Cost benefit analysis of urban minibus operations

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Abstract. Earlier work by the Transport Studies Group of the Polytechnic of Central London on minibus development in Britain for the Transport and Road Research Laboratory provided a financial analysis of intensive urban minibus operation. This is taken as the basis for the application of cost-benefit analysis. Unit operating cost savings and passenger benefits are taken into account, using typical demand elasticities derived from earlier work. Particular attention is paid to the problem of evaluating passenger benefits for which waiting time at the roadside is not necessarily an adequate proxy. A direct survey of passenger waiting times indicates that these do not necessarily decrease when a higher-frequency minibus service replaces a conventional bus service but the improved convenience produces an increase in ridership which may be assessed in terms of a demand curve shift to estimate benefits obtained.

Introduction

The rapid growth of intensive urban minibus operation in Britain from 1984 has been the subject of a series of studies by the Transport Studies Group of PCL for the Transport and Road Research Laboratory (Watts et al. 1990). These have traced the overall growth up to the end of 1988 (Turner et al. 1990), and examined changes in ridership in four case study areas (Turner et al. 1990). A number of studies of reliability have also been reviewed (Turner & White 1990a). A financial analysis has examined the cost structures from the operator's point of view, and identified the necessary demand elasticities for break-even operation to be attained where an increased frequency is offered (Turner & White 1990b).

The growth of minibus operations was initially most marked in smaller towns and cities served by subsidiaries of the then National Bus Company (NBC), all subsequently privatised. These areas were characterised by relatively high fares, poor frequencies and moderate load factors on full-sized vehicles. Substitution of higher-frequency minibuses provided a similar total capacity in terms of passenger spaces per hour, but a more attractive service.
The resultant frequency gains usually generated sufficient extra revenue (at the same fares) to cover the increased total costs. Effects were most marked where relatively low frequency full-sized services were operated (for example, every half-hour).

In later conversions, some higher frequency services were also converted, sometimes in response to competition (or the threat thereof), rather than to stimulate the total market for bus use. Here, although passenger time savings would be experienced, the financial performance from the operator's point of view was often less satisfactory, since relatively little extra traffic was stimulated.

The size of minibuses has grown from 16–20 seats in earlier conversions to about 25–30 seats in more recent deliveries. These slightly larger vehicles retain many of the cost advantages of minibus operation, but offer greater comfort to users. In addition, they may be employed to substitute on a ‘one for one’ basis for larger vehicles where poor loadings are found, giving substantial cost savings.

This paper extends the work undertaken for TRRL by providing a cost-benefit analysis, rather than a purely financial one. The principal difference comprises the estimation of passenger benefits. They are not reflected in operator revenue (except insofar as total revenue rises with increased ridership), since very few examples exist of differential pricing between minibuses and conventional services.

Such passenger benefits primarily comprise:
- Reduced waiting time at the stop: a function of headway and reliability.
- Reduced in-vehicle travelling time.
- Reduced walking times, especially where minibus operation permits better penetration of housing estates and town centres, and ‘hail a ride’ operation is used.

However, where initial frequencies are low, reduction in roadside waiting time may not reflect the true passenger benefits, since an improvement in convenience, rather than roadside waiting time per se, is given. It is vital not to exclude such benefits, since ridership response indicates that such frequency improvements (for example, from half-hourly to every 10 min) may be much more influential than improving an already frequent service.

For this purpose, it is necessary to examine directly the actual passenger waiting times (as distinct from those inferred from vehicle headway observations).

We first outline the assumptions made in a series of notional case studies, in which financial data from our earlier studies forms the starting point. Three such cases are provided, in which waiting time is assumed to equal half the headway, and is valued accordingly. An alternative approach based