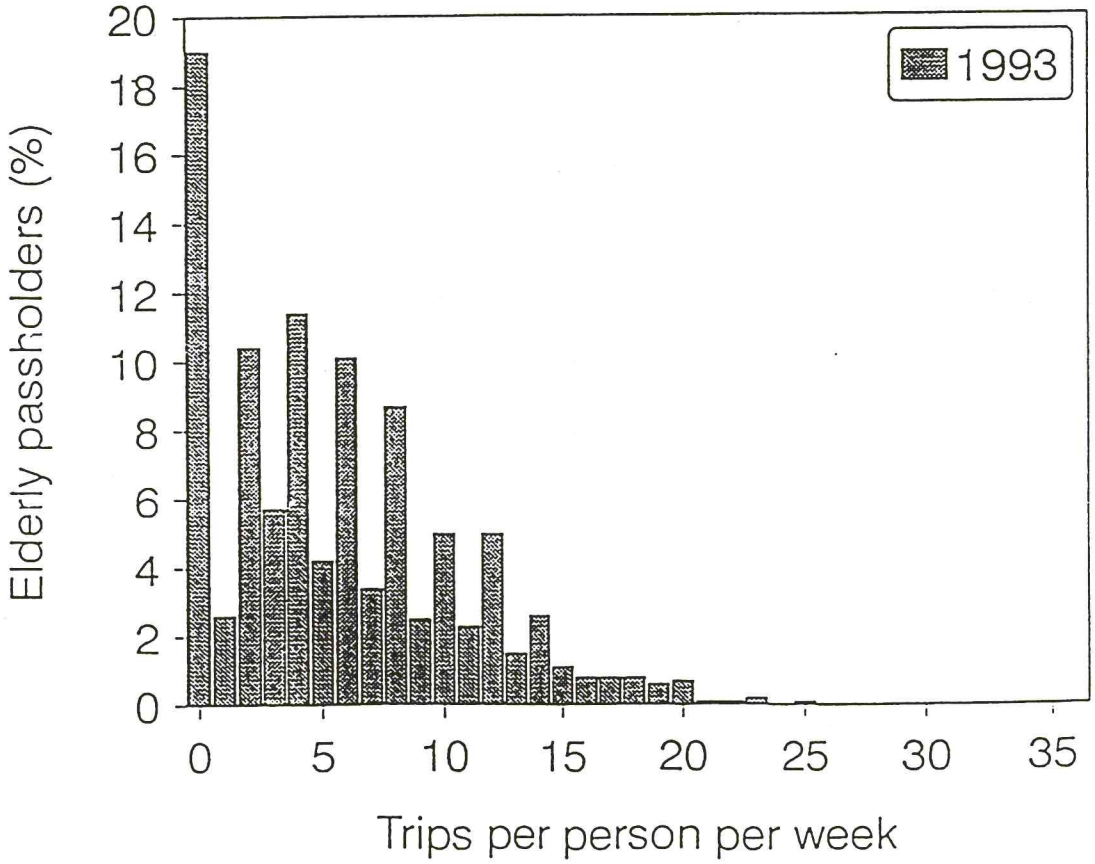

Fig. 1 - Changes in trip frequencies

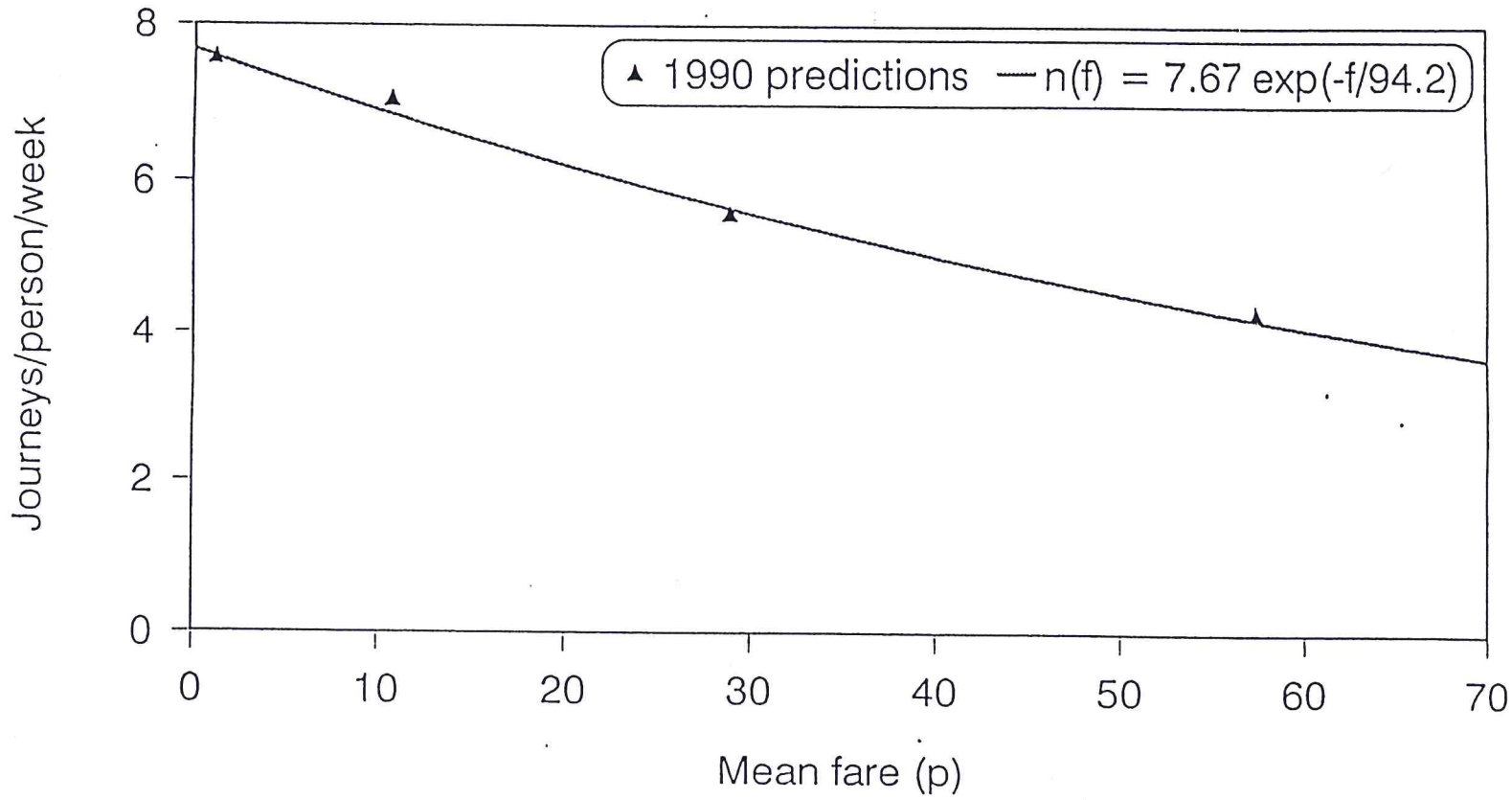

Fig. 2 - Effect of increased fares on trip rates (1990 predictions)
(All journey purposes, weighted data)

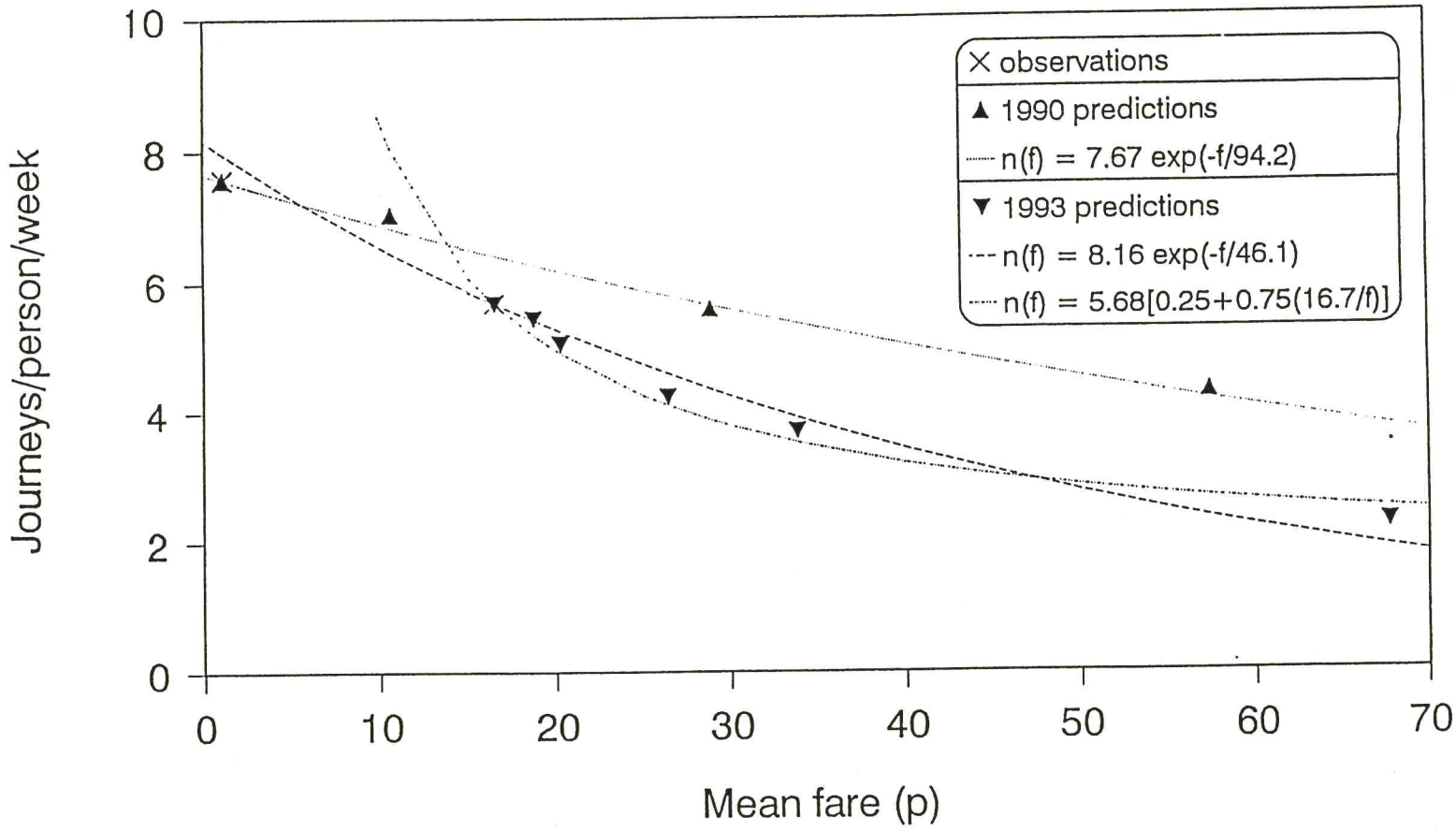

Fig. 3 - Dependence of trip rates on fares
(All journey purposes, weighted data)

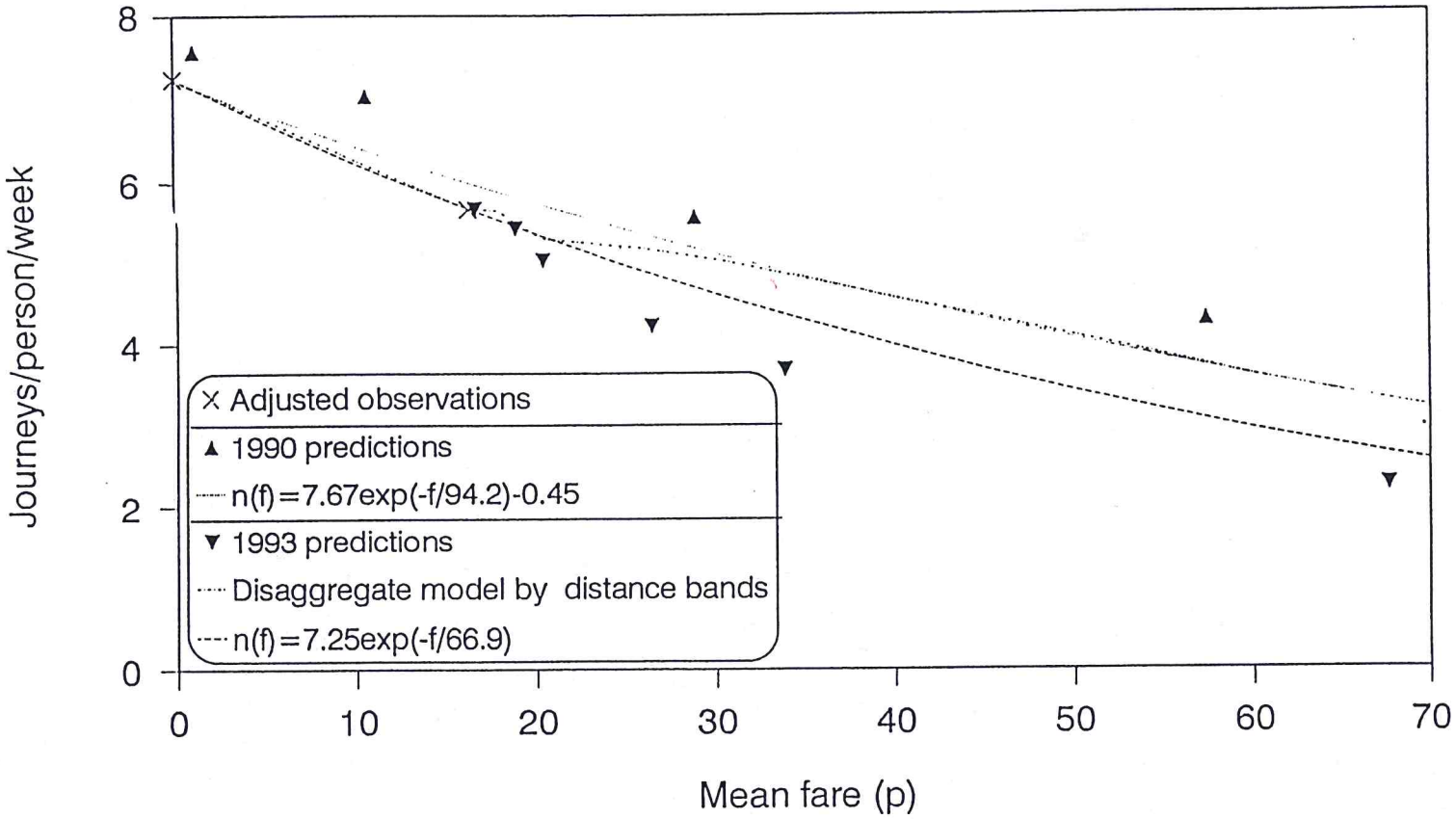

Fig. 4 - Dependence of trip rates on fares
(All journey purposes, weighted data adjusted for falling demand)

The Franchising of Passenger Rail Services in Britain

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1. INTRODUCTION

1.1 The 1993 Railways Act proposes to privatise passenger railways by splitting British Rail's passenger business into some 25 operating units and holding a competition for the franchises to operate these businesses. This competition will be administered by a government body, the Office of Passenger Rail Franchising (OPRAF). Eight franchises have been identified for the first tranche - the so called "fast-track franchises" - three of which are expected to be let by the end of 1995.

1.2 A number of issues have emerged when considering the appropriateness of franchising for the rail industry. Some of these issues are outlined in section 2. A key issue that emerges is the determination of appropriate specification of contracts. In section 3, we describe a hypothetical bidding game we have developed which may assist in determining contract specification and we present some exploratory results based on in-depth interviews of 11 potential bidders. In section 4, we go on to consider the preliminary findings from our bidding game on the likely size of winning bids. Lastly, we draw some conclusions about the likely success of rail franchising.

2. RAIL FRANCHISING - THE ISSUES

2.1 The concept of franchising originates with Chadwick (1859), who stated that: "where competition on the ground is impossible, an auction allows competition for the ground". This work was re-discovered and extended to a modern day context by Demsetz (1968). The rationale for extending franchising to the passenger railway industry, as postulated by Foster (1994), is that, even when operations are separated from infrastructure, the passenger railway business exhibits monopoly characteristics due to concentrations in space and time. In many cases, competition on-the-track will not be feasible. Off-the-track competition for the rights to operate services is the only feasible option. Moreover, current passenger railway services are largely unprofitable. Franchising is therefore the only feasible way of privatising the industry. Franchising is believed to lead to gains in allocative efficiency and, in particular, to gains in productive efficiency with cost savings of 30% achieved in the contracting out of refuse services (Domberger et al., 1986) and the tendering of bus services (Heseltine and Silcock, 1990).