

"MEASURING THE ECONOMIC EFFECTS
OF RURAL PUBLIC TRANSPORT WITHDRAWAL:
THE CASE OF BUTTERMERE-LOWESWATER"

by

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In many ways the demise of Cumberland Motor Services (CMS) route 65 in November 1981 is indicative of what some people fear will occur following UK local bus deregulation.

In the summer of 1981 a private coach company, Yeowarts, was granted - on appeal to the Secretary of State for Transport - a licence to run a circular local bus service in Whitehaven, Cumbria. The service competed with the existing profitable operations of the network operator CMS. The National Bus Company subsidiary had used the profit from Whitehaven to partially support its rural Cumbrian operations. The abstraction of profit by Yeowarts, coupled with the inability of Cumbria County Council to raise additional revenue support, spelt the end of six rural services including that between Cockermouth and Buttermere-Loweswater.

In this paper the author tackles three issues:

- an analysis of the effects of rural bus withdrawal;
- a description, and application, of a methodology to measure the economic effect of rural bus withdrawal; and
- the social desirability of cross-subsidy in this case using thumbnail calculations of economic welfare charges on the other withdrawn services and in Whitehaven.

1 THE EFFECTS OF RURAL BUS WITHDRAWAL FROM BUTTERMERE/LOWESWATER

1.1 Location and Background Information

1.1.1 Location

Buttermere lies in the upper reaches of the valley of the River Cocker (see Figure 1), ten miles south of Cockermouth, and between Buttermere and Crummock Water. The population consists primarily of sheep farmers, with some retired people and some second home owners. It has a resident population of 62, although this figure increases dramatically

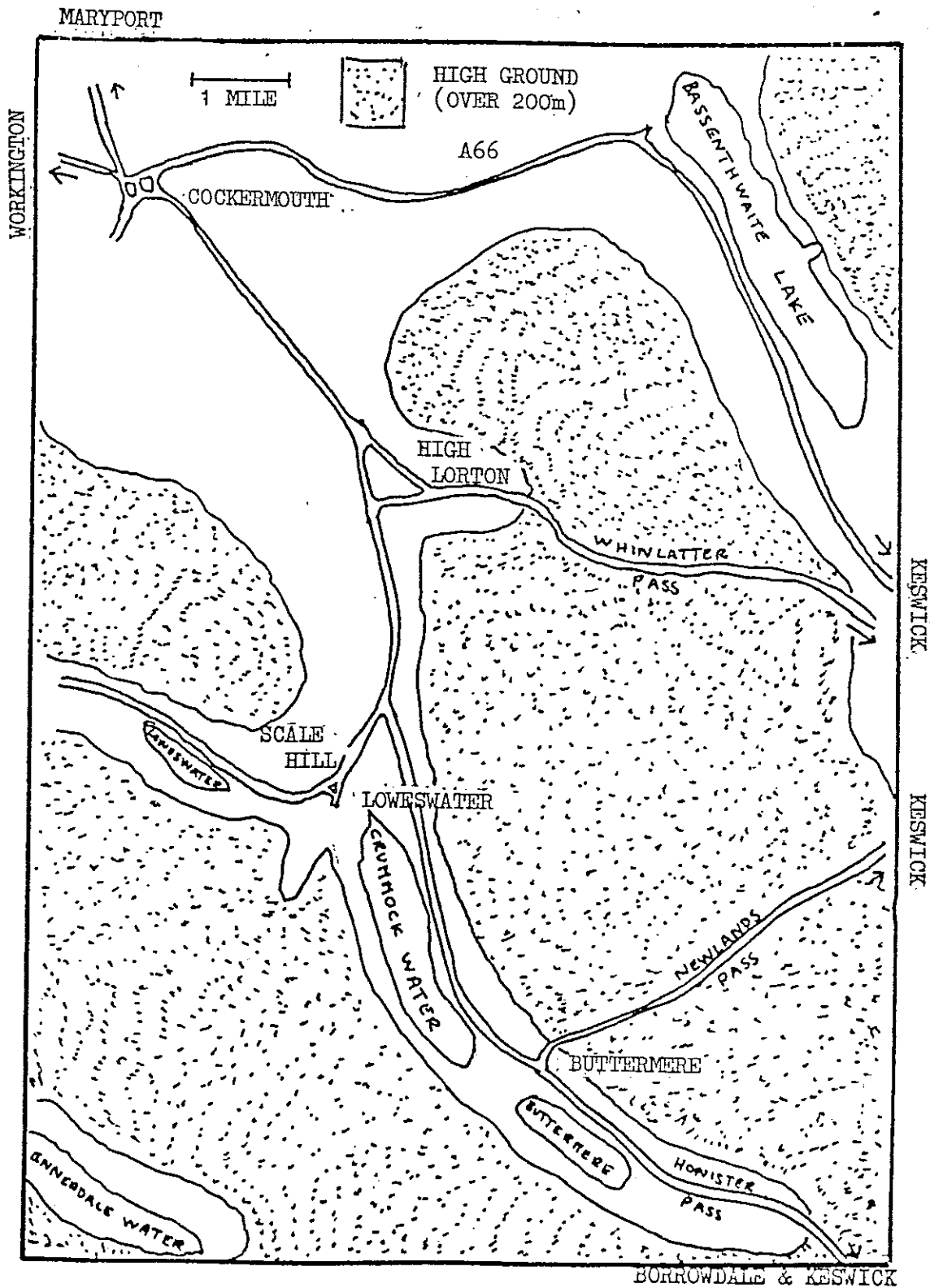


FIGURE 1. MAP OF BUTTERMERE / LOWESWATER AREA

in the tourist season. This very beautiful area sports two hotels and several farms offering Bed and Breakfast accommodation, in addition to camping facilities. Whilst Buttermere is actually closer to Keswick, the formidable Newlands or Honister Passes make Cockermouth the natural access point.

Loweswater is at the north end of Crummock water, where the valley broadens and joins the valley that runs through Loweswater Lake. The larger population of 89 is, however, more widely spread. The 'centre' of Loweswater consists of the vicarage, church, inn and (former) school house but unfortunately no houses. These are scattered on the marshland to the immediate north of Crummock Water, and along the road past Loweswater Lake, and northwards on the hillside towards Thackthwaite. Loweswater is on the edge of the Lake District and therefore, unlike Buttermere, does not attract many visitors.

Around the junction of the Loweswater and Buttermere roads is the dispersed community of Brackenthwaite, with a population of 44. Many of the farms in the area are large, taking advantage of the wide flat valley floor at this point. However, the proximity to Cockermouth becomes apparent in the number of long distance commuters resident in the area. These people are employed by British Nuclear Fuels Limited and other companies in Workington, wither they commute by car.

1.1.2 Bus Provision

Motor bus services reached the valley in the 1920s from Cockermouth via Lorton; Loweswater and Buttermere were served separately, but their routes concurrent up to Brackenthwaite. The metalling of the roads over Honister and Newlands Passes just before the Second World War, brought a summer-only motor bus service from Keswick to Buttermere over both Passes. The service over Honister was curtailed to Seatoller in the 1960s, where it forms the still existant Borrowdale service from Keswick. All of these services were in the hands of CMS.

Since the heyday of bus patronage in the mid 1950s passenger figures have declined. In this particular valley a number of explanatory factors can be identified. First, farming is now organised on a much larger scale with one farm where there were previously, say, five. This has released many farm buildings onto the market which have been bought by 'outsiders' retiring to the district, or as second homes by wealthier people. These people are invariably car owners. Secondly, whilst the tourist potential of the Lake District has been exploited since the formation of the National Park, many of the visitors arrive by car or are walkers. Thirdly, as farming has become more mechanised, farmers now have transport in addition to tractors, which has reduced their bus usage.

This has left a smaller farming community, often with several 'vehicles' per household, and a growing number of people employed outside the valley or just holidaying in the second homes. In such an atmosphere, and with a national increase in car ownership, events were hardly favourable to the bus, or indeed to any form of community life.

In this environment bus economies were called for, and at the end of the 1971 summer season the CMS service over Newlands Pass from Keswick was withdrawn. However, minibus replacements - ultimately by the Mountain Goatbus company - still provides a limited summer service. In 1973 the two Cockermouth services were amalgamated and thus resembled an inverted Y, with the bus visiting Loweswater first on its outward trips from Cockermouth. This led to large increases in journey times. For example, for a Buttermere resident, Cockermouth could be reached in 35 minutes, whilst the return journey would take just over an hour.

The level of service in the final years was five journeys a day Monday - Friday and four on Saturday in the summer; whilst in the winter - apart from two school journeys - there were two daily on Mondays and Wednesday, three on Saturdays and two to Lorton only on Fridays.

The service continued, with much reduced patronage, until the economics necessary as a result of the Yeowarts competition struck the death blow. At the time of withdrawal CMS claimed the service lost £14,000 a year.

Under its statutory duties under the 1944 Education Act, the Council continued to provide a schools service by contract. CMS provided the afternoon service whilst the morning service passed to Mr Ken Routledge, a Cockermouth driving instructor and taxi operator, who acquired a number of minibuses. All children in the valley need to travel to school, the infants and primary facilities being in Lorton, and the secondary schools in Cockermouth. After a few months the afternoon schools trip also passed to Mr Routledge.

Mr Routledge's new found business enabled him to expand his number of vehicles and take on staff. In May 1982 he started a twice daily shopping service on Mondays and Fridays throughout the year, serving both Buttermere and Loweswater. Within a matter of weeks it became obvious that there was no traffic originating in Buttermere. The service was cut back to Loweswater throughout the summer of 1982, and for the winter of 1982/3 it was curtailed still further to Lorton which, being a outer suburb of Cockermouth, provided the vast majority of the traffic. Routledge runs his service to Loweswater on Fridays to pick up one lady.

1.2 The Survey

A Survey was conducted in April 1983 to collect information on the extent of bus trips prior to withdrawal and

how (if at all) these trips were now made. As there was no before-withdrawal studies to pinpoint the former users, the author decided to interview every household within the parishes of Buttermere, Brackenthwaite and Loweswater, even though several were a distance from the line of the former bus route.

A sampling frame constructed from the electoral role indicated 87 households spread over an area of 11 miles long up to a mile wide. Household interviews rather than a postal questionnaire was favoured as it was hoped that a higher response rate would ensue, particularly since a high number of "nil" (ie did not make trips by bus) responses were envisaged. A high response rate of 84% was actually achieved with only one household refusing to be interviewed, although the movements of a proportion of the population were elicited from a relative. The high response rate can be attributed to a letter of introduction sent beforehand as householders, being forewarned of the visit and its purpose, proffered a friendly welcome.

1.3 Survey Findings: The Effects of Bus Withdrawal

1.3.1 Changes in trip mode and pattern

In this section a narrative, supported by tables, indicates the changes in mode and trip patterns of the local residents following bus withdrawal. School trips have been ignored as contact provisions duplicates the former stage timings.

A summary of the frequency of bus use (Table 1) shows a low level of utilisation. Under 8% of the resident population used the bus with a frequency of once a month or greater (with 8 other people making weekly trips in the summer season). Of the daily trips, one only commenced recently as the resident left school and would have commenced work, whilst the other only made a single trip (from Cockermouth on the afternoon school bus).

TABLE 1

FREQUENCY OF BUS USE (EXCLUDING SCHOOL TRIPS)

	<u>Total number of Persons</u>	<u>% of population</u>
DAILY	2	1.2
ONCE/TWICE PER WEEK	6 (+ 8 in summer)	3.7 (+4.9)
ONCE A FORTNIGHT	2	1.2
ONCE A MONTH	3	1.8
OCCASIONALLY	16	9.8
NEVER	113	68.9%
MOVED TO DISTRICT SINCE WITHDRAWAL	7	8.5%

An analysis of the type of person affected is given in Table 2. This shows that the belief that "little old ladies" would be the most affected is a fallacy. As would be expected, five ladies on weekly shopping trips form the weekly patronage, along with one "gentleman of leisure" who had had his driving licence withdrawn. The solitary monthly male passenger is a farmer on his way to livestock auctions in Cockermouth (presumably he did not bring back his purchases on the bus)!

TABLE 2

FREQUENCY OF BUS USE BY PASSENGER TYPE

	<u>ELDERLY</u>	<u>ADULT MALE</u>	<u>ADULT FEMALE</u>	<u>CHILD*</u>	<u>SEASONAL STAFF</u>
DAILY	0	0	2	0	0
ONCE/TWICE PER WEEK	0	1	5	2	6
ONCE PER FORTNIGHT	2	0	0	0	0
ONCE A MONTH	2	1	0	0	0
OCCASIONALLY	4	2	8	2	0

* excluding school trips

The maximum impact was undoubtedly on the daily passengers. The first, a Loweswater lady, is a teacher in Workington. Whilst she used to (and still does) get a lift to work, she would return by CMS bus to Cockermouth and then pick up the afternoon school bus. With the conversion of the school's service to a contract solely for school children, she still travels to Cockermouth (from Workington) by CMS bus, but her husband, a busy farmer, has to drive into Cockermouth to collect her. The other daily passenger left school at the time of the bus withdrawal and would have liked to have taken a secretarial appointment in Cockermouth. She would then, not having a driving licence, have travelled in on the school bus (this being the only daily service in winter). Neither bus or car transport being available to her, she has taken seasonal work in a local hotel, and is thus denied employment in the winter months. A similar theme was discussed by a Loweswater lady, who commented that the summer bus service allowed local ladies and sixth formers (even though nobody appeared to use the option) to undertake summer employment in Cockermouth. This is now impossible. All these problems would be overcome if fare paying passengers were allowed on the schools' service, although there would be problems in the holidays. Indeed, in the case of the teacher, the Parish Council is pressing the District Education Authority for a special exemption.

The next most serious impact is on the weekly shopping trips. Five ladies and a gentleman are affected. The male passenger now takes a lift but comments that he finds

difficulty in getting one. In three cases the husband now drives his wife into Cockermouth and goes shopping with her. In one of these cases the lady has also bought a motorcycle which she uses for half of her trips. A Buttermere lady took driving lessons and now uses one of her farm's numerous vehicles for her trips. The last lady is the passenger whom Mr Routledge comes to pick up on Fridays. In at least one case the availability of a car has meant that Workington (with its 'superstores') has been substituted for Cockermouth as the shopping venue. One lady made the point that many of the shopping trips were now made on Saturdays, which is not convenient for going to the bank.

An equally effected group are the seasonal 'live-in' staff of the hotels, who used to travel on their days off to Cockermouth. One Buttermere guest house said that its staff now used the Mountain Goat service to Keswick. The staff of one the major Buttermere hotels also used this service, or alternatively have to try to get a lift. At the other hotel in Buttermere and a Loweswater hotel, the proprietor has to give the staff a lift into Cockermouth. The Buttermere hotel has purchased a car specifically for this purpose. The problem is made worse because the staff, obviously, do not have their days off on the same day. A couple of hotels noted the difficulty of now getting daily staff. However, only one establishment said that the duties of a previous 'daily' from Lorton had been transferred to 'live-in' staff.

With reference to hotels, none reported any drop in trade. They point out that nearly all of their guests arrive by car. Since the withdrawal of a rail service through Cockermouth in the mid 1960s, most non-car owners arrive by taxi from Penrith or Carlisle and are thus unaffected by the bus withdrawal. The survey identified only eight occasions a year when guests now had to take a taxi from Cockermouth. Some of the hotels reported that guests used the bus as part of a day's walking, but the Keswick service provides an alternative facility.

A number of people made less frequent shopping trips. Those made on a regular basis (fortnightly, monthly) have now tended to have their husbands drive them in, or in the case of the older people, be given a lift by neighbours. A number of ladies used the service for shopping once or twice a year; these are now driven by their husbands or, as in one case, the trips are not made at all. Two Buttermere farmers who used to travel to the cattle auction in Cockermouth by bus (one every month, the other three times yearly) now travel by car. The other regular trips by bus were occasioned by car servicing requirements. However, this problem has been overcome in one of three ways:

- i. the garage might send out a mechanic to collect your car
- ii. the garage lends you a car whilst yours is serviced
- iii. the service is conducted "while you wait".

Not many social trips were made by bus. One lady had an aunt visit her once a year, by bus; this visit is now made by car. Children do not appear to be greatly effected. A few trips which were made by bus (including Saturday morning shopping in Cockermouth) are now made by parental chauffeuring. There appears to be a greater urgency to get a motor cycle and then a car. One farmer commented that a couple of times each summer his children would remain for after-school activities, returning home on the 5.30 pm bus (which only ran in summer); now he has to collect them.

1.32 Wider Issues

There was undoubtedly very little patronage of the bus service in the later years. The number of trips detected, per year, are shown in Table 3. Many people complained of bad timings and high fares (the fares were higher than the marginal cost of a single occupancy car for the distance). Undoubtedly the combining of the Loweswater and Buttermere services in 1973 was nothing short of a disaster, due to the greatly extended journey times.

TABLE 3

BUS TRIPS BY TYPE PER YEAR

	<u>PASSENGER JOURNEYS</u>	<u>NUMBER NOW NOT MADE BY ANOTHER MODE</u>	<u>% NOW NOT MADE</u>
Shopping	828	4	0.4
Work	752	456	61.0
Social	699	10	1.4
Car service	11	0	NIL
	<u>2,290</u>	<u>470</u>	<u>20.5%</u>

Surprisingly, some residents were glad to see the end of the bus service. Those with roadside properties pointed to the congestion and noise the bus caused on the roads. Indeed, only a lightweight bus could "fit down the route", and even then there were problems at some points.

Some people felt that by withdrawing the bus, society had finally proclaimed the community as dead. There was also a fear that younger families would leave the district and the community would fall further into the hands of second home owners. The local Vicar felt strongly on this, although he thought the community had been dead since the late 1950s. He and others felt that the keeping of the bus service was not a financially efficient way of helping these communities. Farming subsidies and the work of the National Trust and the Lake District Special Planning Board were seen as being more important. Some of the commercial businesses in the valley objected to the bus service being "propped up" whilst they received no support in promoting the area.

2. AN ECONOMIC METHODOLOGY FOR CALCULATING THE EFFECTS OF RURAL BUS WITHDRAWAL

To undertake an economic evaluation of rural bus withdrawal the author considered not only the financial effects to the bus company (and its funding County Council) but also the effects on the consumer.

To consider the consumer costs/benefits of bus withdrawal precisely it is noted that whilst bus trips may be curtailed, the former passengers will continue to undertake at least some of the trips by alternative modes. These alternatives may involve greater physical effort, time or discomfort, (eg walking, cycling) or be more expensive (eg private car or taxi) meaning that some journeys now involve a higher generalised cost and, of course, some journeys are discouraged and do not take place.

This section considers first the theory of evaluating rural withdrawal, secondly its practicalities and thirdly the application of the methodology in the case of Buttermere/Loweswater.

2.1 The Theory of Economic Evaluation

The theory has been divided into five segments. The first three deal with the effects on consumers and relate to cases where former bus trips are still made but by another mode, where trips have been discouraged and also an 'option value'. The fourth effect is the cost of school provision to the County Council, and the fifth the financial effects to the bus company.

2.1.1 Consumers' Costs/Benefits - Trips Made by Another Mode

The demand for public transport is a derived demand, in that the service is not valued for its own sake, but for the activities to which the transport allows access. Thus it is possible to derive a generalised cost demand curve from point A to point B for a particular journey purpose, and limit the curve to the sector of the market which was originally bus passengers. This is represented in Figure 2. In this case the generalised cost of bus travel is plotted on the vertical axis. At present OX1 journeys are being made between A and B for a particular purpose at a generalised cost (fare and time) on the bus of GC1.

If the bus service were withdrawn then people have to find an alternative mode of travel often at a higher generalised cost (eg GC2). Consequently, the consumers' benefit is reduced by two factors, first the remaining OX2 trips are made at a higher generalised cost (area GC2deGC1) and secondly the increase in cost has meant that X1X2 trips are no longer made with a loss of surplus of area def.

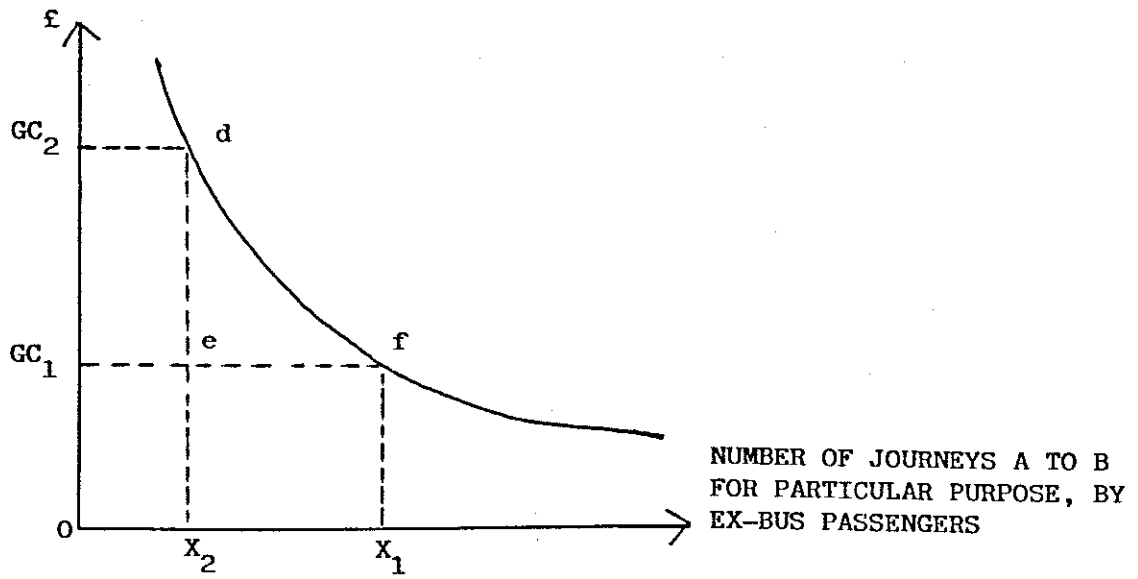


FIGURE 2..

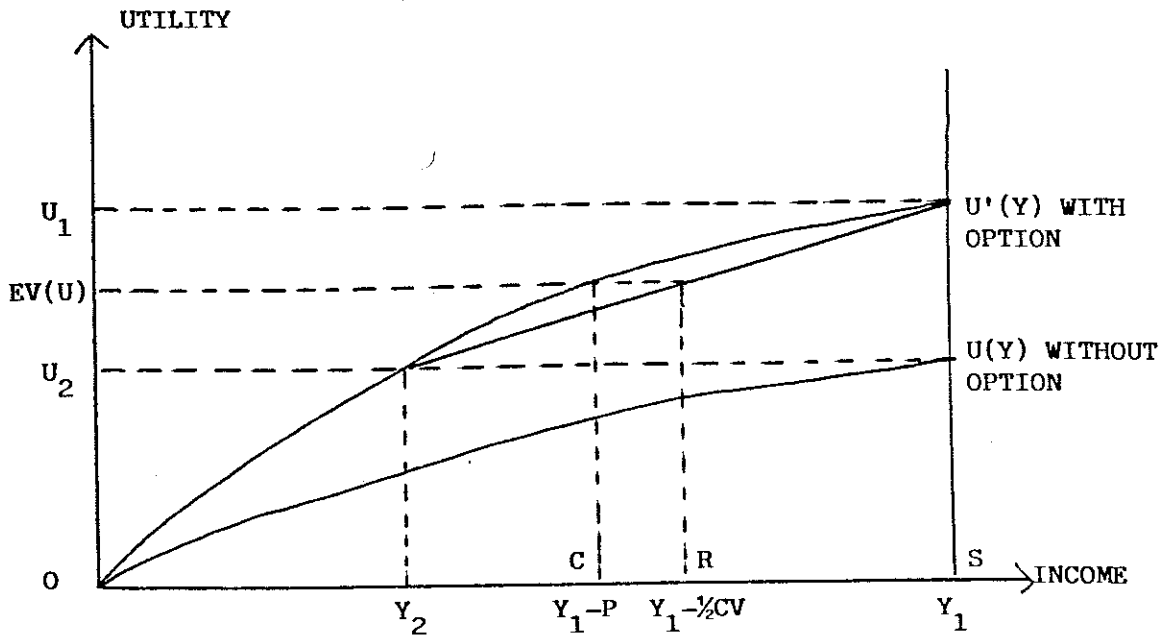


FIGURE 3..

As has already been stated, this formulation is origin-destination pair, and purpose specific. Whilst there are numerable ways of dividing up trip purpose this work has adopted four groups:

- o school trips
- o work trips
- o shopping/medical trips
- o social/recreational trips (ie anything else)

In a welfare calculation, OX_1 - the number of bus trips currently made - can be measured directly by observation/on-bus interviews to obtain trip purpose and frequency for an individual user. Generalised cost for the trip can be calculated. As evidence points to the fact that waiting time is liable to be relatively short on low frequency services, the approach has thus taken the generalised cost to be the bus fare plus the value of in-transit time. It would then be necessary to conduct after studies - by the use of household interviews - to establish the number of former bus trips that continue to be made, and in addition the mode by which they are made. This kind of analysis was used by Oxley (1982).

A potential problem is that the generalised travel cost of the alternative to the bus service (eg. taking a car lift) may be less than the present cost of the bus. This might suggest that people are irrational in presently choosing to travel by bus. This need not necessarily be so. First, there may have to exist some search or transaction costs which made the cost of the alternative travel mode higher than that of the bus. In this case it would be impossible to gain from the bus withdrawal as these search and transactions costs must, at least, equal the welfare gain. A qualification to this is that it may be argued that on the withdrawal some of the cost becomes smaller, for example there will no longer be any 'embarrassment' about asking for a car lift, and in difficult circumstances lifts will be easier to find. Secondly, some people may have travelled on the bus out of habit, and due to inertia did not select a lower cost mode. If the bus withdrawal forces these people to select another mode, then they may actually have gained.

2.1.2 Consumers' Costs/Benefits - Discouraged Trips

The traditional approach is to use the rule of a half which states that the change in user benefit if the trip is discouraged will be:

$$1/2 \sum (X_1 - X_2)(GC_2 - GC_1)$$

The implication of this is that the part of the demand curve under consideration is linear (section df in Figure 2). This assumption of an empirically unlikely demand curve might not lead to excessive errors in the calculation of the change in consumers' surplus (Neuburger 1971), when compared with the error involved in the estimation of the parameters of the demand curve.

For a trip to be discouraged the new generalised cost of making the trip (ie GC2) must be greater than the benefit derived from the trip. Thus the benefit derived must be less than the least expensive mode still readily available for making the trip - for which taxi is presumed to be a reasonable assumption for the bound of this.

2.1.3 Consumers' Costs/Benefits - Option Demand

However, it is not only the users of a service who would lose if it is withdrawn. Even people who use private transport might value the provision of public transport. This may be for reasons of "keeping their village alive", or more importantly for maintaining an alternative in the event of their private transport being unavailable. This is termed an "option value" and is "a form of willingness to pay to reduce the risk of options being removed in the future" (Pearce & Nash, 1981).

In the diagram (Figure 3) a relationship between income and utility of the usual form is illustrated. Obviously a car-owning individual would have higher utility ($U(Y)$) if the bus service continued than if it was withdrawn ($U(Y)$). If there was no bus service and the individual's income was Y_1 then he would have a utility of U_2 . This utility level would also accrue if the individual only had an income of Y_2 but the bus service was running. Thus income $Y_2 - Y_1$ is equivalent to utility $U_1 - U_2$ and is the compensated variation (CV) measure of consumer surplus.

However the choice between being with or without a bus service is not so clear cut because people will be uncertain as to the number of occasions they would have to use the bus in a year. The car owner attaches a subjective probability to the chance that he would have to use the service. Suppose the attached probability is 0.5 then the car owner's $E(CV) = 0.5CV$ which would give the individual an expected income of $Y_1 - 0.5CV$. Based on the individual's idea of a "fair" insurance against the service being withdrawn he would get an expected utility of $EV(U)$. The distance RS is called the expected value of the risky prospect. However, individuals are liable to pay more than a fair price for the retention of the bus service. The individual would pay up to a maximum of P, this additional amount (CR) above the "fair" insurance price of RS being known as "the cost of risk". The cost of risk will vary between individuals. The more concave is the function the greater the cost of risk. This is a measure of how "risk averse" the individual is.

In the analysis it is required to measure the maximum amount of income the individual would give up to ensure the continuance of the bus service, which would be equal to his loss of welfare if the service was withdrawn. The car driver could be asked how he would go about his business if there was no bus service and his car was temporarily unavailable. The increased costs in time and money of using the bus service as the first alternative could be observed. The car owner could then be asked the number of occasions a year he thinks his car

would be unavailable, in order to find the annual increased cost. It need not be a problem if this answer is pure guesswork, as the expected utility of the bus service is dependent on the individuals' opinion (however mistaken) of his car's reliability.

However, this will only give the distance RS, the "fair" price of insurance the owner would be willing to pay to retain the bus service. This is equal to his expected additional costs if the service was withdrawn. However, the individual is risk averse and might fear that his car might be unavailable for more days a year than he expected. Thus the maximum number of occasions the car might be unavailable should be ascertained. The answer will vary between individuals on the basis of the degree of risk aversion. This would measure the distance required, ie CS, which is the maximum amount of annual income he would be willing to give up.

2.1.4 Consumers' Costs/Benefits - the Council

Councils are usually also consumers of bus services because of their duty as an education authority to provide transport to and from school, for distances of two miles and over for children under eight, and three miles and over for children over eight years of age. In the event of withdrawal of the stage carriage bus, the Council will have to maintain its duty by either providing shared taxis, or if the route is more heavily populated, by the provision of a contract carriage bus. All council expenditure will carry a shadow price which reflects the administrative cost of raising additional finance and the efficiency loss caused by the tax. Browning (1976) reviewed the shadow price of taxation and finds it to lie in the region of 1.1, depending on the form of taxation used..

2.1.5 Bus Companies Costs/Benefits

This approach considers net savings to the bus company. This will be the saving of avoidable costs less the revenues collected on the route. There is, in addition, a network effect to be considered whereby there may be a loss of revenue to the rest of the system. This latter point has not been considered further on this analysis. In the case of Buttermere/Loweswater no evidence of a decline in use of the rest of the CMS network was detected.

A summary of the formula for the economic evaluation is given in Table 4.

2.2 Practicalities of Collecting Data for an Economic Evaluation

In this section, methods for collecting the data needed for a welfare evaluation, described in section 2.1 are investigated. The data inputs needed are as follows:

TABLE 4

ECONOMIC EVALUATION OF RURAL BUS WITHDRAWAL

For each individual making trips for a certain purpose per week:

WORK, MEDICAL/SHOPPING AND SOCIAL/RECREATIONAL PURPOSES

$$-2X2 ((P2 + M2Va) - (P1 + M1Va)) - (X1 - X2)(Pt + MtVa) - (P1 + M1Va)$$

SCHOOL PURPOSES ON EDUCATION AUTHORITY PASSES

$$-2X1(M2 - M1)Va + 2fP1 - fCs$$

OPTION VALUE

$$(-Nm((P2 + M2Va) - (P1 + M1Va))) / 52$$

MINUS NET RESOURCE COST SAVINGS

$$Cb - \sum 2P1X1$$

WHERE

- X1 journeys (a return trip) made before, per week
- X2 journeys made after, per week
- P1 bus fares for the trip
- P2 monetary cost of the new mode for the trip
- Pt taxi fare for the trip
- M1 the travel time by bus
- M2 the travel time by the new mode
- Mt the travel time by taxi
- Va value of in-transit time
- Cs cost of replacement schools' contract carriage or shared taxi
- Cb avoidable cost of running the bus service
- Nm maximum number of days a year an individual thinks he may have to use the bus
- f shadow price of public funds

1. journeys (a return trip) made before, per week
2. journeys made after, per week
3. bus fares for the trip
4. monetary cost of the new mode for the trip
5. taxi fare for the trip
6. the travel time by bus
7. the travel time by the new mode
8. the travel time by taxi
9. value of in-transit time
10. cost of replacement schools' contract carriage or shared taxi
11. avoidable cost of running the bus service
12. maximum number of days a year an individual thinks he may have to use the bus
13. shadow price of public funds

2.2.1 Measurement of value of time, operating costs and shadow price

The value of in-transit time (input 9) has to be imposed exogenously. The Department of Transport issues average values which can be used. The operating costs of the bus service is for our purposes, the costs that were avoided on withdrawal. The shadow price of public funds is discussed in Section 2.1.4.

2.2.2 Measurement of Number of Trips

Ideally there should be a before withdrawal survey of the route to obtain travel diaries for the week (ie input 1) and also permission to make a follow-up interview. In the event of a refusal of a follow-up interview, the before survey would establish a definitive figure to scale up the subsequent responses. The initial survey will then be followed up, after curtailment, by a household type interview where the surveyor would wish to obtain the following information:

- a. the number of trips now undertaken
- b. the alternative modes used to make the remaining trips.

The first question (ie input 2) will indicate the number of discouraged trips whilst the second will indicate the change in generalised cost experienced by the people now undertaking their trips by a different mode.

Because of the timing of the present study, only after-studies could be undertaken. Thus we are relying on respondents to correctly report the number of trips undertaken before the bus was withdrawn.

2.2.3 Measurement of Bus Fare and Bus Travel Time

The original time and cost for the journey (ie by bus) - inputs 3 and 6 - can be obtained from the fare and time tables for the route concerned.

2.2.4 Measurement of Monetary Cost of New Mode and Taxi Cost

The modes available as a replacement for the bus are: the use of another stage bus, taxis, cars, motorcycles, bicycles or walk (or indeed a combination of these). The cost of a taxi (input 5), per mile, can easily be obtained from the local taxi firm. This value may also be appropriate if ambulances are used for hospital visits (although the monetary cost may then be borne by public funds).

In the case of cars Oxley identifies four cases:

- i. car driver with a car purchased due to the bus withdrawal
- ii. car driver with an existing car
- iii. car passenger in own household's car
- iv. car passenger in another household's car (ie taking a lift)

Oxley says the first case should be valued at full cost, including purchase and other fixed costs, whilst the second and third are involving just marginal mileage and should be valued at the running cost of the vehicle. The fourth case is more problematical with many people reluctant to ask for payment; however, many of the lifts are on a "sharing petrol" arrangement so Oxley costed them at half running cost. These costs are obtainable from the annual review of car costs in the October edition of "Which" Magazine.

The costs for motorcycles and bicycles can be similarly calculated. As with the car example it is possible to differentiate between whether the bicycle was purchased prior to the bus withdrawal or not. The direct costs of walking are negligible and are treated in the inflated valuing of the time involved.

2.2.5 Measurement of Travel Time by New Mode, and Taxi

The calculation of travel time following bus withdrawal (inputs 7 and 8) required some assumptions to be made. Average speeds of 30 mph for the motorised modes, between 6 and 8 mph (depending on terrain) for bicycle users and 3 mph for walkers are usually adopted. With respect to the value of this time, it is usual to value the in-transit time for car users at the same time as bus in-transit time, whilst for motorcycles,

bicycles and walking it is valued at bus waiting time (ie about twice in-transit time).

2.2.6 Measurement of Cost of Replacement Schools Facility

This can only be obtained by reference to the County Council. Obviously for school children the only change in costs to them will be the change in journey times, as they do not have to bear the monetary costs. Thus some discussion would have to occur with the County to compare the existing cost of school passes with the alternative option (contract service, shared taxi) chosen. In this case study the confidential nature of the cost of the replacement schools' service meant that it was assumed that the cost was approximately that of the existing scholars' passes.

2.2.7 Measurement of Option Value

To deal with option demand all non-users in the effected area must be visited and asked two things: first what mode they would use if the bus was not available as the first alternative, and secondly the maximum number of times a year they would have to use the bus service as a result of their car being unavailable.

2.3 Application of the Methodology

As reported in Section 1.2 the survey implementation went ahead as planned with a high response rate. Generally the details of previous bus trips and how the trips were subsequently made were easily elicited. However, two problems were encountered.

The first concerned the question on option values, which did not generate satisfactory responses. Residents were asked for option values in two ways. First, they were asked directly, "How much would you be willing to pay to have the service restored?" and secondly they were asked that in addition to their regular trips, "when the bus service was running, if the worse happened what would be the maximum possible number of occasions a year you would have to use the bus?" This latter information, coupled with details collected on the mode by which they would make these unexpected trips in the absence of the bus, should theoretically generate the same monetary answer as the first question. A number of reasons for the unsatisfactory response can be suggested.

- i. In some cases information was given by one member of the household about all members of the household. Whilst credence can be given to the reported trip patterns, questions of option values are essentially personal.
- ii. Interviews with respondents who did not formerly use the bus were short and were conducted on the doorstep. In these circumstances, after the first few occasions, it was felt that this was not conducive to deep questioning.

iii. Those who could not quantify an answer could not be prompted, since there would be an inherent danger of putting words (or, more accurately, figures) into their mouths.

It was obvious that many people had not had cause to travel on the bus in the last twenty years (if ever) and hence an option value did not accord with many residents' travel experience in the recent past. However, a number of people said it was "nice" to have the bus service (even if they could not remember when they last used it) and this would support the existence of an option value. In a community where it is common practice to speak to your neighbour, and often lifts are offered, the use of the bus service as an insurance in case of car unavailability would seem small. This is heightened by the fact that the timetable did not permit the making of most work or evening social trips. If such information could be elicited it would have to be in the form of a cunning psychological series of questions, specifically on this subject, and not tacked onto the end of a simple travel diary type survey. Obviously, there is potential for work in this area, as it is accepted that the work done as part of this study was naive.

The second problem occurred because according to the formulation of section 2.1 some people had a welfare gain from withdrawal of the bus. This occurred not only when people were taking lifts, but also in some cases where the husband would drive his wife to the shops. The reasons for this are easy to see. As already mentioned, the bus fares were high and the journey times very long; in addition some people had long access times to the bus route. As discussed in chapter 2.1.1 this does not necessarily imply irrational travel decisions due to the possible assignment of wrong time, the existence of search costs, or inertia. Without psychological questioning to ascertain under what category an individual fell, two figures for the total change in welfare were calculated. The first is the sum of the various welfare changes (be they positive or negative) and is termed the "overall loss". The second recognises that the existence of the search and transaction costs is the sum of the negative welfare changes and is termed the "sum of losses".

These measures were calculated for the 164 people interviewed, then scaled up to represent the total population of 195 in the surveyed area. This probably slightly overstates the total loss, as it is believed that all the major former-users of the bus service were interviewed. The scaled-up figures come to the following totals (per year) at October 1982 prices:

overall loss	=	£1,562.75
sum of losses	=	£2,038.95

These losses accrue from a scaled up, 2723 bus passenger-journeys a year made by Buttermere-Loweswater residents.

CMS made available a figure of passengers' journeys on service 65 in its last year of operation. This totalled 10,093, excluding school children. If a similar trip rate to Buttermere-Loweswater was observed in Lorton (population 222) then a total number of trips by residents of the villages would total 5,823 or about 58% of total trips on service 65. Thus a total welfare loss on the route can be calculated by first extending the observed welfare loss per person in Buttermere-Loweswater to the residents of Lorton, and then scaling up the losses to the villagers to include the 42% of trips made by "outsiders". This gives a total welfare loss on route 65 of:

overall loss = £5,792.48
sum of losses = £7,557.54

Therefore the total welfare losses, however they are calculated, do not exceed the £14,000 annual subsidy needed to sustain the bus service.

3 THE ECONOMIC EFFECTS OF CROSS-SUBSIDY

The Yeowarts competition brought about a reduction in cross-subsidy of £56,000 in Cumbria. The reduced competitive fares and increased frequencies in Whitehaven obviously gave benefits to Whitehaven travellers, whilst the withdrawal of rural service (as witnessed in the case of Loweswater-Buttermere) caused a loss of benefits to lakeland travellers.

Assuming that:

- Cumberland Motor Services withdrew only the number of services necessary to cover the Yeowarts abstraction;
- Yeowarts were only making "normal" profit (in the economists' sense); and
- there is a dimensional comparability of surpluses between gainers and losers

it is possible to determine whether the Yeowart's competition had a positive or a negative net effect on Cumbria.

3.1 Total Rural Consumer Disbenefit

In addition to the Buttermere-Loweswater service four other services were withdrawn and one curtailed. These were:

- Service 25 Whitehaven-Cockermouth: Four villages (Ullock, Dean, Deanscales and Eaglesfield), which were not served by paralleled routes, lost their four buses each way weekday service. A replacement service was provided from Ullock and Dean into Workington. Therefore only Deanscales and Eaglesfield were left without any conventional

public transport provision. In its place a community voluntary car scheme was instituted to provide for hospital transport, whilst Ken Routledge provided a County supported, three times a week shopping service into Cockermouth using minibuses.

- Service 41 Whitehaven-Workington (via Lowca): The northern portion of this daily local service, which ran through a low population density area was withdrawn. The effect was to deny the residents of Lowca direct access to Workington. However, in July 1982, following requests from members of the County Council, a three days a week shopping link was restored over the withdrawn section. In August 1984 CMS diverted some of its principal Whitehaven-Workington services via Lowca to provide a full service.
- Service 62 Cockermouth-Aspatria: This service provided a twice daily, 4 days a week shopping service from a string of villages (Bridekirk, Tallentire, Gilcrux, Arkleby and Plumbland) into Cockermouth or Aspatria. On withdrawal, a village bus scheme operated a once a week shopping trip into Cockermouth from Plumbland and the intermediate villages.
- Service 63 Aspartria-Harriston: Harriston is a small community about a mile to the east of Aspartria. The level of provision, before withdrawal, was two each way on weekdays. Since withdrawal of the service, the village has been served by a once a weekday diversion of the Aspartria-Wigton service, providing a journey to work facility.
- Service 64 Maryport-Aspatria via Hayton: The main service between the towns is provided on the A596. However, a number of journeys were diverted via Hayton, a village a mile off the main road. The service was thin with only one journey each way on Mondays, Wednesdays and Fridays and two on Saturdays. There has been no corresponding replacement service, the residents of Hayton having to walk to the main road to catch the (frequent) bus service along it.

Some measure of the total rural consumers' welfare loss due to the withdrawals of November 1981 can be calculated. To do this a number of assumptions have to be made. These are:

- a. the proportion of people effected in each parish relative to total parish size is similar;
- b. similar changes in welfare are incurred by these people; and

c. a similar proportion of "outsiders" used the services.

In some way there is a trade off between the first two. Whilst undoubtedly the number of trips by Buttermere-Loweswater residents was very small, the costs of alternative modes were high. As illustrated above most of the other effected communities have some level of provision, and this provision is generally on more than one day a week.

Parish household population figures are obtainable from the 1981 census returns, shown in table 5.

TABLE 5
POPULATION OF EFFECTED PARISHES

	<u>Population</u>
Buttermere-Loweswater	195
Lorton	222
Dean (includes Ullock, Eaglesfield, Deanscales)	883
Bridekirk (includes Tallentire)	770
Gilcrux	286
Plumbland (includes Arkleby & Parsonby)	368
Hayton	219
Harriston	100
	<u>3,043</u>

Scaling up the welfare losses for the people of Buttermere-Loweswater, and then allowing for trips by "outsiders", gives a grand total of (using the two different measures):

overall loss = £42,262.51
sum of losses = £55,140.73

These figures might be slightly on the high side for two reasons. First, some of the parish populations given above (particularly Bridekirk) might include communities which the bus did not serve anyway, and secondly, it is unlikely that some of the parishes (eg Hayton) would have attracted as much "outside" traffic as does the tourist orientated Buttermere.

3.2 Total Whitehaven Consumer Benefit

A thumbnail calculation of welfare change in Whitehaven is not easy. Specific passenger figures were not revealed publicly. However, prior to competition CMS reported that their present annual revenue on the effected services was £103,400, and that this would fall to £71,000 (for both operators) if Yeowarts entered and CMS reacted by matching his 20p fare. CMS based their calculation on a "negligible" elasticity of demand. From the post entry revenue a passenger journey figure of 355,500 a year can be calculated. On this basis the average fare prior to competition can be calculated as 29p.

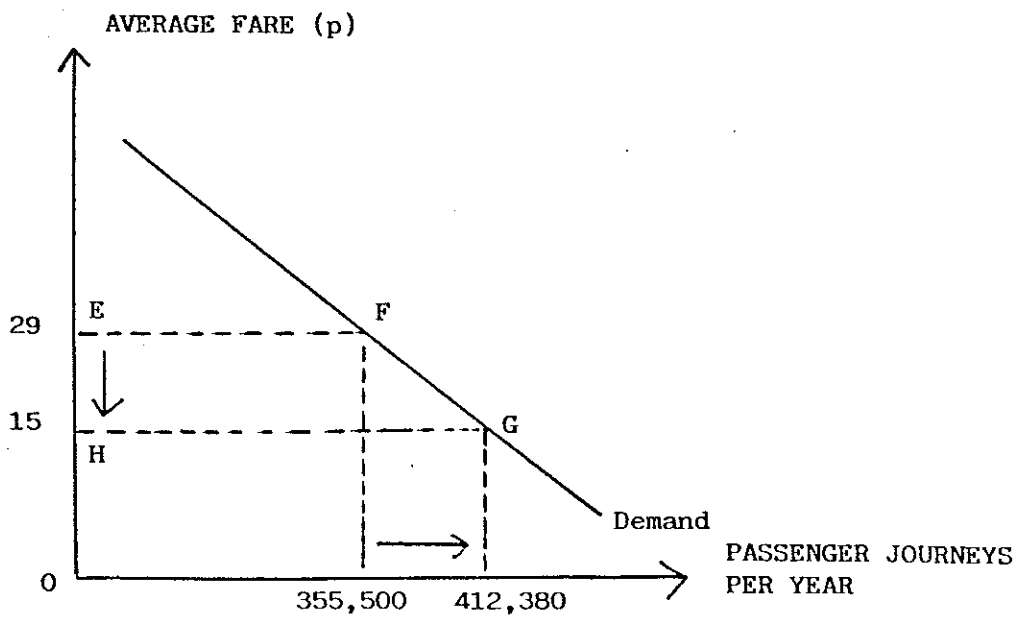


FIGURE 4..

In the competition itself CMS actually undercut Yeowarts' fare of 20p. Yeowarts responded by cutting his flat fare to 15p. At this level of fares Yeowarts claim there was a 16% generation of traffic. Some of this generated traffic could be attributed to a frequency effect which has not been quantified here. The consumers' welfare change is illustrated in figure 4. The relevant "area" is EFGH which, using the "rule of a half" is equal to a consumers' welfare change of £53,751.60 per year at 1981 prices, or £56,922.94 at October 1982 base.

3.3 Comparison

A comparison can now be made to see if the loss of cross-subsidy caused by the Yeowarts competition had been in the public interest. Two dimensions will be considered. First, allocative efficiency (comparison of welfare effects) and secondly distributional efficiency (transfer from one income group to another).

The allocative effect can be measured by comparing the consumers' benefit in Whitehaven (£56,922.94) with the losses in the rural communities. These losses were

Overall loss method = £42,262.51
Sum of losses method = £55,140.73

It would appear to be a marginal decision as to whether an allocative welfare gain has occurred. In practice the issue may be more clear-cut in favour of a welfare gain, for a combination of three reasons. First, the total rural loss will lie somewhere between the "sum of losses" and "total loss" figure. Secondly, it is believed that the rural loss has been overstated by the study because the level of "outside" traffic applicable to the tourist area of Buttermere might not be appropriate to non-tourist areas; and thirdly, there may be a greater gain to residents of Whitehaven because - due to the lack of data - the reduction in waiting time, as a result of higher frequencies, has not been taken into account. In these circumstances, where the services withdrawn do not generate enough consumer benefit to outweigh the resource costs, the reduction in cross-subsidy as a result of the competition has actually brought about a higher level of social welfare, due to a better matching of demand and supply in both the Whitehaven and rural bus markets.

The distributional aspects can also be considered. The Yeowarts service runs through a massive post war council housing estate, in a town where unemployment is rising rapidly, whilst the 1981 census lists Buttermere as having 0.0% unemployment. Thus the competition has implicitly made a transfer from Lakeland farmers and hoteliers to council house dwellers in industrial Whitehaven.

The converse of this argument is, of course, that the cross-subsidy, practiced by Cumberland Motor Services in this case had, as the 1984 National Bus Company Annual Report admits, produced "unwelcome social effects".

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