RAILWAY COSTS AND CLOSURES

By J. S. Dodgson*

INTRODUCTION
An important feature of the Serpell Report on the future of British Rail (Department of Transport, 1983) was a series of network studies by the Committee's consultants outlining estimated financial savings that could be achieved by reducing the rail system. One criticism of these studies was that the savings identified were purely financial, and that no attempt had been made to use cost-benefit techniques. The present paper sets out to survey twenty years of developments in the analysis and treatment of rail services in Britain since the Beeching Report (British Railways Board, 1963). As Figure 1 shows, the Beeching Report heralded a substantial contraction of the rail system; and its analysis too was based on financial criteria. But it was not long before subsidies were to be provided for rail services whose "value to the community outweighs their accounting cost to the railways" (Ministry of Transport, 1966, p. 4). This paper surveys the development of cost-benefit analysis of such services and the difficulties in its application, and considers the implications of cost-benefit results both in the light of previous Government policy towards the rail network and in the light of the Serpell Committee's network studies.

SOCIAL BENEFITS OF RAIL SERVICES AND THE DEVELOPMENT OF COST-BENEFIT ANALYSIS

The 1968 Transport Act system
Under the 1968 Transport Act specific subsidies were provided for unprofitable rail passenger services in Britain, in the hope that the remaining services (freight and long-distance passengers) could be made to break even. At the same time, a political decision was made to stabilise the rail system at a network of 11,000 miles known as the Network for Development. This compromise gave British Rail management some stability after the rapid cuts of the Beeching era, but never-

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theless permitted them to withdraw a significant number of services still within the closure machinery. It was intended that the new subsidy system should be associated with a mechanism for determining whether the services which were candidates for support did provide sufficient benefits to justify their retention. In 1967 the Ministry of Transport created a special Economic Unit to develop cost-benefit procedures for analysing unprofitable services, and a pilot cost-benefit study, of the Cambrian Coast line, was published in 1969 (Ministry of Transport, 1969). A number of independent studies were also published,¹ and the correct methodology was developed in a debate in this Journal and in the Chartered Institute of Transport Journal (Evans, 1972; Richards, 1972; Thomas,

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1971). The technique was used by the Government in the early 1970's, mainly to assist in closure decisions, and over 30 services were appraised, though with varying degrees of detail.²

The methodology of railway cost-benefit analysis

Cost-benefit analysis is relevant in analysing rail closures, both because the benefits to rail users from a service might exceed the fare revenue they pay to the railway operator and because there may be external benefits from the rail service. Benefits to rail travellers can be measured by generalised cost and consumer surplus. This can be illustrated by considering the demand for transport services between one of the pairs of origin and destination served by the rail route. Demand is assumed to be a function of generalised cost per trip, g, where suppose

\[ g = f + \alpha_v t_v + \alpha_w t_w \]  

and

\[ f = \text{money cost (fare, operating costs, parking charges etc.)} \]

\[ t_v \text{ and } t_w = \text{in-vehicle and walking/waiting time} \]

\[ \alpha_v \text{ and } \alpha_w = \text{values of in-vehicle and walking/waiting time.} \]

Figure 2 shows the position where bus is the only alternative transport mode, and bus and rail fares are equal. The difference between generalised cost per trip, \( g \), and fare, \( f \), gives the time cost per trip for each mode. By considering in turn the net benefits of the rail and of the bus service, we can derive the net benefit of retaining the rail service as the benefit of having a rail service rather than an alternative bus service. The net benefits of rail and bus services are equal to the gross benefit under the demand curve, less resource (including time) costs expended. Hence the net benefit of the rail service equals

\[ OaeT_r - fg_r c_d - C_r = g_r ac + OfdT_r - C_r \]  

The net benefit of the alternative bus service is

\[ OaeT_b - fg_b e_j - C_b = g_b ae + OffT_b - C_b \]

The area \( OfdT_r \) is equal to railway revenue, \( R_r \), and the area \( OffT_b \) is equal to additional bus revenue, \( R_b \). The term \( C_r \) is the avoidable cost of the rail service, and \( C_b \) is the additional cost of the replacement bus service.⁴ \( C_r \) and \( C_b \) are not shown in Figure 2 because, owing to the indivisibilities of operation, they are assumed not to be sensitive to small variations in the number of trips made.

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² Some 32 of the services appraised are listed in Department of Transport (1977a). p. 208, but the results were never published.

⁴ Hence if there were already an alternative bus service in operation with enough spare capacity to absorb transferring rail passengers, \( C_b \) would equal zero.
The net benefit of retaining the rail service is then (2) minus (3):

\[
(g_r ac - g_b ea) + (R_r - R_b) - C_r + C_b
\]

\[
= g_r g_b ec + (R_r - R_b) - C_r + C_b
\]

\[
= g_r g_b ec + (R_r - C_r) - (R_b - C_b)
\]

This net benefit of retention is therefore equal to the increased time costs to rail travellers who would transfer to bus (area \(g_r g_b eh\), or \((g_b - g_r)T_b\)), plus the loss to those who would no longer travel (area \(hec\), or \(\frac{1}{2}(g_b - g_r)(T_r - T_b)\) if the demand curve is assumed to be linear between points \(e\) and \(c\)), plus the loss of revenue incurred by public transport operators in the event of closure (area \(T_b \times dT_r\), or \(R_r - R_b\)), plus the costs of providing additional bus services \((C_b)\), minus the potential saving on the avoidable costs of the rail service \((C_r)\). We should also subtract from \(C_b\) any additional benefits that the extra buses would provide for existing or newly generated bus travellers. If we used the same geometric framework to analyse the case where rail and bus fares were different,
it would be straightforward to show that the net benefit of retention of the rail service would include the same items, except that the generalised cost losses from diverted and suppressed rail trips would incorporate changes in money as well as in time costs.

In practice, experience shows that when a rail service is closed many former rail travellers transfer to private cars, either as drivers or passengers. Figure 3 illustrates the case where car is assumed to be the only alternative mode. The rail fare is denoted as $f_r$ and the behavioural car operating cost per trip, which must take account of car occupancy rates, as $f_c$. The net benefit of car trips is equal to the gross benefit under the demand curve, less time and resource costs. If resource and behavioural car costs were equal, then from Figure 3 the net benefits of car trips would be

$$0amT_c - f_c g_e mp - 0f_c pT_c = g_e am$$  \hspace{1cm} (5)$$

Subtracting (5) from (2), we then find the net benefit of rail retention as equal to

$$(g_ca - g_e am) + R_r - C_r$$  \hspace{1cm} (6)$$
This net benefit of retention is equal to increased generalised costs to rail travelers who would transfer to car (area $g_r g_{mn}$, or $(g_c - g_r)T_c$),\(^4\) plus the loss to those who would no longer travel (area $nm_{nc}$, or $\frac{1}{2}(g_c - g_r)(T_{nc} - T_c)$), plus the rail revenue lost ($R_{rc}$), \textit{minus} the potential saving on the avoidable costs of the rail service ($C_{rc}$). In addition, we should add to the benefits of rail retention any increases in the costs of highway provision (both capital and maintenance) which were regarded as essential in the event of rail closure, less any additional benefits this provision would create for existing or newly-generated highway users. Finally with regard to car travel note that, if the behavioural costs of car operation exceed the resource costs (as they would, for example, if motor fuel taxation were regarded as a transfer rather than as a device for the correction of resource costs) the correct treatment is to subtract the difference between behavioural and resource costs of those who transfer to car from the net benefits of rail retention in equation (6).

Of course, if a rail service is closed some former rail travellers will travel by bus, some by car, a few by bicycle, foot or taxi, and some will not travel or will make a trip to a different destination. The methodology outlined above can be used to determine generalised cost changes for all these groups. Where trips are no longer made, the appropriate treatment is to view the former traveller as not valuing this trip as highly as the minimum generalised cost by the alternative modes which are available to him for the journey.

We turn now from the first main justification for cost-benefit analysis of rail services to the second, namely, the existence of external benefits of rail services in the form of reduced highway congestion, fewer road accidents, environmental effects, and development effects.

Where some former rail travellers divert into cars which travel on already congested roads, there will be costs to existing road users. These are conventionally measured by taking the predictions of former rail users diverting to car, assigning the resulting increase in car trips to the road network parallel to the railway, and then combining this information and data on existing traffic levels on these routes with speed/flow curve and operating cost formulae to calculate the increase in operating and time costs to existing traffic.\(^5\) The predicted increases in road vehicle flows can also be used in conjunction with data on accident rates to predict increased numbers of road accidents, though valuation of this item will be particularly dependent on choice of an appropriate value for increased risk of loss of life. Allowance must also be made for any expected reduction in rail casualties after closure, both to passengers and to railway employees.

Little work has been carried out on the environmental effects of withdrawal

\(^4\) Note that $(g_c - g_r)T_c = (g_c - g_r)T_c + (a_{tc} - a_{tr})T_c$. The former term might be positive but the latter negative in the case of transfers from rail to car.

\(^5\) One pitfall in this approach is that the resultant increase in traffic on the parallel highway routes will cause diversion or suppression of some of the existing traffic on these roads, and, unless allowance is made for this, the element of reduced road congestion in the benefits of rail retention will be overestimated. Note also with regard to highway congestion that rail closure may permit some reduction in delays at level crossings.
of passenger services in the United Kingdom, but there does appear to be a general view that they are not great, and none of the published cost-benefit studies appears to have regarded them as important. People living close to rail lines do not seem to be very sensitive to rail noise, so that rail closure would bring few benefits in reduction of noise. On the other hand, the likely increase in road traffic on routes close to the more lightly-used rail services would be small in relation to existing traffic flows, and the relation between traffic flow and traffic noise indicates that the proportional increase in perceived nuisance from noise would be less than the proportional increase in traffic. Likely increases in air pollution also do not appear too serious; but, where in particular locations there was concern about environmental effects of rail closure, the predicted increases in highway traffic could be used to assess these effects within the type of multi-criteria analysis framework that can be used for appraisal of highway investment. This approach would also be appropriate for assessing the environmental effects of withdrawal of those freight services which were expected to lead to a significant increase, not restricted to motorways or other high-capacity roads, in flows of heavy goods vehicles.6

Our view of the environmental effects of withdrawal of passenger service is confirmed by a study carried out in the United States of the external benefits of the national Amtrak network. Mulvey (1979) attempted to quantify and value the external benefits of the whole network in terms of the impact of passenger train operation on safety, on air pollution, on air and highway congestion, and on fuel conservation.7 After reviewing and attempting to value each of these items in turn he concluded that “even under highly optimistic assumptions, both current and potential benefits fall far short of current and projected deficits” (Mulvey, 1979, p. 342); and he argued that the environmental improvements that were achieved could be obtained much more cost-effectively by means other than expenditure on rail subsidies.

Development costs of rail closure are also not likely to be significant, though there may be limited effects on local economies. The effects of closure of lightly-used rail freight lines have been extensively researched in North America, and the results of these studies have been summarised by Allen and Due (1977) and by Sammon (1979). Studies of the effects of closure, some of which used similar control areas which did not lose rail service, show that pre-closure fears of the effects on local levels of activity were generally exaggerated, and that effects on employment mainly consisted of direct loss of railroad employment rather than second-round effects. Some firms in particular locations may have suffered, but in the main these are distributional effects, as business lost was transferred to other firms located elsewhere. “The primary conclusion that can be drawn from

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6 An early study of the environmental effects of diversion of freight traffic from rail to road is summarised in Pryke and Dodgson (1975), pp. 242–244.

7 Note that a separate allowance for fuel use within a cost-benefit analysis framework is only legitimate if the prices used to value fuel are not regarded as reflecting true resource costs because of non-optimal policies of resource depletion.
these various impact studies is that the overall effects of abandonment of rail lines in the past have been relatively limited, due to the availability of motor (and other) transport” (Allen and Due, 1977, p. 12).

Similar work on rail disinvestment has not been undertaken in the United Kingdom, but empirical studies of the development benefits of highway investment were surveyed in an appendix to the Leitch Report (Department of Transport, 1977a). This concluded: “At the national and regional level all the evidence points to the conclusion that improvements to the trunk road system can only have a limited effect on industrial location and growth . . . In part this is a reflection of the relatively well-developed state of the British transport system . . . (though) even within the developing countries there has been considerable scepticism as to whether transport investment, except as a package deal involving other sectors of the economy, is a major influence in promoting economic development” (p. 207). The general view with respect to transport investment is that if there are any benefits to the development of the economy these will be measured by a correct evaluation of user benefits. Since rail transport in the United Kingdom is less important than road, it is very unlikely that rail closures would lead to any significant costs in reduced economic development, though, as in North America, there might be some limited distributional effects on the locations of particular activities.

**SOME PRACTICAL DIFFICULTIES**

We may now mention a series of problems that arise in applying the methodology of cost-benefit analysis. The first concerns the fares and service levels, both on the rail service and on the assumed alternative bus service. It is to be hoped that the rail service is operated with the best mix of fare and frequency, but the fare/service combination which accords best with British Rail’s financial objectives may well differ from that which maximises net social benefits. On a lightly-used minimum-frequency service the appropriate fare for maximisation of social benefit might well be zero, to make optimal use of the fixed capacity; but that zero fare would yield zero revenue. Alternative combinations of rail fare and frequency might be considered in a cost-benefit study, but the levels chosen for appraisal in comparison with the non-rail options would have to reflect the practical realities of railway pricing policy. In addition, fare and frequency levels for alternative bus services need to be considered; the choice of frequency would usually involve a trade-off between extra bus-operating costs and time losses to former rail users.

Difficulties also arise on the cost side. The first is the obvious need to ensure that rail operating costs for the services provided are minimised. If cost savings do appear to be technically feasible, it is sensible to carry out a cost-benefit study with the predicted lower cost levels in order to determine whether the service would be worth retaining even if these potential cost savings were realised. Otherwise investment in cost-saving facilities, such as radio signalling or automatic level crossings, may prove in retrospect to have been wasted.
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The second difficulty on the cost side is the estimation of joint and common costs. Joint costs are here defined as those costs of facilities shared with other services which cannot be reduced at all if the service under consideration is withdrawn. Common costs are those costs of facilities shared with other services which can be reduced to some extent if the service is withdrawn. As Joy (1964, 1971) showed, many of the costs of shared facilities, including track and signalling, may be common rather than joint, so it is incorrect to treat all costs of shared facilities as fixed in circumstances where some of the services are withdrawn. Examples of common costs relevant for a cost-benefit study of a particular service would be terminal costs at stations shared with other services, where it might be possible to reduce manning levels and platform capacity because of the lower levels of traffic handled; track and signalling costs on routes traversed by other trains, where reductions in line capacity, maintenance standards, or signalling facilities might be feasible; and administration costs, which, though they are often treated as "overhead" costs, are in practice likely to be related to the amount of administrative work that needs to be done. In addition, the joint costs would be avoidable if the services sharing these joint costs were also to be withdrawn. If the cost-benefit study shows that the initial service should be withdrawn, then the joint costs will all be loaded on to the remaining services. It may then be that the social benefits of those remaining services do not cover the total avoidable costs of withdrawing them. Alternatively, even if the cost-benefit study of the initial service shows that its social benefits exceed its avoidable costs, it may be that the social benefits of this service and those of the services with which it shares facilities do not cover the total avoidable costs of withdrawing the services and their shared facilities as a group.

With regard to capital costs, depreciation and interest charges on assets which have no alternative uses are not an avoidable cost, and are irrelevant for a cost-benefit decision. Where the assets do have an alternative use, the appropriate treatment is to include a rental element reflecting their value in their next best railway or non-railway use. Thus rail rolling stock may have a value, as it may be possible to defer investment in replacement rolling stock elsewhere on the system, and land occupied by rail route or stations may have a value equal to its rental value for alternative uses less any necessary conversion costs. Where capital assets do need to be replaced, costs are no longer unavoidable, and should be allowed for within a D.C.F. framework or, if annual costs and benefits are required, by including replacement cost depreciation and interest charges on the assets in the estimates of annual costs and benefits of retaining the service. Renewal of important items may have an influence on the timing of closure decisions, so it is important that the replacement costs be allocated to the particular year in which they are likely to be incurred.

All these considerations imply that when closure plans are under review a very careful analysis needs to be made of the avoidability of costs, and of the impact of different patterns of withdrawal on avoidability. Unfortunately railway cost data may often not be in a form that will readily permit this. British Rail's main approach to costing in recent years has been based on Profit Planning and Cost Centre Analysis (P.P.C.C.A.) which breaks the business down into some 700 profit centres, about half of which are individual passenger services or groups of
services. Only direct costs (which consist mainly of the costs of train crews, fuel, rolling stock maintenance, and terminals) are allocated to individual profit centres, leaving indirect costs (track, signalling and administration) unallocated. In addition, because the 1974 Railways Act required that freight and parcels should break even after covering all their avoidable costs, estimates were made of the track, signalling and administration costs which would be avoided if no freight or parcels were carried. This estimation of avoidable costs at the level of a particular business sector was extended in 1980 in an exercise that considered the avoidable costs of removing each of the four main passenger sectors (Inter-City, London and South East, Passenger Transport Executive, and Other Provincial) in turn.

This exercise was severely limited in the assumptions made about how the rail system and timetable could be adjusted if some services were withdrawn, and one-third of total rail costs were still not allocated even at the aggregate level of business involved. A further approach to cost allocation, termed the prime user method, does allocate all costs to different businesses, by defining a hierarchy of users for each section of route. For example, Inter-City is defined as prime user on most of the route traversed by Inter-City trains (though the Inter-City sector is now defined much more narrowly than the use of the brand name would imply), and London and South East is defined as prime user in the South East on passenger routes not already defined as prime user Inter-City. Because of the 1974 Railways Act financing system, freight and parcels are always defined as the marginal user, and so can only be prime user on freight-only routes, whatever volume of traffic may be handled on any route shared with passenger trains. The prime user costing method proceeds by estimating the avoidable infrastructure costs of the marginal user on each section of route and allocating those avoidable costs to that user. Additional infrastructure costs of eliminating the next lowest group of services in the hierarchy are then allocated to that business sector, until only the prime user, to which are allocated the rest of the infrastructure costs, remains. A major object of this costing system is to ensure that all the infrastructure costs become the responsibility of one of the five Sector Directors who are now responsible for costs and revenues in the five sectors — Inter-City, London and South East, Other Provincial (which includes Passenger Transport Executives), Freight, and Parcels — so that there is a proper incentive within the railway management structure to keep infrastructure costs under constant review.

The latest costing system in process of development, which uses exactly the same hierarchy of services on a particular section of route as does the prime user method, is termed by British Rail the “sole user” method. This approach is based on long-run costs, rather than on actual costs incurred. It involves an initial estimate of the infrastructure costs required if the prime user were the only (that is, the sole) user of a section of route. Additional infrastructure costs of a second and then, if appropriate, a third group of services are then added on. This method has yielded infrastructure cost estimates lower than existing infra-

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8 The methods of allocating direct costs to services were under review when this paper was being written.
structure costs, partly because the method is able to identify surplus physical track and other capacity not required by any of the sectors sharing a route, and partly because the unit cost values used reflect British Rail's view of current best technology rather than actual maintenance and renewal costs on particular sections of route.

The new prime user and sole user costing methods do provide valuable information about infrastructure costs which can be avoided if particular services are withdrawn. One limitation is that the hierarchy of cost allocation to different sectors is to some extent arbitrary, so that the lowest service in the hierarchy is not necessarily the one most likely to be withdrawn, either on financial or on social cost-benefit grounds; indeed, identification of the most vulnerable service on a route would itself require information on the costs that would be avoided on that route, and throughout the rest of the system, if the service were withdrawn. A second limitation of the system as initially developed was that the infrastructure costs of track and signalling on each section of route were not actual costs, but average system-wide costs incorporating renewal allowances for particular categories of infrastructure (for example, track of a certain category based on a 16-cell combination of tonnage and maximum speeds). Thus actual savings from withdrawal might not be accurately measured, especially if large renewal expenditure was imminent. Finally, it may be noted that cost allocations at the aggregate, sector, level might still conceal the possibility that important savings in infrastructure costs might be achieved by withdrawing or rescheduling a few trains from within one or a mixture of sectors using a particular route, rather than withdrawing all the trains in one sector from that route.

A final problem in the application of cost-benefit analysis is that there may be losses of contributory revenue. These are a social loss unless they are counterbalanced by reductions in operating or other costs made possible by the reduced traffic on the rest of the network. Calculation of contributory losses requires evidence on the amount of the contributory revenue, and prediction of the amount which will be lost if the rail service is withdrawn. Contributory revenue for different services has been found to vary considerably from service to service, but it can be high in proportion to the direct revenue. Experience of previous closures suggests that rail travellers may be reluctant to continue to use rail for part of their journeys, so it may be difficult to retain a high proportion of the contributory revenue at risk. British Rail's favoured solution is to give a high priority to timing and advertising rail connections when alternative bus services are designed, with the aim of integrating the replacement bus services as closely as possible into the rest of the rail network. This could produce conflict where higher social benefits from a given subsidy might be obtainable by tailoring services more closely to the needs of shorter-distance travellers.

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9 Time losses can be measured within the framework outlined in the previous section, since the set of origin-to-destination pairs can be defined to include origins or destinations beyond the immediate locality of the rail service under consideration.

COST-BENEFIT ANALYSIS AND CLOSURE POLICY SINCE 1968

The results of a number of the published cost-benefit studies, particularly those for services in rural areas, showed that the social benefits from the services were not sufficient to cover the costs incurred in operating them. The same result appears to have been reached in many of the Ministry of Transport/Department of the Environment studies. The clear implication was that subsidisation of the services was not justified on social grounds. In the meantime, however, the financial provisions of the 1968 Act relating to British Rail had collapsed, since the unsubsidised parts of the network moved into deficit. Small surpluses after receipt of subsidies had been earned in 1969 and 1970; but (converted to 1982 purchasing power) a deficit of £57 million in 1971 had grown to £92 million in 1972, £169 million in 1973 and £442 million by 1974. Faced with these escalating deficits, fearful of the political consequences of large-scale route closures, and apparently convinced by arguments from British Rail at the time that smaller networks would in any case not require significantly less financial support than larger ones, the Conservative Government framed new legislation, which was passed largely unchanged by the newly-elected Labour Government. Under the 1974 Railways Act system, still in operation in 1984, the individual grants under Section 39(1) of the 1968 Transport Act were abolished and replaced by a block grant, the Public Service Obligation. In return for receipt of this grant, British Rail were instructed “to operate their railway passenger system so as to provide a public service which is comparable generally with that provided by the Board” at the end of 1974. However, local services in the metropolitan counties continued to be supported under Section 20 of the 1968 Act, though with costs estimated on a new avoidable cost basis.

A comparison of the published cost-benefit studies, and revision of their results to take account of the correct methodology and to convert them to common price levels, had shown that the services generated rather similar levels of social benefits per passenger mile, and that differences in their cost-benefit results were due mainly to differences in costs per passenger mile, largely reflecting differences in traffic density or differences in the extent to which costs were shared with other services.¹¹ The 1968 subsidy system had required collection of cost and other data for each supported service. Using these data for 1974, the last year for which they were available, Dodgson (1977) showed that it appeared likely that in that year some 52 of the subsidised services failed to generate sufficient social benefits to cover even their specific costs of operation.¹² Withdrawal of these services would have closed nearly 1,100 route miles to passengers, and would have brought financial savings of some £35 million at 1982 purchasing power. In addition, a further allocation of avoidable track, signalling and administration costs would have revealed a further group of services failing to generate enough social benefits to cover their avoidable costs.


¹² Specific costs were defined as train movement costs together with terminal, track, signalling, and electricity supply costs for facilities used exclusively by the service.

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Influenced by considerations such as these, the Government’s 1976 Consultation Document on Transport Policy noted that it was doubtful whether many of the non-Inter-City and non-commuter services did provide “value for money even after taking account of the social benefit they confer” (Department of the Environment, 1976, p. 58). The Document announced that the Government intended to initiate discussions on the replacement of such services by rail-linked assured bus services. In response, British Rail considered the possibility of replacing many of the non-urban local rail services by bus services provided under contract to British Rail and financed through the Public Service Obligation grant. The services would be integrated into the rail network and could only be withdrawn after the same statutory procedures had been followed as for rail services.  

Though the Consultation Document had been very critical of rail subsidies, the 1977 Transport Policy White Paper (Department of Transport, 1977b) which followed was less so. The White Paper rejected any “major cuts in the rail system”, but it did propose that local rail services, if they were not judged by British Rail and the Government to be an essential part of the national rail network and worthy of support through the P.S.O., should become the financial responsibility of the county councils in the areas for which they were operated. The councils could then determine whether the services were worth retention, and could subsidise them with central government support. But this financial support would also be available for alternative bus services, so that the local authorities would “be under a positive obligation to find the most cost-effective ways to meet local transport needs” (Department of Transport, 1977b, p. 22). In addition, the White Paper proposed reform of the complex machinery for withdrawing a rail service. In effect, the proposals represented an attempt to shift any unpopularity for closure of rail services away from the Minister and central government on to the local authorities; but the difficulties in persuading county councils to accept the burden, together with the administrative problems that would arise because many of the services involved crossed county boundaries, meant that no provision for such changes was made in the 1978 Transport Act which followed the 1977 White Paper.

Despite the results of many cost-benefit studies and the various attempts to introduce bus replacement services for the most unprofitable lines, Figure 1 shows that very few routes were closed in the 1970s after the post-Beeching backlog had been dealt with. And, like its Labour predecessor, the Conservative Government elected in May 1979 remained sensitive to fears of rail closures. Reports in November 1979 that discussions had been held between British Rail and Department of Transport officials on proposals to withdraw 41 services from 900 miles of route led to swift denials from the then Transport Secretary, Norman Fowler, that any closures were in fact planned. When Fowler was succeeded by David Howell in September 1981, the new Secretary was quick to note that he did not wish to see any substantial cuts in route mileage. But in the same month, because

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13 The proposals would have involved withdrawal of passenger services from up to 2,500 miles of route (Keen, 1978).
of increasing financial problems and the unclear objectives set by the 1974 Rail-ways Act, British Rail requested that an independent working party be set up to investigate railway objectives and finances. The Government agreed, and in May 1982 appointed a Committee under the Chairmanship of Sir David Serpell.

THE SERPELL NETWORK STUDIES

The Serpell Committee's report was published in January 1983 (Department of Transport 1983). Although the precise meaning of the Committee's terms of reference proved to be a source of considerable confusion, the Committee commissioned a series of option studies of alternative network sizes from their consultants, R. Travers Morgan. These options investigated the financial (but not the cost-benefit) effects of reducing route mileage from a base level of 10,066 miles to 9,987 miles (option C1), 8,305 miles (C2), 6,117 miles (C3), 2,222 miles (B), and 1,630 miles (A). The consultants proceeded by building up the costs of these alternative networks from data on the resources used by each profit centre, from infrastructure levels on different links of the network, and from unit cost values which they assumed for different types of operations and resources. Passenger revenue was allocated to individual profit centres and thence to links, but freight revenue had to be allocated in an unsatisfactory way directly to links.

Results of the network studies were based on forecasts of levels of traffic and of real costs for 1992, derived from the 1982 Rail Plan and valued at 1982 price levels. The financial effects of reductions in network size were estimated by deleting the profit centres and links with the worst revenue/cost ratios. For the purpose of the present paper it is the results of the C networks that are of most interest. Just over 100 services would be closed in the move from network R1 to C1. These services had a calculated deficit per passenger mile of 22.5 pence, and revenue of 5.1 pence, so their cost was over five times as great as revenue. The passenger deficit, excluding interest, would be reduced by £180 million from the £987 million of R1, with a loss of 4.4% of R1's passenger mileage. The further

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14 A more detailed survey of the report is to be found in Dodgson (1983b). See also Holland et al. (1983).


16 This particular mileage is misleading because it conceals withdrawal of passenger services from a number of routes. The low reduction in total mileage arises simply because, in considering C1, the option was constrained so as not to lose freight traffic, and so routes conveying freight were retained in this run of the computer model. As footnote 17 notes, some of the freight on these routes would be unprofitable, and if it were withdrawn the route mileage of option C1 would then be lower.

17 Since, by assumption, no freight traffic could be lost from C1, some extra infrastructure and administration costs, amounting to £16 million, would be transferred to the freight business when the passenger services were withdrawn. However, in practice this would render some of the freight on the routes closed to passengers unprofitable, and this freight should then also be withdrawn, with subsequent savings in infrastructure costs.

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reduction from C1 to C2 would cut a further £117 million from the passenger
deficit and a further 4.4% from passenger miles. The services that would then
have been withdrawn had an average deficit of 14.6 pence per passenger mile.
Further cuts from C2 to C3 would eliminate services with an average deficit of
11.5 pence per passenger mile, that is, with costs still over three times as great as
revenue. The overall reduction from R1 to C3 would reduce total passenger traffic
by 15%, but would cut the overall railway deficit by 45% from £982 million to
£534 million, a potential saving of £448 million. Of course, these calculations are
purely financial, but the levels of deficit at each of the three stages of service
withdrawal are well above the levels calculated in earlier cost-benefit studies of
social benefits of rail services not captured in railway revenue.

One problem in the network studies was the treatment of contributory re-
venue. In the absence of recent experience and data on contributory revenue losses
from closures, British Rail investigated possible losses in four areas of the country
by extending their passenger demand model.18 The model forecasts traffic flows
as a function of perceived time of trip (including allowances for waiting times); it
was extended to incorporate interchange penalties and time incurred by using
slower and less comfortable modes for part of the journey. The model was then
used to analyse traffic flows from a countrywide matrix of rail trips. In this way
a prediction could be made of the percentage of trips that would no longer be
made by rail if rail were unavailable for part of the journey; in the absence of
data to calibrate such a model, this prediction is obviously based on assumed
rather than estimated values of interchange penalties and time on non-rail modes.
The consultants then used the results of this exercise to derive their own rules,
one of which was that losses of contributory revenue should be set equal to a
fixed percentage of the direct revenue that would be lost if the whole of a profit
centre was closed. On the basis of earlier evidence of contributory revenue losses
noted above, this percentage is likely to be too low for the smaller branch lines
feeding into the main system and probably too high for the larger profit centres
that cover groups of main line services. This means that the calculations on the
smallest network reductions are likely to understate losses of contributory
revenue, though certainly not to an extent that would alter their broad conclu-
sions; the move from network R1 to C1 was estimated to save £221 million in
costs but to lose only £41 million in revenue, so that even a 25% underestimation
of the overall loss of revenue would only result in a 6% overestimation of the
financial saving.

CONCLUSION

The failure of governments to implement rail closure policies in Britain over the
last ten years may be traced to a number of factors. Despite the pioneering work
of Joy (1964, 1971), there has been painfully slow progress in the refinement of
railway costing techniques to allocate track and signalling costs to different

18 See Shilton (1982) for an outline of the basic demand model.
services in a way that will better demonstrate the costs that can be avoided when
particular traffics are withdrawn. Secondly, the question of contributory revenue
has muddled the argument, as it was alleged to have done in the 1950s (Pryke,
1971, pp. 238–240), because of the lack of sufficient empirical data. Thus, as an
extreme example, in their response to the Government’s 1976 Consultation
Document, British Rail argued that “very many local services which in them-
selves lose money also provide valuable contributory revenue to the main trunk
network which is largely viable. Closure of the unremunerative rail services,
therefore, tends to lead to loss of the contributory revenue, thus weakening
the trunk network. The net effect is that there are only a limited number of
cases when closure can lead to an overall improvement in the Board’s finances”
(British Railways Board, 1976, p. 43). But, as our discussion of the Serpell
network studies showed, the likely size of the losses of contributory revenue is
in fact small in relation to the deficit savings to be gained.

The most significant explanation of the failure to withdraw services has been
the political opposition of special interest groups. The groups (which primarily
consist of users of the services at risk, rail unions and railway enthusiasts) natur-
ally oppose closure because of the losses they will suffer, whereas the potential
gainers from savings that will result in government expenditure are widely dis-
dersed throughout the population. Hence no one has a strong incentive to support
closures — an example, as Hilton (1980, p. 78) notes with regard to United States
government subsidies for Amtrak, of “the oft-noted use of governmental pro-
cesses to administer a benefit to a small group that is large enough to motivate
them to fight for it, but at a cost so small per person to the electorate as a whole
that there is negligible incentive for anyone to fight against it”.

In conclusion, there is now substantial evidence from cost-benefit studies of
the low value for money from the more lightly-used services, while British Rail
themselves appear in some cases to be in favour of substituting buses. It would be
very useful to supplement the Serpell financial studies with cost-benefit ones; but
the financial studies show that for many rail services the discrepancy between
avoidable costs and the revenue which users are prepared to pay to travel on them
is now so great that there is little likelihood that user and external benefits would
outweigh the financial savings from their closure.

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19 Value for money would appear even lower if a shadow price were used to reflect the oppor-
tunity costs or efficiency losses from raising funds to finance government expenditure, as has
been suggested by Dodgson (1983a) in the case of the analysis of subsidisation of urban bus
services.

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