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Findings of a Study to Estimate the Effectiveness of Proposed Car-Pool-Incentive Policies

Jeffrey M. Bruggeman and Richard B. Rubin, Peat, Marwick, Mitchell and Company
Frank Griffiths, Market Facts, Inc.

This paper summarizes the findings of a car-pooling impact study conducted for the Federal Energy Administration. The aim of the study was to estimate the impacts of various proposed car-pool-incentive policies on work travel. A market research methodology was adapted to estimate modal-split impacts under various policy conditions and corresponding estimates of vehicle kilometers of travel and fuel consumption. A trade-off model was used to simulate modal behavior under 14 representative car-pool-incentive policies and nine travel-time sensitivity tests. Paired-comparison responses on work-trip preference collected by a specially designed survey were the primary input to the trade-off model. The study produced two major sets of results: (a) tabulations and cross tabulations of the survey data and (b) estimates of the impact on modal split, vehicle kilometers of travel, and fuel consumption from policy simulations of the trade-off model. Gasoline rationing was found to be the most effective policy for reducing vehicle kilometers of travel and fuel consumption. Substantial surcharges on gasoline sales and parking in the central business district or in facilities of major employers were moderately effective. Purely incentive policies such as tax rebates to car-pool members and car-pool matching programs were not very effective. If practical policies for achieving significant discriminatory travel-time advantages for high-occupancy vehicles could be implemented, they would be moderately effective.

Car pooling has tremendous potential for conserving transportation energy in urban areas. Despite the simplicity of car pooling, Americans have been reluctant to take advantage of its many benefits. Recognizing this problem, the Federal Energy Administration (FEA) sought to determine the incentives and disincentives that will encourage people to alter their basic travel habits.

PURPOSE OF THE STUDY

Significant car pooling already exists in most urban areas but does not approach its full potential. The FEA-sponsored study of car-pooling impacts was specifically designed to select representative policies and assess their potential for reducing vehicle kilometers of travel and energy consumption through their impact on modal choice. The study concentrated on the type of travel that has the greatest car-pooling potential—the work trip in urban areas.

Many policies have been proposed for encouraging the formation of car pools. The following were selected for evaluation in the study:

1. Gasoline rationing,
2. Four types of parking-rate adjustment,
3. Two levels of gasoline surcharge,
4. A toll surcharge,
5. Rebate for car-pool members,
6. Three types of car-pool matching improvement programs,
7. Two programs to improve the availability of midday transportation, and
8. Nine sensitivity tests of travel-time changes.

These policies (with the exception of the sensitivity tests) were applied to specific target groups at levels representative of typical, administratively feasible programs.

METHODOLOGY

Because the decision on whether or not to car pool is highly subjective, a quantitative market research approach was used instead of a traditional modal-split methodology. The study methodology is presented in greater detail in a paper by Rubin, Bruggeman, and Griffiths in this Record.

Market Research Approach

Research techniques used in a marketing context to evaluate products were adopted to predict the modal choice of commuters. Such an approach uses the preferences and attitudes of individuals toward the various attributes of specific products. In this study, the products are the alternative work-trip modes available to respondents. The attributes include the characteristics of both the mode and the specific journey that might influence the modal decision.

A survey was administered that required respondents to choose between alternative levels of the various attributes of the work trip and revealed the weight or the importance of selected attributes in modal decisions. The results of this trade-off task were input to a model that developed a scheme of qualitative preferences, or utilities, for each attribute. The model was applied by defining the levels of each attribute for the specific policy alternative being evaluated and for the mode and the respondent under consideration.

Many attributes with a potential for influencing mode choice were identified. The number of attributes was limited, however, by the ability of the respondent to perform a lengthy trade-off exercise. Therefore, attributes that appeared to be of less importance and those that could not be affected by public policy were eliminated from the study. The attributes selected were mode used, travel cost, parking cost, extra time (i.e., walk and wait time), riding time, the number of people in the vehicle, the ease of finding others to share a ride, the ease of finding transportation during the day for personal business, and the available supply of gasoline. The first, or mode, attribute was used so that specific characteristics of the various modes that were not explicitly included in the other attributes could be included.

Data Base

Data were collected for this study during the summer of 1975 in three major metropolitan areas—Chicago, Pittsburgh, and Sacramento. Interviews were held with 300 selected respondents in each area. Expansion factors were developed for each city so that estimates of impacts could be made at the metropolitan-area level.

A specially designed survey obtained information on the socioeconomic characteristics of the sampled households, the work-trip characteristics of respondents, and the attitudes and opinions of respondents toward various car-pooling issues. Respondents also performed a series of trade-off exercises designed to measure the importance of various modal-choice attributes and to serve as input to the trade-off model.

STUDY FINDINGS

The major findings of the study in relation to the market for car-pooling alternatives and the effectiveness of individual policies are as follows:

1. The effectiveness of policies is tied to the size of the market to which they are applied. Important considerations are the number of persons who pay to park, the proportion of total employment associated with major activity centers and major employers, and the characteristics and the availability of parking facilities.
2. The overall impact of policies that apply to the total population is generally greater than that of policies that apply only to specific groups, but secondary considerations may increase the desirability of the second type of policy.
3. Use of a vehicle (by another member of the household) that is left at home during the day is not substantial.
4. Of the policies tested, gasoline rationing had by far the greatest impact. Energy savings for work travel were less than proportional to the level of rationing, which indicated a greater willingness to reduce nonwork travel.
5. Parking surcharges were highly effective in reducing fuel consumption among the groups to which such policies were applied.
6. Gasoline surcharges achieved a reasonable degree of effectiveness because they applied to all commuters.
7. Travel-time changes that discriminate between the car pool and single-occupant modes have high potential.
8. Purely incentive policies such as rebates, improved matching, reduced parking rates for car pools, and improved midday transportation did not yield substantial energy savings.

SURVEY TABULATIONS

The use of car pooling for work trips can be encouraged by many policies. However, the effectiveness of these policies is influenced by the basic characteristics of the urban work-travel market. Examination of market characteristics is a necessary first step in the detailed assessment of individual policies.

Current Modal Choice

The modal distribution for work travel in each of the three study cities in the summer of 1975 is given in Table 1. The total modal distribution for each region and various group breakdowns are presented.

The proportion of workers driving alone is approximately two-thirds in both Chicago and Pittsburgh; in automobile-oriented Sacramento, it is greater than three-fourths. The proportions for transit use and car pooling are approximately reversed between Chicago and Pittsburgh; Chicago has higher transit use because of the availability of extensive commuter rail and rail rapid transit service.

Examination of the results by the disaggregations presented in the table reveals typical patterns of modal choice. Persons employed in the central areas used transit much more frequently, which reflects the radial nature of most urban transit systems. An interesting aspect is that car-pool participation did not show major variation across most of the socioeconomic classifications examined except for households that do not own an automobile.

These results do not directly reveal any market segments that should be particularly sensitive to car-pooling alternatives, but they do indicate that caution should be used when policies are applied in markets where transit use is high. An overly aggressive car-pooling program could draw participants away from transit and have decidedly undesirable results.

Employer Characteristics

Many car-pooling programs focus on the employment end of the work trip and are more practical for certain specific geographic areas such as the central business district (CBD) of the city and major activity centers throughout the urban area. The number of persons employed in the CBD represented 18 percent of the total in Chicago and 12 and 13 percent in Pittsburgh and Sacramento respectively.

Another important factor in car-pool market potential is the size of the individual employers. It is clear that, in practice, certain policies are only applicable to major employers. The distribution of employees by company size is shown in Figure 1 for the three cities studied. The number of workers at work locations that have 20 or

Table 1. Percentage distribution of work-travel modes by market characteristics.

Characteristic	Chicago Drive Alone	Chicago Car Pool	Chicago Transit	Pittsburgh Drive Alone	Pittsburgh Car Pool	Pittsburgh Transit	Sacramento Drive Alone	Sacramento Car Pool	Sacramento Transit
Work ring									
1	41	13	46	37	8	55	68	18	14
2	72	16	12	60	21	19	79	20	1
3	85	14	1	72	22	6	85	15	0
Income									
<$10 000	48	15	37	65	15	20	67	21	12
$10 000 to $15 000	65	17	18	70	16	14	72	24	4
$15 000 to $20 000	74	15	11	55	35	10	87	10	3
>$20 000	73	11	16	61	21	18	82	16	2
Automobiles owned by household									
0	2	27	71	0	44	56	0	54	46
1	62	16	22	66	13	21	72	20	8
≥2	84	9	7	74	22	4	80	16	4
Sex									
Male	72	15	13	68	21	11	80	75	5
Female	56	12	32	57	18	25	69	23	8
Travel period									
Peak	60	15	25	66	20	14	74	19	7
Off-peak	79	12	9	62	20	18	84	12	4
Car-pooling policy of employer									
Encourage	58	16	26	59	27	14	70	20	10
Not encourage	67	14	19	67	17	16	79	17	4
Distance to work									
<3.2 km	62	24	14	69	18	13	67	24	9
3.2 to 16 km	69	12	19	64	18	18	75	18	7
>16 km	62	16	23	59	28	13	80	16	4
All	66	14	20	64	20	16	76	18	6

Notes: 1 km = 0.62 mile.
All figures are expressed as row percentages and are thus treated as modal splits.

Figure 1. Distribution of employees by size of employing company.

fewer employees is substantial and as a group is hard to reach through most car-pooling programs. Another factor that has considerable impact on the implementation of car-pooling programs is the number of individual employers in the largest categories. Although the number of workers at locations where 200 or more people are employed is only about 35 percent of the total in each area, the number of individual employer markets is quite small.

Many major employers already encourage employees to use car pools as a civic-minded gesture and a way to reduce the demand for costly parking. The percentage of employees in the three cities who work for employers who encourage car pooling is shown in Figure 2. The fact that the actual mode split among employees working for employers who encourage car pooling and those who do not is not very different (Table 1) suggests that simple encouragement by employers is of limited effectiveness as a car-pooling incentive.

Parking Supply

The amount and the type of parking available to employees are among the most important supply characteristics of the urban travel market. Parking characteristics for the three cities are shown in Figures 3 and 4. Parking in company lots dominates in all three cities and accounts for over 75 percent of the total in Sacramento (Figure 3). Parking in commercial lots, which would be a target for a number of car-pooling policies, accounts for a relatively small portion of the total.

The success of car-pooling strategies that affect parking in company lots depends on the identification of benefits to the company and the general feasibility of the proposal at the specific location. The single best measure of these factors is the amount of company parking provided (Figure 4). The primary market for employer-based car-pooling programs is places of employment with a deficiency in existing parking: A direct economic incentive clearly exists for the employer to remedy the condition. Data show that the amount of employment at facilities with deficient parking is relatively small. Thus, the effectiveness of programs aimed at parking in employer lots will not be substantial unless the more drastic policies are implemented.

Parking Cost

The amount of free parking versus the amount of paid parking is another factor that affects certain car-pooling policies (Table 2). A parking cost is clearly easier to implement as a fee added to an existing pay structure than as a completely new collection requirement. In the three cities surveyed, however, approximately 90 percent of all employees do not pay for parking. Only about 2.5 percent in Chicago and Pittsburgh and 0.5 percent in Sacramento paid a daily fee of $1.50 or more to park. This disappointingly small group is the most promising target for the imposition of a meaningful surcharge or a graduated pay structure based on vehicle occupancy (without generating enormous resistance). However, because such workers are employed almost exclusively in the most congested part of the CBD, secondary benefits might be sufficient to warrant such policies even though overall regional impact might be negligible.

Table 2. Weekly parking costs.

Cost	Employee Population: Chicago Number (000s)	Chicago Percent	Pittsburgh Number (000s)	Pittsburgh Percent	Sacramento Number (000s)	Sacramento Percent
None	1861	91.6	490	88.4	225	88.9
$0.01 to $2.49	26	1.3	12	2.1	17	6.6
$2.50 to $7.49	94	4.6	39	7.1	10	4.0
$7.50 to $12.49	20	1.0	12	2.1	1	0.5
$12.50 to $17.49	31	1.5	2	0.4	0	–
≥$17.50	0	–	0	–	0	–
Total	2030	100	555	100	253	100

Note: Mean employee parking costs in the three cities are as follows: Chicago, $0.57; Pittsburgh, $0.64; and Sacramento, $0.33.

Figure 2. Percentage of employees working for employers who encourage car pooling.

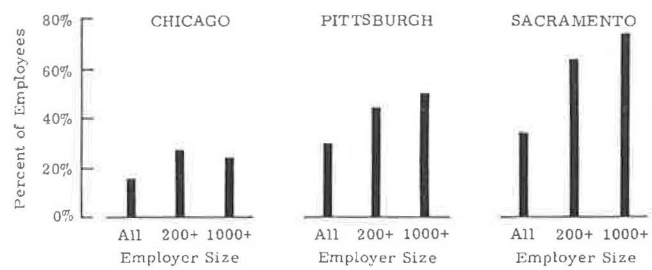


Figure 3. Use of parking facilities.

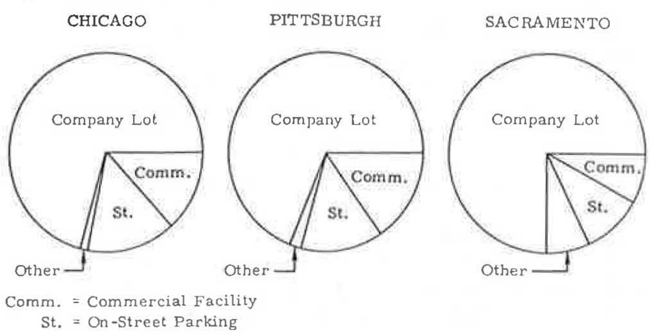
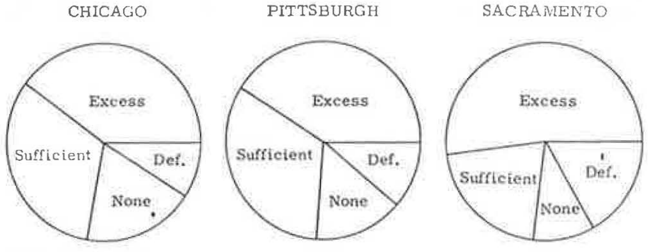


Figure 4. Company-supplied parking.



Other Market Groups

Car-pooling policies may also be imposed by using other mechanisms that affect specific target groups. An example is a surcharge imposed at toll facilities, perhaps graduated to favor car-pool vehicles. The three cities studied all had some toll facilities, but the number of commuters paying tolls amounted to less than 5 percent. In view of this extremely small market, even a massive toll policy would have negligible impact on regional energy-consumption figures.

Another car-pooling policy that has received considerable attention requires the creation of a reserved car-pool lane on an existing freeway. An attempt was made to locate suitable facilities for such an alternative in each of the three cities studied. Two major radial freeways were chosen in Chicago and a radial facility that has been proposed in other studies was chosen in Pittsburgh. No suitable facility could be identified in Sacramento. About 10 percent of Chicago commuters travel in the two selected corridors, and about 7 percent of Pittsburgh commuters use the corridor selected there. Although these levels are not insignificant, the potential of such a policy must be carefully weighed against the difficulties and costs involved in its implementation.

Impediments to Car Pooling

Two major factors have a significant influence on the environment in which car-pooling decisions are made. The first concerns the relative ease of finding someone with whom to share a ride to work. Figure 5 shows that slightly more than 25 percent of the surveyed population in all three cities felt that finding a car-pool match would be easy; this is 40 to 80 percent more than the number of persons who were actually using car pools as their major mode of travel. The percentage of respondents who indicated that finding a match was impossible was much higher. Although many of these persons are merely uninformed about car-pool matching opportunities, the large numbers involved impose a serious limit on the overall car-pool market.

The second major factor is the need for an automobile during the day for personal business (Figure 6). The mode used for 80 to 90 percent of these midday trips is the automobile. Although midday travelers make between 5 and 10 percent of these trips as automobile passengers, many of these trips are probably joint trips to lunch or for some similar purpose rather than a true car-pool activity. Although the availability of midday transportation should not be a major factor for most of the work market, the fact that the overwhelming mode choice of midday travelers is the automobile represents another real limit on the overall car-pool market.

Another factor that is frequently cited as an impediment to car pooling is the additional time required to pick up and drop off passengers. In all three cities, the responses of persons who actually participated in car pools indicated an average pickup time of about 5 min and an average drop-off time of from 1 to 3 min. Although not large in themselves, these values are not insignificant when compared to average reported riding times.

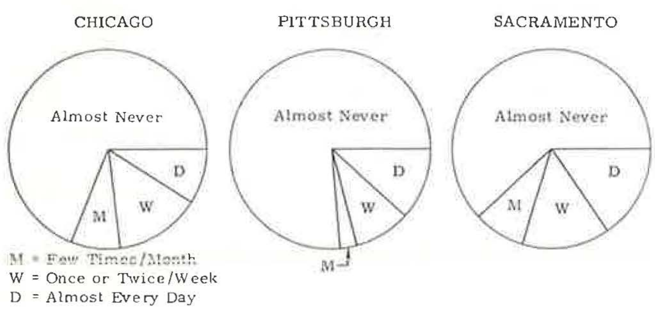
Attitudes That Affect Modal Choice

Each respondent in the survey was asked to rate several attributes of work travel as to their importance in the decision on which mode to select. A total of eleven attributes were assessed; those that were rated highest were reliability, safety from accidents, convenience, and safety from crime. A second set of attitudes that concerned more specific attributes and their importance in the decision to car pool were also assessed. Among these attributes, those chosen as most important were waiting to pick someone up and waiting to be picked up. Also of importance were not having to adjust one's schedule, having to depend on someone else, the ability to drive oneself, and reducing pollution.

These attitudinal responses were not unexpected, but the relative strength of some of the attitudes was not anticipated. Unfortunately, few of the most important attributes of car pools perceived by the respondents can be affected by public policy.

Figure 5. Response of survey population concerning ease of finding a car-pool match.

Figure 6. Response of survey population concerning frequency of midday trips that require transportation.



Car-Pool Characteristics

Reported car-pool occupancies are given in Table 3. By far the greatest number of car pools contain only two occupants. One characteristic of existing car pools that has implications for extrapolating current occupancies to future conditions is the number of family or household car pools. Such pool members have different attitudes and needs than those in a more formal car pool. The number of car poolers who reported members from the same household as members of the car pool represented 9.7 percent, 21.1 percent, and 28.6 percent for Chicago, Pittsburgh, and Sacramento respectively.

Another characteristic of existing car pools that has policy implications is the number of expense sharers in the pool. In all three cities the number of respondents who reported no sharing of expenses is about 50 percent. This may explain some inconsistencies in car-pool forecasting because a cost may not be shared evenly among members, as assumed, but be borne by the primary driver.

POLICY SIMULATION

The trade-off model simulation estimates include the modal-split estimates for each selected incentive policy and the travel-time sensitivity tests as well as related estimates of travel impacts (1).

Overall Modal Impacts

Table 4 gives a brief description of all of the base case and policy simulation runs made with the trade-off model. Table 5 gives a summary of the modal-split estimates for each of the simulated base cases, policies, and travel-time sensitivity tests. Two observations on the modal-split results are particularly relevant:

1. Some policies increase the car-pool share but at the expense of transit ridership. This is especially true of pure car-pool incentives such as the car-pool rebate and policies that call for graduated parking rates.

2. The results for the car-pool-matching and midday-transportation policies in Table 5 correspond to policies that were simulated by using alternate utilities (qualitative preferences) derived from special paired-comparison questions. These results and other indications suggest that the use of paired-comparison questions under alternate assumptions may not be a fully reliable approach for dealing with attributes such as the ease of

Table 3. Car-pool occupancy.

	Car Poolers					
	Chicago		Pittsburgh		Sacramento	
Occupancy	Number (000s)	Percent	Number (000s)	Percent	Number (000s)	Percent
Number						
2	353	60.1	92	52.6	42	65.1
3	164	27.9	37	21.4	16	24.7
4	45	7.6	30	17.3	4	6.0
5	26	4.4	13	7.6	1	1.1
6	0	0.0	2	1.1	2	3.0
Total	588	100	175	100	65	100
Number from same household						
0	531	90.3	138	78.9	46	71.4
1	41	6.9	37	21.1	17	25.5
≥2	16	2.8	0	0.0	2	3.1
Total	588	100	175	100	65	100

Note: Mean car-pool occupancies for the three cities are as follows: Chicago, 2.6; Pittsburgh, 2.8; and Sacramento, 2.5.

finding a car-pool match and the availability of midday transportation.

Impacts on Vehicle Kilometers of Travel and Fuel Consumption

Estimates of vehicle kilometers of travel and fuel consumption under the various policies were made by using the modal-split estimates and the reported work-trip lengths for each survey respondent. Corrections for variations in average speed and type of road were also incorporated into these calculations (2).

Only slight differences appear between the percentage impact of a policy on vehicle kilometers of travel and on fuel consumption; thus, the percentage change in work-trip vehicle kilometers of travel is used as the basis of the following evaluations (Figure 7).

As anticipated, the policy for 25 percent gasoline rationing has by far the greatest impact. The first three parking-tax policies are more modestly successful, pro-

Table 4. Description of policies tested.

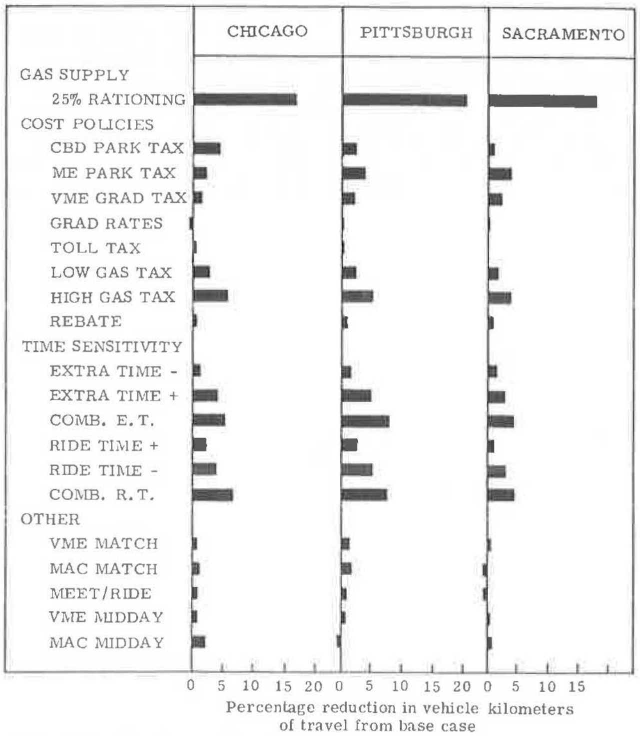
Policy	Description
Base case	All respondents
Gasoline rationing	25 percent reduction in supply
Cost	
CBD parking tax	$2/vehicle/d surcharge
Major employer parking tax	$2/vehicle/d surcharge
Major employer graduated tax	$2.50, $1.50, $0.75, $0.40, and $0.0 for vehicles with one, two, three, four, and five or more occupants respectively
Graduated parking rates	Full, half, or free parking rates for vehicles with one, two, or three or more occupants respectively
Toll	Doubling of existing tolls
Low gasoline tax	$0.05/L
High gasoline tax	$0.10/L
Rebate	$260/year for car-pool members
Time sensitivity	
Decrease extra time	10 min for car-pool members
Increase extra time	10 min for single occupancy
Combination extra time	Both of the above
Decrease urban extra time	For central-city workers
Increase urban extra time	For central-city workers
Combination urban extra time	Both decrease and increase
Decrease riding time	20 percent for car pools and transit
Increase riding time	20 percent for single occupancy
Combination riding time	Both of the above
Other	
Base case match	"Easy matching" respondents
Major employer match	Major employer matching program
Major activity center match	Major activity center matching program
Meet and ride	Meet-and-ride lots in suburban areas
Midday transportation base case	"Easy midday transportation" respondents
Major employer midday transportation	Major employer midday transportation program
Major activity center midday transportation	Major activity center midday transportation program

Note: 1 L = 0.26 gal.

Table 5. Modal split by policy.

Policy	Chicago			Pittsburgh			Sacramento		
	Drive Alone	Car Pool	Transit	Drive Alone	Car Pool	Transit	Drive Alone	Car Pool	Transit
Base case	62.83	16.93	20.24	63.23	19.99	16.77	75.26	17.85	6.87
CBD parking tax	61.27	17.04	21.70	61.85	20.43	17.72	74.34	18.21	7.44
Major employer parking tax	60.11	18.67	21.22	60.39	22.10	17.51	70.69	21.34	7.97
Major employer graduated tax	61.35	18.02	20.62	61.28	21.40	17.32	71.59	20.52	7.88
Graduated parking rates	62.72	17.30	19.98	63.09	20.29	16.63	75.23	17.93	6.84
Toll	62.74	16.93	20.33	63.20	20.01	16.80	75.26	17.87	6.87
Low gasoline tax	61.49	17.52	20.99	62.10	20.70	17.19	73.86	18.99	7.15
High gasoline tax	60.17	18.05	21.78	60.95	21.46	17.58	72.47	20.05	7.48
Rebate	62.24	17.82	19.94	62.77	20.56	16.66	74.49	18.73	6.78
Decrease extra time	60.42	20.07	19.50	61.35	22.22	16.43	73.26	20.07	6.67
Increase extra time	59.17	19.66	21.17	58.36	23.73	17.92	71.13	21.39	7.47
Combination extra time	56.43	23.28	20.30	56.20	26.32	17.48	68.91	23.89	7.20
Decrease urban extra time	60.95	19.50	19.55	62.68	20.68	16.63	73.64	19.67	6.68
Increase urban extra time	59.94	19.02	21.03	61.46	21.14	17.40	72.13	20.55	7.32
Combination urban extra time	57.81	21.97	20.21	60.80	21.97	17.23	70.36	22.56	7.07
Decrease riding time	60.44	18.83	20.73	60.76	20.72	17.52	73.23	19.53	7.23
Increase riding time	59.35	19.59	21.05	59.08	23.35	17.57	71.30	21.26	7.43
Combination riding time	56.88	21.84	21.49	56.43	25.18	18.38	69.17	22.99	7.84
Gasoline rationing	45.78	26.26	27.96	46.37	26.20	27.43	56.16	30.18	13.65
Base case match	65.28	20.88	13.84	65.28	20.32	14.40	73.59	20.12	6.28
Major employer match	65.14	20.86	14.00	65.08	20.81	14.11	73.39	20.08	6.53
Major activity center match	65.23	21.39	13.37	65.21	20.65	14.14	73.57	19.63	6.79
Meet and ride	65.33	20.61	14.05	65.76	19.89	14.36	73.93	19.75	6.32
Midday transportation base case	63.58	16.07	20.35	71.74	17.56	10.70	74.35	17.23	8.41
Major employer midday transportation	62.80	16.27	20.93	71.66	17.74	10.60	74.52	17.01	8.47
Major activity center midday transportation	62.22	16.82	20.96	71.91	17.37	10.73	74.37	17.16	8.47

Figure 7. Summary of the impact of policies on vehicle kilometers of travel.



ME = Major Employer - Over 200
VME = Major Employer - Over 1000
MAC = Major Activity Center

ducing reductions in vehicle kilometers of travel in the range of 2 to 5 percent. The markets for these policies are relatively small, however, ranging from 8 to 21 percent of the total work trips. The CBD parking tax is most potent in Chicago, largely because the market there is nearly twice as large as in the other two cities. Similarly, the very large employer parking tax is least effective in Chicago, which has the smallest relative market of the three cities.

The policy that calls for graduated parking rates, which reduces existing parking rates for car pools, and the toll surcharge policy, which applies only to existing tolls, are both relatively ineffective largely because of the small market size for these policies. The gasoline-tax policies were more effective than many of those involving parking surcharges; as expected, the higher tax, at $0.10/L ($0.40/gal), was nearly twice as effective as the lower rate at $0.05/L ($0.20/gal). The gasoline-tax policies, like rationing, were effective in part because they affected the entire work-travel market.

Because practical policies to test the impact of time changes on modal choice could not be identified, a series of sensitivity tests was run for the entire commuting population. The decrease in time for car-pool modes was not nearly as effective as a similar increase in time for single-occupant automobiles, which again illustrates the problems faced by an incentive policy. The implementation of time changes as actual policies is difficult and would most likely be confined to certain facilities. The market affected by bus and car-pool lanes on major radial freeways may be only 10 percent; thus, the impacts of such facilities would have to be cut by a factor of approximately 10 to simulate a typical policy of this type.

As already mentioned, policies that involve matching opportunities and availability of midday transportation were simulated by using an experimental technique that may have caused some problems for the respondents. The results for these policies may not be valid. In any event, they show very small impacts.

CONCLUSIONS

The results of the study revealed few surprises with respect to policy impacts. The most effective policies were those that had strong, potentially unpopular disincentives and restrictions on single-occupant automobile use. Purely incentive policies had much less impact.

Gasoline Rationing

Of all the policies tested, gasoline rationing (simulated at a level of 25 percent reduction in supply) is the most effective in reducing vehicle kilometers of travel. This is not surprising; a reduction in gasoline supply must result in reduced fuel consumption. The results indicate that work-trip vehicle kilometers of travel would be reduced by approximately 17 to 20 percent in the short run. The impact on nonwork trips would therefore be correspondingly greater than 25 percent.

Gasoline Surcharges

Although they were not nearly as effective as rationing, surcharges achieved significant reductions of approximately 3 to 5 percent. Two such policies were tested: a low surcharge of $0.05/L ($0.20/gal) and a high surcharge of $0.10/L ($0.40/gal). These levels represent rather substantial gasoline price increases. However, they are not much greater than the natural gasoline price increases that motorists have recently been obliged to accept. Such surcharges are likely to be much more palatable to the public than gasoline rationing although equity and ability to pay must be considered. Because the taxation machinery is already in operation, such surcharges are also far less administratively burdensome than rationing would be.

Parking Surcharges

Parking surcharges for facilities of employers of 200 or more people and for CBD parking are also moderately effective. The general rule suggested by the limited results of the study is that the parking surcharge oriented to the major employer will probably have a greater overall impact than a CBD-oriented parking surcharge in all but the biggest metropolitan areas (such as Chicago) because of market size. The important point to be made here is that these policies are defined as affecting all parkers including those who currently pay nothing to park (90 percent of all parkers included in the survey). The imposition of parking charges on those who currently pay none and the imposition of surcharge responsibilities on all employers of 200 or more people are likely to create almost as much opposition as gasoline rationing, if not more.

Travel-Time Changes

The simulation results of the sensitivity tests suggest that a policy that could achieve strong mode-discriminatory travel-time changes for a large fraction of commuters could also prove to be effective. A 20 percent time decrease for car poolers and a 20 percent time increase for solo drivers, applicable to a majority of commuters, would be quite effective. However, the political and administrative feasibility of achieving such substantial and widespread discriminatory time changes by means of a specific policy is questionable.

Less Effective Policies

Toll surcharges, car-pool rebates, and programs to improve opportunities for midday transportation can all be categorized as poor performers. These policies falter because of the small group of commuters affected, their minor behavioral impact, or a combination of both factors. Such policies may still have potential in particular situations, but their effectiveness for most metropolitan areas is questionable.

Car-Pool Matching Programs

The study results with respect to policies to improve car-pool matching opportunities were not conclusive. The results of the trade-off model suggested very modest impacts on vehicle kilometers of travel for the two car-pool matching programs tested. However, for reasons that were previously cited, these results were not treated as completely reliable. Tabulation of attitude and perception responses suggested that the ease of finding someone with whom to share a ride to work was a moderately important factor in the decision on whether to car pool. Although car-pool matching programs are designed to address this problem, it is not clear that a conventional matching program can substantially improve the ease of finding an acceptable match. However, matching programs are incentive rather than disincentive in nature and do not generate much opposition.

General Market Considerations

The potential of any car-pooling policy is limited by the following general considerations:

1. Any policy based on surcharges or adjustments to existing parking rates will affect only about 10 percent of all commuters.
2. Nearly 75 percent of commuter parking is in employer-operated facilities. Only 9 to 17 percent of employees indicated that such parking, if supplied, was deficient. Thus, most employers lack a direct incentive to create some type of preferential parking policy.
3. In most cities, the percentage of commuters who pay tolls is very small. Toll surcharges will be ineffective except perhaps in cases where no alternative routes exist.
4. The perception of more than a third of commuters is that finding someone with whom to share a ride is impossible. This significantly limits the effectiveness of car-pool matching programs.
5. Commuters considered car pooling to be deficient for several reasons, including travel dependence, having to find a ride sharer, and the inability to make side trips on the way to and from work. Only the second deficiency can be significantly affected by public policy.

ACKNOWLEDGMENTS

The research for this paper was performed under contract for the Federal Energy Administration. We would like to thank the FEA project manager, Anne Marie Zerega, for her assistance and guidance in completing this project. We would also like to thank the following persons and their agencies for the data which they so graciously provided: Wade G. Fox of the Southwestern Pennsylvania Regional Planning Commission, Chalabi and Bell of the Chicago Area Transportation Study, and Don MacVicar of the California Department of Transportation.

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Transportation Efficiency and the Feasibility of Dynamic Ride Sharing

Alain L. Kornhauser, Paul Mottola, and Brian Stephenson, Princeton University

This paper defines the theoretical limits imposed on ride sharing by the spatial and temporal structure of urban travel demand. Differences in market potential between prearranged ride sharing as it is used in car pooling and dynamic ride sharing as it is used in, for example, shared taxi are given. The paper presents the results of the simulation of a hypothetical shared-ride transit system that used various operational policies of dynamic ride sharing and identifies the improvements in transportation efficiency and the economic and technological savings that result from ride sharing. Data on the dynamic ride-sharing taxi system operating at Union Station in Washington, D.C., establish the feasibility of implementing dynamic ride sharing.

As a result of the gasoline crisis of 1973 and the scarcity of federal funds for the construction of new urban transportation facilities, improved efficiency has become a primary focus of urban transportation policy. A recent transportation systems management directive issued jointly by the Urban Mass Transportation Administration and the Federal Highway Administration is aimed toward the efficient use of existing transportation facilities. The most obvious target for efficiency improvement is private transportation—the automobile and the taxi. Van-pooling and car-pooling programs are aimed at trying to increase the people-carrying capacity of street systems during peak demand hours without construction of additional physical facilities. Shared-taxi and jitney enabling legislation is also aimed at the people-carrying productivity and the economic efficiency of the taxicab and its driver.

Even analysts of futuristic automated transit systems