# THE EFFECT OF THE BUS GRANT ON URBAN TRANSPORT

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Traditionally in Britain bus crews comprise two men, driver and conductor, the conductor handling fare collection, supervision and assistance to passengers. Staff shortages and the desire to reduce labour costs have given rise to the new arrangement whereby one man is responsible for both functions.

The Department of the Environment makes a grant of 50% towards the cost of approved vehicles. Rear-engined double-deckers are eligible for grant, but conventional front-engined double-deckers are not. The object was to encourage one-man operation, and by standardising vehicles to reduce production costs. It has, however, been argued that the grant makes little difference to the relative merits of front and rear engined double-deckers, and has not seriously affected bus design, as the trend towards rear-engined double-deckers was well advanced before it was introduced.

This belief casts doubt on the success of the grant scheme in achieving its objectives. Yet, by using the published sources of relative operating costs as used by Rhys [1], it can be shown that the scheme has a considerable impact not only on bus design but on operating practice. It should be a subject of debate whether the impact is a beneficial one, or whether the aid to the bus industry which the scheme represents might not be better provided in another form.

Although front-engined double-deck vehicles have been successfully used for one-man operation, it is not an ideal layout. Experiments are taking place with new designs; but normally, when a front-engined vehicle is used for one-man operation, the driver has no access to the passenger saloon, the cab layout is cramped, the driver has to turn right round in his seat to collect the fares, and the noise from the front engine makes communication difficult. For these reasons, when the use of double deckers for one-man operation was legalised in 1966, new vehicles intended for the purpose were of rear engine design, with an entrance forward of the front wheels opposite the driver. There was thus an immediate increase in the number of rear-engined buses, as was demonstrated by Rhys in his Table 4. Rhys went further and suggested that this trend was likely to continue and that before long we should be in the situation that prevails today—that front-engined double-deckers would no longer be produced for the home market. It is equally possible to argue that it was not at first the intention of operators to convert all their double-deck services to one-man operation, and in all probability double-deck vehicles designed for one-man operation would have co-existed with vehicles designed for

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two-man operation, which would have remained front-engined until such time as the newer rear-engined designs proved comparable in terms of cost and reliability. It can be shown that the bus grant has changed this situation by increasing the apparent savings to be gained from operating one-man rear engined double-deckers instead of front-engined crew-operated double-deckers. To this end, a cost comparison has been prepared. The methodology requires some explanation.

The comparison considers the total annual cost of operating one double-deck bus on urban service, assuming that the annual mileage to be expected from a crew-operated front-engined bus is 35,000. The comparison takes into account the reduced productivity of rear-engined vehicles, and the further reduction in productivity from one-man operation. On rural services, conversions to one-man operation have often been possible without extending journey times. On the busiest urban routes, however, booked journey times have had to be increased by up to about 10 per cent. As the increase necessary will depend on local circumstances, a figure of 5 per cent has been used in the comparison.

Savings are often attributed to one-man operation when in reality they accrue from other sources. For example, we have assumed that a 5 per cent slower service requires a 5 per cent increase in vehicle numbers. In practice, frequency may be

## THE COST COMPARISON

| | *Front Engine* (*No Bus Grant available*) | | *Rear Engine* | | | |
|---|---|---|---|---|---|---|
| | | | *Without Bus Grant* | | *With Bus Grant* | |
| | *One-Man Operated* | *Crew Operated* | *One-Man Operated* | *Crew Operated* | *One-Man Operated* | *Crew Operated* |
| A. *Standing Cost* (£) | | | | | | |
| 1. Depreciation[1] | 630 | 600 | 945 | 900 | 473 | 450 |
| 2. Interest[2] | 378 | 360 | 473 | 450 | 236 | 225 |
| 3. Tax and insurance | 315 | 300 | 347 | 330 | 347 | 330 |
| 4. Spare bus provision[3] | 119 | 113 | 353 | 336 | 211 | 201 |
| | 1442 | 1373 | 2118 | 2016 | 1267 | 1206 |

[1]Straight-line depreciation based on 12-year life for front-engined vehicle costing £8,000; 10-year life for rear-engined vehicle costing £10,000 [1]; 10% residual value assumed in both cases. Costs for one-man operated vehicles have been increased by 5% to reflect the larger number of vehicles needed to manitain frequency with journey times extended.

[2]Based on capital cost to operator, charged at rate of 9% p.a., assuming that interest earned on depreciation sinking fund will, over vehicle life, offset 50% of capital charges.

[3]A float of 9% is required for front-engined vehicles, compared with at least 20% for rear-engined vehicles [1].

| | *Front Engine* (*No Bus Grant available*) | | *Rear Engine* | | | |
|---|---|---|---|---|---|---|
| | | | *Without Bus Grant* | | *With Bus Grant* | |
| | *One-Man* | *Crew* | *One-Man* | *Crew* | *One-Man* | *Crew* |
| B. *Wages* (£)[4] | | | | | | |
| 1. Driver | 4620 | 3600 | 4620 | 3600 | 4620 | 3600 |
| 2. Conductor | — | 3400 | — | 3400 | — | 3400 |
| | 4620 | 7000 | 4620 | 7000 | 4620 | 7000 |
| C. *Running costs per mile* (p) | | | | | | |
| 1. Fuel, oil, tyres[5] | 1·66 | 1·63 | 1·79 | 1·75 | 1·79 | 1·75 |
| 2. Maintenance | 1·74 | 1·74 | 3·00 | 3·00 | 3·00 | 3·00 |
| | 3·40 | 3·37 | 4·79 | 4·75 | 4·79 | 4·75 |
| D. *Average annual mileage*[6] | 33,250 | 35,000 | 30,200 | 31,800 | 30,200 | 31,800 |
| E. *Average annual running cost* (C × D) (£) | 1131 | 1180 | 1447 | 1511 | 1447 | 1511 |
| F. *Total annual operating Cost* (A + B + E) (£) | 7193 | 9553 | 8185 | 10,527 | 7334 | 9717 |
| G. *Cost per Vehicle mile* (F ÷ D) (p) | 21·63 | 27·29 | 27·10 | 33·10 | 24·28 | 30·56 |
| H. *Number of seats*[7] | 72 | 72 | 76 | 76 | 76 | 76 |
| I. *Cost per seat mile* (G ÷ H) (p) | 0·30 | 0·38 | 0·36 | 0·44 | 0·32 | 0·40 |
| J. *Cost per seat mile as % of cost for front-engined crew operated vehicle* | 78·9 | 100 | 94·7 | 115·8 | 84·2 | 105·3 |

[4]Enhancement of pay of 20% for drivers of one-man double deck vehicles has been assumed. The figures, which are intended to reflect a reasonable average, are based on double shift working. A further 5% has been added to O.M.O. drivers' costs because of reduced vehicle productivity.

[5]An increase of 2% has been assumed for one-man operated vehicles to reflect increased idling time at bus stops.

[6]The norm for front-engined crew-operated vehicles in urban service has been taken to be 35,000. The mileage of rear-engined vehicles has been adjusted downwards to reflect the larger fleet required for a given service. Mileage of one-man vehicles has been reduced by 5% to reflect extended journey times.

[7]Typical figures for vehicles of approximately 30 feet in length. Rhys [1] states that rear-engined double-deckers have a potential load factor some 10 to 14 per cent higher than front-engined vehicles, but this does not seem to be borne out in practice. For example, London Transport's front-engined 30-foot-long Routemasters have the same seating capacity (72) as their rear-engined Atlanteans, which are 5 inches longer. In general, an increase of more than about four in the seating capacity of rear-engined vehicles, compared with front-engined, will result from increased vehicle length or reduced seat pitch, and not from the engine position. Even this may not be realised if dual doorway vehicles are used for one-man operation.

reduced or layovers shortened, so that a conversion to one-man operation does not require an increase in the fleet. Savings thus effected should, however, be properly attributed to service reduction or increased vehicle productivity, as appropriate, and not added to the savings achieved from one-man operation.

One further point follows from this. If journey times are extended by 5%, then 5% more vehicles are required to maintain the same *frequency* of service, but from the passenger's point of view his journey will still take 5% longer. To maintain the same *level* of service, in terms of overall journey time, would require a 5% *increase* in frequency. This cost has not been taken into account in the table. The effect of its inclusion would be to reduce the savings from one-man operation by a further 2.7%.

Various estimates of the savings to be achieved from one-man operation have been made in the past, ranging from 25 per cent [2] through 15–20 per cent [3] to around 14 per cent [4] and [5].

The comparison made here suggests that savings of about 21% can be made if the decision to operate with one man does not lead to a decision to purchase the more expensive and less reliable rear-engined buses in place of conventional types. If, however, rear-engined vehicles are purchased to operate services with one man which would otherwise have been operated by front-engined crew-operated vehicles, the real cost saving is only 5.3%, assuming that there is no increase in service frequency. If the bus grant is paid on rear-engined vehicles, the savings to the operator are almost trebled to 15·8%. We know that operators prefer to use rear-engined vehicles for one-man operation, and that the bus grant brings the cost of rear-engined vehicles much closer to the cost of front-engined (which are in any case no longer available); and, once rear-engined vehicles have been purchased, 21% of their costs can be saved by one-man operation. Therefore the bus grant must inevitably have a powerful influence in extending the practice of one-man double-deck operation. As the grant is paid by the taxpayer, the question should be asked whether a subsidised extension of one-man operation of double-deck services is really in the national interest.

## THE CONSUMER'S VIEW[1]

Many double-deck bus services were converted to one-man operation before the introduction of the bus grant; these are not the main subject of this paper. There are many services which are suitable for one-man double-deck operation, for example those which are not heavily loaded in off-peak periods, and on which the peak passengers travel sufficiently regularly to be well informed about the services, fares and procedure, and also services on which stops are not very frequent. Before the bus grant, however, it was not envisaged that all double-deck bus services would become one-man-operated. The Prices and Incomes Board, reporting in 1967 [7], did not expect manual driver operation to be practical and profitable with peak hourly passenger loads above about 120, depending on conditions. They went on to say that "in perhaps one quarter of the small urban undertakings we think that the

[1]Many of the points made in this article were discussed by Randall [6].

scope for purely manual driver operation may be considerable". Such has been the effect of the grant that only five years later eventual one-man operation of all bus services has become a distinct possibility. It is therefore the busy urban and inter-urban services with which we are concerned here.

From the passenger's point of view one-man operation on busy routes has many disadvantages. Journey times will be extended by five per cent or more, unless frequency is increased, and immediately after conversion there will be a period during which late running, with further increases in journey time, will be inevitable while passengers become accustomed to the new procedure. Boarding the bus will become a frustrating experience for the passenger in a hurry, and can be an unpleasant exercise if the weather is bad. If a bus shelter is provided at busy stops, the queue can move quickly from the shelter to the vehicle if it is crew-operated, but has to re-form at the unsheltered entrance of a one-man-operated bus. In addition, the frequent practice of keeping the vehicle doors closed at terminals (often points of heavy loading) while the driver takes his break makes it necessary for passengers to stand and wait, possibly without shelter, until the bus is due to leave.

When the passenger does board the vehicle, he will find that if he is elderly or disabled, or carrying children, luggage, shopping, or a push chair, the driver is not able to assist him as a conductor on the platform would be able to do. If he is uncertain of his route or his fare, he will have to incur the displeasure of the other passengers, and perhaps of the driver, while he asks for information. He will find his journey takes longer, and he will be particularly irritated by the increased time spent at bus stops. This waiting time is more disagreeable than time spent on the move. His journey will also be less enjoyable because of the way the vehicle is driven. It is normal practice in Britain to allow the same time for a given journey, regardless of the time of day. This has the important advantage that passengers become accustomed to departures at standard times. With one-man operation, however, loading time becomes a far greater proportion of the total journey time, which therefore becomes very sensitive to the number of passengers travelling. The result is that in busy periods speeding becomes much more common as drivers attempt to make up for lost time. (The absence of a conductor, who might be expected to complain to his driver if he is thrown about, does not help here.) Conversely, in times of light loading drivers have to devise ways of losing time. This may lead to very slow running, or to unpunctual running if, rather than drive slowly, drivers arrive at the terminal before time or deliberately leave late. Supervision of time-keeping may be more difficult, as time clocks are not suitable in the absence of a conductor who can readily descend to operate them.

The passenger therefore suffers a marked deterioration of service as a result of one-man operation on busy routes. It seems to be commonly held, both within the bus industry and outside it, that the passenger is above all interested in paying the lowest possible fares, but investigation does not support this view. A study in Belfast [8] showed that, among car owners who had reasonable access to bus services, over half gave speed as the main determinant of their choice and only one in thirteen gave cost. In the same study, twice as many bus passengers, when asked for their opinions, criticised the service as the level of fares. Not surprisingly, the conclusion of the study was that greater emphasis should be placed on providing a good service than on keeping fares down.

## THE OPERATOR'S VIEW

The operator will be concerned at the deterioration of his services described above, and will probably incur additional costs in supervision and in handling complaints, thus further reducing the cost advantage of one-man operation while having only a marginal remedial impact. Other effects will be apparent, such as small increases in mileage to avoid the difficulty of reversing vehicles without the assistance of a conductor, and the necessity for drivers to complete their cash waybills during layover time, which cannot therefore be used as rest time. It will be much more difficult for passengers to avoid payment, but it will be almost impossible to prevent overriding, which will increase as passengers learn by experience of their chances of escaping detection. Again, increased supervision will be required to check this practice, but its effect will probably be only marginal, especially if dual doorway vehicles enable passengers to alight immediately if they see an inspector boarding the bus at the front. But the most serious effect may only become apparent in the long term, as passengers dissatisfied with the service begin to look for alternatives. The bus grant, by approximately trebling the savings to be made from one-man operation with rear-engined vehicles compared with crew-operated front-engined vehicles, enables the operator to make a net gain from conversion even if he suffers a considerable long-term decline in business. Without the bus grant, in present conditions, a 5 per cent loss in revenue would put the economics of one-man operation in doubt. With the grant this figure becomes 15% or, if front-engined vehicles are no longer on the market, 21%.

## EXTERNAL EFFECTS

A decline in bus traffic—which, as has been shown, is less unacceptable to the bus operator because of the present bus grant scheme—will lead to an increase in private transport in cities at a time when other policies are being devised to produce precisely the opposite effect. Traffic congestion will be further increased in busy streets by the greater amount of time spent by buses at stops. It has recently been reported that one-man buses in urban service spend on average between 3 and 13 seconds longer at each stop than two-man buses; and preliminary results of a cost-benefit study suggest that, taking into account the reduced productivity of buses, the extended passenger journey times, and the traffic congestion caused, an increase of just one second in the average time spent by buses at stops would cost the community about £0·5 million a year in Central London alone [9].

Since payment of the grant is not dependent on local conditions or local availability of labour, another important factor is the loss of employment opportunity in areas of high and continuing unemployment. This might be acceptable if justified by real benefits from better utilisation of resources; but if it is assumed that the viability of these operations depends merely on financial arrangements this implies unnecessary increases in regional unemployment and social security payments, with attendant debilitating effects on local morale.

It is also of note that in areas of labour shortage one-man operation could, apparently paradoxically, diminish rather than improve the availability of labour.

Members of traditional bus crews are not freely interchangeable; the conductor is not necessarily trained or licensed to drive the vehicle. The net increase in bus journey times attendant upon one-man operation means that, if the level of service is to be maintained at the previous standard, there will be a significant increase in demand for drivers. Further, the changed duties may be unacceptable to some existing drivers, and they may choose other employment outside the industry. At the same time a heavy increase in demand for road haulage drivers is expected with the introduction of E.E.C. legislation to reduce working hours. So, far from curing labour shortages, one-man operation may well aggravate the problem.

## CONCLUSION

The bus grant scheme, as it operates at present, discriminates against front-engined double-deck buses. Once an operator has purchased a rear-engined double-decker it is to his financial advantage to operate it with one man, but the real saving in cost compared with a front-engined crew-operated vehicle may be only 5%, or less. The bus grant distorts the economic case by providing a financial advantage to the operator of between three and four times this amount. Bus companies should, of course, be free to convert services to one-man operation if the true economic case warrants this, but the bus grant scheme should be revised so that it does not artificially lead to slower and less convenient services and increased traffic congestion, or distort employment opportunities. Instead the bus grant scheme, which is due to continue until 1980, should apply to *all* buses on condition that they reach a minimum level of passenger comfort, which might with advantage be higher than today's standard. But what the industry really needs may be aid in other forms, such as the prevention of parking in busy streets, the prohibition of the private car in the busiest shopping areas, bus lanes, and the rapid development of road pricing. Faster and more direct bus services in urban areas will result in genuine cost savings to the operator and may lead to a rapid recovery of passenger traffic, bringing benefits both to bus passengers and to the remaining road users.

## REFERENCES

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