CAR SHARING IN THE UNITED KINGDOM

A Policy Appraisal

By Peter Bonsall*

1. INTRODUCTION

Car sharing\(^1\) is a well developed mode of transport in the United Kingdom. Analysis (by Vincent and Wood, 1979) of National Travel Survey data has shown that 12\% of total trip miles are travelled by passengers in non-household cars, while only 10\% of total trip miles are travelled on local stage buses. More detailed analysis (Wood, 1979; Balcombe, 1979) reveals that car sharing is particularly common where public transport is poor, and for social and pleasure journeys.

The current debate, however, is not about the importance of car sharing but about the desirability and effectiveness of efforts to increase it. Historically, interest in car sharing has been greatest at times of fuel shortage or crisis—World War Two, Suez and the 1973/74 energy crisis being cases in point. Assistance to would-be car sharers has generally been seen as an emergency measure, not as a permanent element of transport policy. However, the current interest in car sharing, which stems from 1973/74, has outlasted that stimulus.

When in 1973/74 concern arose to reduce energy consumption, theoretical calculations of the effect of increased car sharing were carried out, more or less independently, in a number of countries (Vincent and Wood, 1979; Pratch, 1974; Tomlinson and Kellet, 1978a). They showed that potentially substantial savings could be made. The increased vehicle occupancies associated with car sharing were equated with a reduction in vehicle miles travelled, which implied considerable reductions in energy consumption, congestion, pollution, and requirements for parking space. Calculations in the United States (Pratch, 1974) suggested that a 22\% reduction in work trip mileage could be expected from car sharing. Because of the anticipated energy implications of such forecasts, the U.S. Departments of Transportation and Energy instituted a substantial programme of car sharing schemes. Most of them benefited from generous government aid and included the provision of a matching service for would-be car sharers and a parallel publicity campaign. The

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\(^1\)"Car sharing", "car pooling" and "van pooling" are relatively new terms but they refer to well established concepts. All three refer to high occupancy of private vehicles. Car sharing is a global term which encompasses lift giving and car pooling (car pooling implies that drivers take it in turns to drive one another). Van pooling is a more specialised form of lift giving where the driver uses a minibus (which may be owned, leased or borrowed) rather than an ordinary car.

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more ambitious schemes also included special incentives for car sharers, such as reserved road space or parking places.

In Britain there was a somewhat cautious reaction to the American initiatives in promoting car sharing. It could be argued that the availability of North Sea oil, and the relatively highly developed public transport system, meant that there was no necessity to seek out the supposed benefits of car sharing as avidly as in the U.S. Nonetheless, interest was sufficient to stimulate a number of research projects, and some legislative changes.

2. CAR SHARING LEGISLATION IN THE UNITED KINGDOM

Car sharing is affected by legislation through the regulations which provide for the licensing of vehicles and drivers. The concern in the 1930s to protect public transport operators and taxi drivers resulted in legislation which made it illegal to accept any reward for giving lifts in a private car. Technically this could have been taken to preclude car pooling (where a lift received one week might be viewed as a reward for a lift given the previous week), as well as the acceptance of a box of chocolates and a smile in lieu of petrol money.

Recent legislation has been concerned to remove these restrictions on car sharing. The 1978 Transport Act amended the licensing legislation to allow a private car driver to receive payment from passengers so long as the payment did not entail a "profit" (undefined). After this the insurance companies modified their exclusion of the use of private cars for "hire and reward". The 1978 Act specifically forbade advertisement for car sharing partners, except at social clubs and places of work or worship. The 1980 Transport Bill\(^2\) further relaxes the legislative restrictions on car sharing. The number of passengers who can be carried in a car sharing scheme is increased from 7 to 8. More significant is the removal of the restrictions on advertising by would-be car sharers.

The sharing elements of the 1978 Act became law with a distinct absence of publicity. It remains to be seen what publicity will accompany the passage of the 1980 Bill.

3. RESEARCH AND EXPERIMENTS

The interest in car sharing spawned by the 1973/74 oil crisis and the 1978 Act resulted in a number of research projects and experimental car sharing schemes: investigation of current levels of car sharing, both nationally and at specific sites (Vincent and Wood, 1979; Wood, 1979); studies of the American car sharing programme (Bonsall, 1979); theoretical estimates of the potential impacts of increased car sharing (Vincent and Wood, 1979; Tomlinson and Kellet 1978a); studies of public acceptance of the concept of car sharing (Voorhees, 1974; Tomlinson and Kellett, 1978b; Bonsall, 1980a); modelling of the likely impacts of organised car sharing schemes (Bonsall, 1980b and 1980c) and finally the establishment and monitoring of experimental schemes (Bonsall, Spencer and Tang, 1980).

The investigation of current levels of car sharing in Britain revealed that it was a

\(^2\) A Bill is so named before it receives the Royal assent, when it becomes an Act.
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more important mode of travel than had perhaps been realised. The theoretical estimates of the impacts of increased car sharing, though not as optimistic as the early U.S. figures, suggested considerable savings in energy consumption and congestion. A 10% increase in mean car occupancies was postulated as the basis for calculation, and this, it was shown, could imply a 9% reduction in use of cars for work trips. More recently it has been possible to supplement these theoretical calculations with the results of further modelling work and of the performance of actual schemes both here and in the United States.

The results of work reported in Bonsall (1980c) caused somewhat of a stir: they implied that the energy-saving impacts of organised car sharing schemes in Britain would be measured in fractions of 1%, rather than approximating to the 5 or 10% that had been suggested. The model (outlined in the appendix to this paper) predicted that, from a given target population of work trippers, about 8% of the people would apply to join an organised scheme and about 2% would actually become car sharers as a result of the scheme. The model indicated that, since almost half of those who became car sharers would previously have been users of public transport, the main impact of the scheme upon the transport system would be abstraction of patronage from public transport. The reduction in private vehicle mileage, and hence the reduction in energy consumption, congestion, pollution and the rest, paled into insignificance.

These model predictions have been borne out by the performance of the car sharing experiments which were set up in the United Kingdom after the 1978 Act. Table 1 contains such results as are known to the author. (For purposes of comparison the table also includes the model prediction and the result of the “average” United States scheme.)

4. RESULTS OF EXPERIMENTS

The most significant results from this table are:

(a) The percentage of the target population who become car sharers as a result of the matching system rarely exceeds 2%. For those U.K. schemes which have no special incentives (such as preferential parking for car sharers) this figure has not exceeded 1%.

(b) The application rates (percentage of target population who express an interest in car sharing) average about 5% for the U.K. schemes. There is however a wide variation around this average (see (m) below).

(c) The lowest application rates were associated with the YORKSHARE 1 scheme and the Heathrow scheme. This is probably because the YORKSHARE 1 scheme was based on shop-floor workers and the Heathrow scheme was restricted to car drivers only (see (i) below).

(d) The application rates to self-service schemes (in which a map is on display in which interested parties are invited to stick a labelled pin at a position corresponding to their address and to fill in a form giving details of their journey requirements) were lower than average (see (m) below).
The Performance of Organised Car Sharing Schemes

<table>
<thead>
<tr>
<th>No.</th>
<th>Scheme</th>
<th>Date</th>
<th>Target Pop.</th>
<th>Application rate*</th>
<th>Match rate†</th>
<th>Participation rate‡</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>L.B. Croydon employees</td>
<td>1973</td>
<td>2,000</td>
<td>7.5</td>
<td>5.0</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>Oxfordshire CC employees</td>
<td>1975</td>
<td>360</td>
<td>20.6</td>
<td>?</td>
<td>?§</td>
</tr>
<tr>
<td>3</td>
<td>Oxfordshire CC</td>
<td>1976</td>
<td>2,000</td>
<td>10.2</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>4</td>
<td>Strathclyde R³ Council offices</td>
<td>1978</td>
<td>900</td>
<td>1.7c</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>5</td>
<td>YORKSHARE 1 (industrial)</td>
<td>1979</td>
<td>890</td>
<td>0.8</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>6</td>
<td>YORKSHARE 2 (Boston Spa)</td>
<td>1979</td>
<td>750</td>
<td>4.5</td>
<td>3.2</td>
<td>0.9</td>
</tr>
<tr>
<td>7</td>
<td>WMCC⁴ employees</td>
<td>1979</td>
<td>1,024</td>
<td>7.8–29.7d</td>
<td>?</td>
<td>apparently 0§</td>
</tr>
<tr>
<td>8</td>
<td>L.B. Croydon employees</td>
<td>1979</td>
<td>1,500</td>
<td>2.4⁵</td>
<td>1.4</td>
<td>0.4</td>
</tr>
<tr>
<td>9</td>
<td>Gloucester CC employees</td>
<td>1979</td>
<td>1,100</td>
<td>8.7–13.6d</td>
<td>5.4</td>
<td>?</td>
</tr>
<tr>
<td>10</td>
<td>YORKSHARE 3 (Leeds CC)</td>
<td>1980</td>
<td>2,300</td>
<td>6.9e</td>
<td>6.6</td>
<td>2.0</td>
</tr>
<tr>
<td>11</td>
<td>Heathrow⁶ employees</td>
<td>1980</td>
<td>16,000</td>
<td>1.3f</td>
<td>0.3</td>
<td>?</td>
</tr>
<tr>
<td>12</td>
<td>Model 1* (Leeds region)</td>
<td>1978</td>
<td>21,236</td>
<td>7.9</td>
<td>7.5</td>
<td>1.5</td>
</tr>
<tr>
<td>13</td>
<td>Model 2* (park space incentive)</td>
<td>1978</td>
<td>21,236</td>
<td>10.2</td>
<td>9.3</td>
<td>2.1</td>
</tr>
<tr>
<td>14</td>
<td>Model 3 (central Leeds)</td>
<td>1978</td>
<td>4,985</td>
<td>7.8</td>
<td>6.1</td>
<td>0.8</td>
</tr>
<tr>
<td>15</td>
<td>“Average” U.S.A. scheme</td>
<td>1976</td>
<td>129,000</td>
<td>15.6</td>
<td>?</td>
<td>2.1</td>
</tr>
</tbody>
</table>

* Application rate = applications received as % of target population.
† Match rate = applicants matched as % of target population.
‡ Participation rate = % of target population who start car sharing as a result of the scheme.
§ These figures are derived, in the main, from unpublished sources and via private communication.

Sources
1 and 8: private communication from K. Phair (London Borough of Croydon).
4: private communication from D. Robertson (Strathclyde Regional Council).
5, 6 and 10: see Bonsall, Spencer and Tang (1980).
7: paper presented by G. Parsons (West Midlands County Council) at Leeds Car Sharing Seminar, October 1979, and subsequent private communications.
9: private communication from C. Baldwin (Gloucester County Council).
11: paper presented by E. Turner (Greater London Council) at Leeds Car Sharing Seminar, October 1979, and subsequent private communications.
12, 13 and 14: see Bonsall (1980c).
(e) The model predictions have proved fairly accurate.

(f) The U.S. schemes have generally had more impact than their British counterparts. This is probably as much due to socio-cultural differences and the lower level of public transport usage in the U.S. as it is to the "harder-sell" used in organising the schemes. Note however that, although the U.S. application rate is substantially higher than the British one, the participation rate is only barely so (see (m) below).

Other, more detailed, results, not included in Table 1 but of some significance, are:

(g) The interest in car sharing is fairly evenly divided between interest in driving, in riding and in pooling. A typical breakdown is that 31% of applications are from people wishing to drive, 38% from people wishing to ride, and 31% from people wishing to pool.

(h) Public transport users are slightly less likely than car drivers to apply to a scheme, but where they comprise a substantial proportion of the target population they inevitably form a substantial proportion of the applicants.

(i) In a typical scheme, open to all comers, between one third and a half of the participants will have previously been public transport users. Where public transport users are excluded from a scheme the resultant sparsity of applicants makes matching very difficult (vide Heathrow scheme).

(j) In a typical scheme, true pooling (driving on a rota) will make up less than one third of all arrangements. The majority of the arrangements will be simple lift giving (in return for compensation), and the majority of the passengers in these will be former public transport users.

(k) The abstraction of patronage from public transport results in a reduction of about 2% in the weekly work journey passenger kilometres within the target population of a typical scheme.

(l) The net reduction in private vehicle kilometres on weekly work journeys (when expressed as a percentage of total weekly work journey vehicle kilometres among the target population) as a result of the car sharing schemes is negligible (approximately 0-3%). This is due to the small number of drivers who give up their cars to become poolers or passengers, and to the circuitous journeys which involve picking up passengers.

(m) The level of publicity and organisation given to the schemes seems quite crucial. Those schemes which have relied on self-service matching have generally foundered, presumably because people are unwilling to take so public an initiative—they prefer to wait for someone else to stick a pin in the map close to their house. On the other hand, it appears that a centralised matching system will be just as successful with reasonable publicity as with intensive publicity. The more intensively advertised scheme may achieve more applications, but many of these will be from people whose interest in car sharing is only ephemeral, and people whose interest is more serious will be frustrated if they find themselves matched with these less serious applicants.
(n) It is apparent that the "image" of the scheme is important—it must appear professional, efficient, flexible and personal.

(o) Computerised matching is rarely justified—its apparent efficiency will not outweigh its inflexibility and overheads, except for the largest schemes (say over 300 applicants). It may be used as a complement to manual matching, to ensure compatibility of journey times, smoking habits and so on, and to print the match lists. Spatial matching is best done manually, with a map and pins. Above about 1,000 applicants, however, it is difficult to use the manual method, and complete computerisation will be desirable.

(p) Car sharing is unlikely to be a viable access mode for public transport except where the line-haul element is substantial (say 50 kms)—below this distance the costs involved in transferring modes are unacceptable.

(q) Organised car sharing has little role for non-regular journeys: when organised at places of employment the enthusiastic support of management and unions is essential.

(r) Few of the car sharing arrangements resulting from the British organised car sharing schemes have resulted in more than three people travelling together. This is partly a result of the low level of applicants and hence the very low probability of finding more than three people whose journeys and personalites are all compatible. This obviously raises a problem for van pooling since, to be viable, it must attract groups of six to eight people.

5. POLICY IMPLICATIONS OF RECENT DEVELOPMENTS

The results of the experiments undertaken so far allow two significant conclusions to be drawn: first, the most significant impact of organised car sharing schemes in Britain is an abstraction of patronage from public transport; second, the impact of organised car sharing schemes upon energy consumption, road congestion or pollution is extremely limited.

These results must obviously be taken into account in any formulation of policy in respect of car sharing. Any policies which were formulated on the basis of the over-optimistic theoretical calculations of the potential impact of car sharing (as discussed in Section 1 of this paper) must be revised.

Although the provision of a matching service for car sharing does yield benefits to those who take advantage of it (as they voluntarily elect to travel by an alternative, preferred, mode), the community benefits are controversial. The minimal reductions in energy consumption, congestion and pollution will, to many, be outweighed by the abstraction of public transport patronage. There are, however, some instances where the benefits of car sharing will be easily agreed: instances where conventional public transport is unable to provide economically an acceptable level of service. In such instances, car sharing can provide a substitute for, and complement to, conventional public transport.
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Car sharing may thus be justified as a replacement for public transport in areas of sparse demand, or more directly as an aid to the management of the patronage market. In providing mobility in areas of sparse demand, car sharing may be an attractive method of servicing isolated employment sites and small communities. It may also provide an access mode for a heavily pruned public transport network. In the context of market management, it may be possible to use car sharing to suppress demand deliberately. Suppression of demand may be justified where the servicing of that demand involves a net drain on resources. In many cases, servicing the morning and evening peaks requires additional labour and resources which are not covered by the extra fares collected. Similarly there will be cases where a given route has a demand equivalent to, say, \( \frac{1}{4} \) bus loads which at present must be serviced with two buses—it may be possible to decant the \( \frac{1}{4} \) bus load into car sharing arrangements or van pools and to service the remaining demand with one, fully utilised, bus.

Having defined some of the circumstances in which encouragement of car sharing may be justified, we must now consider how successful encouragement would be and how it should be effected. Evidence and experience from the United States (Bonsall, 1979; Wagner, 1978), from the RUTEX experiments (Balcombe, 1979), from the work reported in Bonsall (1980c) and from the latest generation of car sharing schemes (Bonsall, Spencer and Tang, 1980), some of which was presented earlier in this paper, allows us to draw some very firm conclusions on this matter.

First, it is clear that the majority of travellers are satisfied with, or have a commitment to, their current modes of transport, and that an immediate dramatic increase in the level of car sharing cannot be expected to follow from the provision of a matching service and associated publicity. It is also clear that (politically feasible) incentives to car sharing do not have a miraculous impact either. Given that, except in dire emergency, we do not wish to resort to enforced car sharing, the only method of securing a large impact for a scheme is to synchronise it with an important change in the transport system—a change in job locations, home locations or modal provision. The car sharing scheme will then have a ready market of travellers who, more or less simultaneously, will be considering a change in their journeys. In such circumstances, the larger pool of applicants will allow for more successful matching and hence a higher chance of compatibility among would-be sharers. Organised car sharing and van pooling\(^3\) may then have a considerable impact.

Second, schemes will have a higher chance of success if they can be planned and organised with due regard to the lessons already learned. There is, therefore, a need for a series of guides and manuals for would-be scheme organisers to help them to assess the likely impact of car sharing or van pooling at their sites and the form that their schemes should take. Guides and manuals will, of course, carry extra weight if they can refer to indigenous case studies or demonstration projects. This has been done in the U.S.A., but in the U.K. the results of the schemes so far established are not positive enough to serve as models to be emulated. It is important, therefore, that further projects, particularly ones including a van-pooling element, be planned and executed at sites where demonstrable success can be assured.

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\(^3\) Van pooling is obviously a particularly appropriate mechanism to fill the gap left by a withdrawal of a public transport service.
CONCLUSIONS

Analysis of the development of car sharing policy in the United States shows three main trends. Firstly, a scaling down of the expected impacts of car sharing; secondly, a redirection of emphasis away from its energy-saving objectives and towards its broader role in transport systems management; and, finally, the increasing significance of van pooling.

British parallels to these trends are apparent: the theoretical estimates of car sharing scheme impacts are seen to have been over-optimistic; the relationship with public transport is seen to be central to car sharing policy; and the role of van pooling as a substitute for conventional public transport is increasingly canvassed.

Results of recent research and experiments have shown that the impact of organised car sharing schemes will, typically, be very small and that the only impact of substance is an abstraction of patronage from public transport. Where this abstraction of patronage is indiscriminate it is unlikely to be beneficial, because it will rarely allow for a comensurate reduction in provision of service. The indiscriminate encouragement of car sharing or car sharing schemes is thus unlikely to be beneficial to the transport system as a whole. It could be argued, therefore, that the de facto encouragement afforded by the relaxation of legislative restrictions in the 1978 and 1980 Transport Acts is unwise unless coupled with a positive effort to encourage car sharing at those places and times when it is beneficial.

If car sharing schemes are to succeed, the organisations which establish and run them must be convinced that success is in their own interests. There is little prospect of a commercial organisation making any profit from subscribers to a scheme (although indirect profits might be derived from sales of vehicles in a van-pooling scheme), so other agencies must be relied on. It seems that the agencies which stand to benefit most from successful car sharing schemes are public transport authorities and those concerned to enhance accessibility to sites (local authorities, industrial estate managers, employers and so on). The immediate problem is that these agencies are unlikely to perceive the benefits unless they are broadcast. It is, therefore, important that government take the initiative by establishing demonstration projects, producing advice leaflets, and engendering an interest in car sharing among potential organisers. The most important measure is undoubtedly a sustained effort to show the value of car sharing schemes in the context of demand management for public transport.

APPENDIX

Modelling the likely impact of car sharing schemes

In 1976 the Transport and Road Research Laboratory funded a research project on car sharing at the Institute for Transport Studies at Leeds University. The aim of the project was to use advanced modelling techniques to predict the likely (as opposed to potential) impact of organised car sharing schemes in the United Kingdom.

The modelling technique used in the project was microsimulation, wherein the choices and interactions of individual decision makers are uniquely represented within the model. The model has three stages. In the first stage the car sharing scheme to be
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tested is defined and the decision by each member of the target population on whether or not to apply to join the scheme is represented by calibrated logit models. In the second stage of the model the "applicants" from the first stage are sorted according to their preferred journey time, location of home and workplace, and type of interest expressed (driving, riding or pooling); by this means lists of up to ten potential travelling companions are constructed for each applicant. In the third stage of the model each applicant considers the benefits and disbenefits of car sharing with each person on his list and, by a process of mutual assessment and exchange of utilities, car sharing arrangements are formed or fail to be formed (they are formed only if the net utility to participants is positive).

The calibration of the two choice models (the decision to apply and the assessment of potential companions) was done on the basis of special surveys; members of a population (10,000 households) with known characteristics were sent a form which described a car sharing scheme and asked respondents to indicate whether they would wish to receive a list of potential travelling companions. Those who were interested were asked to give some personal details which enabled us to use personal characteristics as the determinants of choice probability in the apply/not apply logit models.

Every respondent who expressed an interest in car sharing, and who agreed to complete a further questionnaire, was then sent the description of a potential car sharing partner (with details of journey time consequences, personal details of the partner and so on) and was asked to evaluate the worth to himself of participating in an arrangement with that partner (would-be drivers were asked to indicate the minimum compensation they would accept, and would-be passengers were asked what maximum compensation they would give). Each respondent was asked to evaluate thus ten potential partners whose characteristics differed slightly. Simple arithmetic then allowed us to deduce the apparent attribution by each respondent of utility or disutility to match characteristics. Regression equations were then used to show the relationships between respondents' characteristics and their attribution of utility to match characteristics. The coefficients from these regressions were then used within the microsimulation model.

The model was used to test the impact of a variety of car sharing schemes upon the transport system. The schemes tested varied in size, location, matching procedures and the availability of special incentives for car sharers. The model, its calibration surveys and results are described in Transport and Road Research Laboratory supplementary Reports Nos. 563, 564 and 565 (Bonsall, 1980a, b, c).

REFERENCES


